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Editors

Technology Entrepreneurship

Insights in New Technology-Based Firms, Research Spin-Offs and Corporate Environments

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Contents

Architecture of Technology Ventures: A Business Model Perspective

Arash Najmaei

Abstract This chapter develops a framework for analyzing the architecture of technology ventures. The framework is based on the concept of business model-how the venture creates and captures value. Application of the business model concept in the technology venturing literature results in four theoretical postulations which explain how and why technology ventures differ from other ventures. In summary, we propose that: (1) business model of technology ventures has a complex technological core and a flexible marketing periphery. (2) Because of this core-peripheral architecture, business model of technology ventures is technology-driven and market-driving (3) market driving-ness makes these business models disruptive and (4) versatile, able to tap into multiple emerging markets. Supportive empirical evidence from three technology ventures substantiates this framework and its implications.

Keywords Technology ventures · Theory of the firm · Business models · Core-Periphery model · Market driving

1 Introduction

Technology ventures defined as small (less than 50 employees) and young (less than 10 years old) firms driven by high-technologies (technologies that require advanced and sophisticated knowledge base such as ICT, biotech and nanotech) have made and continue to make significant contributions to the world economy (Caridi-Zahavi, Carmeli, & Arazy, 2016; Gruber, Heinemann, Brettel, & Hungeling, 2010; Roure & Maidique, 1986; Zhang, Baden-Fuller, & Pool, 2011). Despite the importance of this type of business firms, little is known about the architecture of their business models and why they differ from other ventures. The extant literature is largely based on the assumption that technology ventures are formed around novel technologies which

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give them a potentially phenomenal capacity to exploit untapped markets (Deeds, DeCarolis, & Coombs, 2000; Li & Atuahene-Gima, 2001; Voudouris, Dimitratos, & Salavou, 2011; Zahra, 1996). Given this realization, one would naturally ask, if technology ventures differ from ordinary ventures why there is no specific theory for the architecture or design of their business models? This chapter seeks to answer this question by synthesizing work on technology venturing (Li & Atuahene-Gima, 2001; Voudouris et al., 2011) and business model design (i.e. Massa, Tucci, & Afuah, 2016; Wirtz, Pistoia, Ullrich, & Göttel, 2015).

The primary objective of this chapter is, hence, to outline a theory for the business model of technology ventures based on a synthesis of the literature on theories of the firm and the business model concept. The core argument of the chapter builds on two points: (1) current theories of the firm including the resource-based views and transaction costs are too simplistic and generic; falling short in providing a complete explanation for why technology ventures differ from other ventures. (2) The process of designing a business model based on new technologies to tap into unexplored markets (Najmaei, 2014; Najmaei, Rhodes, & Lok, 2015) is a potential yet relatively neglected perspective which can address the shortcomings in the theories of the firm for technology venturing.

We propose a framework, suggesting that, the emergence and growth of technology ventures are best explained by looking at the dynamics of their business models. Business models create the momentum that drives a high-tech venture by linking its technologies to different markets. This momentum originates from an opportunistically developed flexible orchestration of core technological know-how and complementary assets which generates a steady demand for the technology of the venture.

In addition, our theory posits that the business model of technology ventures is different from general business models employed by non-technology ventures in two fundamental ways: (1) they are nested dual systems composed of a core technology system nested in a periphery market focused system. The business model is technology based hence the venture is technology driven not market driven. This technological driven-ness enables technology ventures to become market driving. (2) This technological core and marketing periphery provides the technology venture with a superior versatility to commercialize its core technology in multiple markets and disrupt existing ones (Najmaei, 2012).

Considering the above, this chapter is organized as follows. The first section overviews the design and structure of technology ventures. This section establishes that a technology ventures is essentially a firm and the current view of the emergence, scope, boundaries and growth of the firm and consequently technology ventures is largely shaped by the economic theory of the firm. The second section elaborates the business model concept and the business modeling theory. It suggests that the business model concept is an alternative and perhaps new perspective to study technology ventures. The third section synthesizes the concept of technology ventures with the business model concept and proposes an architecture for the business model of technology ventures with its primary features. Section 4 substantiates the proposed model using three case studies. The last section discusses the implications of this theory for the theory and practice of technology venturing and outlines several directions for future research.

2 Technology Venturing

To understand the concepts of 'technology ventures' and 'technology venturing' let's define two terms of 'technology' and 'venturing' respectively. A technology in its simplest term is an application of knowledge to solve problems. In this regard, economic theory represents technology as a given set of factors' combination, defined (qualitatively and quantitatively) in relation to certain outputs such as tools, products and machineries (Dosi, 1982). Some outputs require relatively simple technologies while other require use of more advanced, sophisticated and complex technologies. Example of the former technologies are agricultural, carpentry, and cooking tools. Whereas nanotechnology, bio-technologies, and information technologies exemplify the latter type also known as high or advanced level technologies.

Technological progress in this respect is driven by the development of theoretical know-how and practical knowledge, expertise and embodiment of technical knowledge over time. Such progress, hence, follows certain paradigms which serve as patterns of solution of selected technological problems (Dosi, 1982). Each paradigm evolves through normal problem solving activities which shape technological trajectories along which various tools, machineries and products are developed until a revolutionary solution changes the paradigm. Technological progress, hence resembles that of scientific knowledge in a preparadigmatic, paradigmatic and post-paradigmatic phases (Dosi, 1982; Teece, 1986).

A venture, on the other hand, is simply an organization which brings a technology to the market in the form of a value offering encapsulated in products or services (Byers, Dorf, & Nelson, 2011). The act of venturing is the process through which a technological idea is brought to the market or simply commercialized. Taken together, the process of technology venturing involves conversion of technological know-how into market offerings within a technological paradigm along a specific technological trajectory (Abernathy & Utterback, 1978; Dosi, 1982; Teece, 1986). Having discussed the notion of technology venturing, let's see how economic theory explains emergence of technology ventures.

2.1 Two Polar Views: The Problem of Exogeneous Perspectives

The extant literature reflects two broad polar views on the nature of technology ventures. The first one points to market forces as the main determinant of technological advances and hence creation of ventures (Abernathy & Clark, 1985; Dosi, 1982; Schumpeter, 1942). This view, known as 'demand-pull', is an exogenous one in which consumers' unmet needs and preferences signal opportunities for venturing to be enacted by alert entrepreneurs (Dosi, 1982). Here, "consumers (or users) express their preferences about the features of the goods they desire (i.e. the features

that fulfill their needs the most) through their patterns of demand" (Dosi, 1982, p. 149). The main shortcoming of this view is its treatment of technology as a "freely available black box" (Dosi, 1982). That is, it assumes that, "there generally exists a possibility of knowing a priori (before the invention process takes place) the direction in which the market is "pulling" the inventive activity of producers" (Dosi, 1982, p. 149), hence ignoring the creativity of technologists and scientific breakthroughs.

The second view is in clear contrast to the market pull view. It suggests a technology push approach in which scientific advances backed by heavy investments in R&D result in technological breakthroughs which are pushed to the market via the process of technology venturing. Schumpeter (1934) is broadly recognized as the pioneer of this view. According to Schumpeter (1934), large firms with considerable market power, capital and R&D investments develop new technologies. This creative pattern destructs established norms, giving the inventor more competitive power to secure greater share of the market.

To Schumpeter technology venturing is a process of creative destruction done by large firms and smaller firms, if initially successful, will be eventually absorbed by larger corporations (Abernathy & Utterback, 1978). Furthermore, as Dosi (1982, p. 147) states, the 'technology push' view proposes a one-way causal determination (from science to technology to the economy) which fail to consider the intuitive importance of demand factors in shaping the direction of technical progress.

Despite their apparent differences and shortcomings, both market pull and technological push have informed our understanding of the ecology of technological venturing (Anderson & Tushman, 1990; Tushman & Romanelli, 1985). That is, they rest on exogenous assumptions which rather than explaining the internal mechanism which makes technology ventures different from other ventures, consider interactions between markets and technologies in a population of firms.

2.2 Transactions and Resources: Endogenous Views on Technology Venturing

As previously discussed, an endogenous view is required to understand factors and specify the internal structure of the technology ventures, their management, resources, capabilities and organizational processes. There are two pivotal endogenous views within the literature on technology venturing; the transaction costs and the competency or resource-based views. Both views posit that internal factors have more explanatory power than external technological and market exigencies in explaining the nature of technology ventures.

2.2.1 Technology Ventures: Transactions Costs and Resources

The transaction cost theory (TCT) (Coase, 1937; Williamson, 1975, 1979) is a powerful endogenous theoretical tool which explains how technology ventures work by looking at the governance and mode of transactions inside the ventures and between ventures and markets for technologies. A transaction refers to the exchange of goods, services, and information within and between firms in markets or from the providers to the users (Williamson, 1979).

TCT suggests that optimal choices are made when internal and external costs of transacting are minimized (Williamson, 1979). Internal costs include costs of managing, monitoring and controlling personnel and productive activities to develop and use technologies in creating market offerings. Whereas external costs include costs of selecting, contracting and monitoring performance of parties involved in transactions such as suppliers of materials and distributors (Williamson, 1979). In this regard a technology venture is a unit or mode of governance capable of performing transactions that are based on the use of technologies markets cannot perform (Williamson, 1991). Three attributes of such technology-driven and technology-intensive transactions determine how a venture performs them: (1) uncertainty involves in them, (2) their frequency, and (3) the nature of assets or resources required to perform them (Williamson, 1981). Uncertainty has two types. Internal uncertainty refers to the difficulty in evaluating performance of internal mechanisms, elements, and assets. External uncertainty refers to the environmental unpredictability, complexity as barriers of effective adaptation (Williamson, 1981). With respect to the frequency of transactions, Williamson (1981) states that only recurrent transactions (i.e., routines) are important because they make strategic and economic sense for the firm. Finally, asset specificity is whether the asset used in executing the transaction is tailored to the user and specialized to a transaction (Williamson, 1981). Asset specificity has three forms. Site asset specificity refers to the location of plants and systems that are specialized to a key transaction or set of transactions. Physical asset specificity refers to transaction-specific and specialized materials, tools, machineries, equipment, and technologies. Human asset specificity refers to the specific and specialized knowledge, skills, and abilities of staffs that is mainly developed through learning by doing (Williamson, 1981).

Given these attributes, the main purpose of the transaction cost analysis is to "align transactions, which differ in their attributes, with governance structures such as various organizational forms, markets, joint ventures, etc. which differ in their costs and competencies in a discriminating way" (Williamson, 1991, p. 79). A key task of managers is to find and execute the most efficient economizing alignments. Economizing alignments are not always obvious and/or sometimes are at variance with managerial personal attitudes and preferences (Williamson, 1991).

Applying transaction costs theory in the context of technology ventures suggests that, technology ventures are performers of technology-intensive transactions which cannot be performed in markets. Hence, the process of technology venturing involves the process of using technological know-how to perform a set of

transactions which are riddled with uncertainty in markets for technologies and internal the venture due to their complexity and lack of prior market testing. Such transactions are usually performed frequency using a complex configuration of specialized technological and human assets and involves higher than usual external and internal uncertainty. What transaction cost theory does not explain is the configurations of resources with which transactions are performed and management of these configurations.

The above shortcomings led to the formation of the resource-based or the competency view (Barney, 1991; Wernerfelt, 1984). The competency view treats a technology venture as a bundle of resources mainly technological know-how managed by executives who have different worldviews about technologies, markets and resources at their disposal (Barney, 2001). Resources here, are defined broader than assets in the transaction cost view. Organizational resources in this view refer to all those specific physical (e.g., specialized equipment, geographic location), human (e.g., expertise in chemistry), and organizational (e.g., superior sales force) assets that can be used to implement value-creating strategies (Eisenhardt & Martin, 2000, p. 1107). Hence, similar ventures in terms of resource endowments can use their resources in uniquely different ways to perform market transactions differently (Eisenhardt & Martin, 2000). Furthermore, the competency view suggests that market offerings (i.e., products and services) are results of transactions performed by resources utilized by managers. Success of a venture's market offerings (i.e. products and services), is a function of the way the venture acquires, uses and develops its resources and competencies (Deeds et al., 2000; Siegel, Siegel, & Macmillan, 1993).

Finally, the competency view suggests that resources which are valuable, rare, inimitable and organized in a firm-specific structure (e.g. innovative product development, networking, alliance management) can shape competitive competencies which drive sustained market success of technology ventures (Najmaei, 2016a; Park & Tzabbar, 2016; Tzokas, Kim, Akbar, & Al-Dajani, 2015).

At the heart of both transaction cost theory and the competency view—and departing from the exogenous views as previously discussed—rests the concept of value and how internal factors are assembled to create and capture value.

2.3 Value Concept: The Foundation of an Endogenous View of Technology Venturing

Both transaction costs and competency views suggest that a technology venture succeeds only when it creates and captures value. The transaction cost view considers value creation and capture in terms of the venture's ability to economize transactions or minimize overall economic costs (Williamson, 1991). The competency view takes a slightly different stand by considering value as the difference between the totality of customers' perceived benefit by acquiring the firm's products

or services and the full economic costs of these products and services (Barney, 2001).

For the purpose of this research and to align transactions and competency views on the notion of value, the conceptualization of value proposed by Bowman and Ambrosini (2000) is used. According to Bowman and Ambromani, value in general can be divided into 'use value' and 'exchange value'. Use value is defined as the "customers' perceptions of the usefulness of the product on offer, equivalent to 'total utility'" and exchange value is "the amount paid by the buyer (customer) to the seller (business enterprise) for the use value".

As noted, a venture succeeds when it creates and captures value. Value creation in this regard is the activation of the firm's tangible and intangible resources (through the actions of organizational members) as inputs of procedures that combine and transform use values the firm has acquired into new use values (Bowman & Ambrosini, 2000, p. 5). Or simply, creation of competitively superior products and services. Then, the use value must be captured.

Value capture is the realization of 'exchange value' by economic actors including firms, customers, resource suppliers and employees (Bowman & Ambrosini, 2000, p. 15). Value is realized when buyers are convinced and enticed to pay for the use value (Teece, 1986). Both creation and capturing of value are driven by a venture's ability to use its resources to perform technology-driven transactions in a competitively superior way relative to other firms in the industry. Taken together, technology venturing is the process of using a technology to create 'use value' and developing an organization around it to capture this value by generating 'exchange value'. As next section shows, capturing value is more difficult than creating it.

2.4 How Can Technology Ventures Capture Value?

To capture value from technological innovations, innovators should generate revenue in excess of the total cost of their resources and convert it into profit (Teece, 2006). Not every firm can capture the entire profit generated by a technological offering because this profit is distributed among the firm and its suppliers, imitators, followers and customers (Teece, 1986). Teece (1986) argues, an innovator needs to take three factors into considerations to maximize its share of the profit, (1) appropriability regime. That is "the environmental factors, excluding firm and market structure, that govern an innovator's ability to capture the profits generated by an innovation. The most important dimensions of such a regime are the nature of the technology (its complexity, design, knowledge-base), and the efficacy of legal mechanisms of protection (existence of patents, copy rights, trademarks, trade secrets, etc.)." (p. 287). (2) Stage of the technology in the industry life cycle and its dominant design. According to Teece, once a dominant design emerges, competition shifts to price and away from the design. Competitive success then shifts to a whole new set of variables. Scale and learning become much more important, and specialized capital gets deployed as incumbents seek to lower unit costs through

exploiting economies of scale and learning (p. 288). Hence, innovative designs accrue more profits faster. (3) Complementary assets involved in the creation and commercialization of the technology. These assets are different from specific assets discussed in the transaction costs view in that they complement assets used in performing core technological transactions. Teece further argues that, a technology is based on a complex system of knowledge components (i.e. specific assets in transaction costs). In almost all cases, the successful commercialization of an innovation requires that the know-how in question be utilized in conjunction with other capabilities or assets. Services such as marketing, competitive manufacturing, and after-sales support are almost always needed. These services are often obtained from complementary assets which are either generic, specialized or co-specialized (p. 288).

Teece defines three forms of complementary assets as follows: "Generic assets are general purpose assets which do not need to be tailored to the innovation in question. Specialized assets are those where there is unilateral dependence between the innovation and the complementary asset. Co-specialized assets are those for which there is a bilateral dependence" (Teece, 1986, p. 289). Ceccagnoli and Rothaermel (2008) offer the following examples for these three types of complementary assets: General purpose manufacturing equipment are an example of generic complementary assets. GE Medical System's stellar reputation for quality and service in hospital equipment is considered a specialized complementary asset, whereas specialized repair facilities for Mazda's rotary engine would be a co-specialized complementary asset.

A technology venture succeeds in maximizing its share of profit (i.e. capturing value from its innovation) when, (1) the design its technological offerings is different from the dominant design either by creating a new technological trajectory or progressing along an emerging one within a new paradigm where the dominant design is not well-established and entrenched yet. Under such circumstances, the competition is not on price hence allowing the venture to charge a premium for its design. (2) It has access to well-defined and developed sets of complementary assets to deliver its technological offerings to the market place and capture its value faster than competitors in a more economic was. (3) It can only manage these two conditions when strong regimes of appropriability exist in the ecosystem where it operates.

Considering the above, Teece (1986)'s model offers a precise understanding of how the structure of resources in the form of complementary and transaction specific assets and nature of transactions in presence of strong appropriability regimes help technology ventures capture value from technological offerings. What is missing from these theoretical models is the logic or the model by which resources (complementary and specific) are managed to optimize both the creation of superior value offerings and capturing of their value in the market. In what follows, it will be argued that the business model concept can cover this void. It not only integrates and complements these models into a complete view of what technology ventures are, but also explains how they work and how they differ from other ventures.

2.5 *The Business Model Concept: Logic of Creating and Capturing Value*

It is now a well-established fact that all technology ventures have business models: "Every company has a business model, whether they articulate it or not" Chesbrough (2007, p. 12). "Whenever a business enterprise is established, it either explicitly or implicitly employs a particular business model that describes the design or architecture of the value creation, delivery, and capture mechanisms it employs" Teece (2010, p. 172). Therefore, the question is how the business model concept fits into the endogenous theories of technology venturing and specifically models of value creation and capture. To address this question, lets briefly discuss what a business model is.

2.5.1 What Is a Business Model?

The extant literature offers three interpretations of the business model concept. The first one is the industry view. Per this view business models define how firms in an industry work. For instance, the social networking business model represents Facebook, twitter, Instagram, etc. Whereas the e-commerce business model refers to the general style of operation used by eBay, Amazon, Alibaba and other similar firms. In other word, ventures which operate in one technological paradigm and evolve along similar technological trajectories by adding common technological problems in different ways (Dosi, 1982; Dosi & Marengo, 2007) are expected to have similar business models and vice versa.

The second view is the cognitive view. According to this view, business models are cognitive representations of the reality of business, how it works and is expected to work in the mind of founders or managers of technology ventures (Malmström, Johansson, & Wincent, 2015;Najmaei, 2016a). Markides (2008) uses the strategic thinking model of Abell (1980) and conceptualizes business models as encompassing three sets of assumptions about who customers are, what they want and how the value offerings should be created and delivered to them. Similarly, Teece (2010) argues that this mental model encompasses assumptions about who customers are, what products are offered to them, how these offerings are created and delivered to customers and how customers are enticed to pay for them (Fig. 1).

The last view is the reified or enacted view. In this view, a business model represents what the firms actually does. Hence, giving scholars and practitioners a sense of the business in action (McGrath, 2010). Some also argue that business models are, in fact, ventures' realized strategies (Casadesus-Masanell & Ricart, 2010), or a system of interconnected boundary-spanning activities performed by the venture to create and capture value (Zott & Amit, 2010). Osterwalder and Pigneur (2010) consider this system as being composed of nine interrelated components: customer segments, value propositions, customer relationships, distribution channels, revenue systems, key resources, key activities, key partners and cost

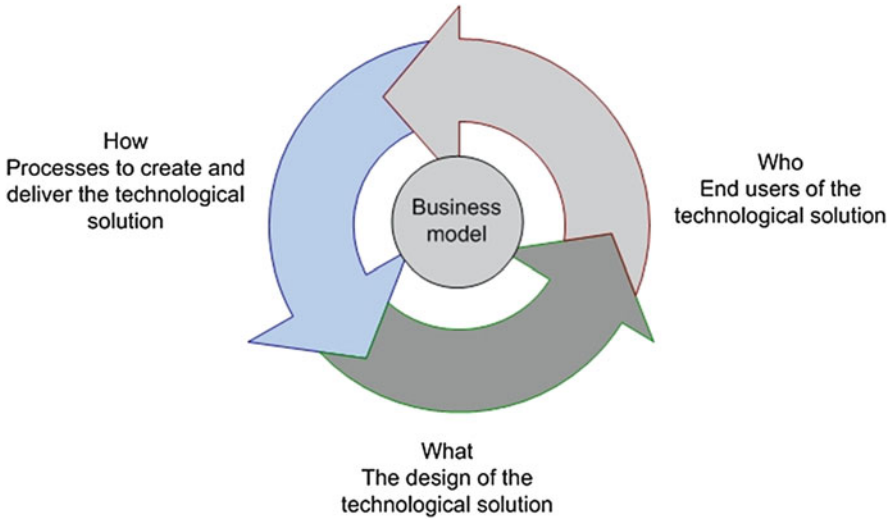

Fig. 1 Business models involves assumptions about who to serve, what to offer and how to develop, deliver and market it

structure.[1] Similarly, Al-Debei and Avison (2010) argue that business models have four interconnected dimensions: value network, value architecture, value propositions and value finance.[2]

From this perspective, a business model defines how resources are configured, bundled and utilized (George & Bock, 2011) to perform various transactions with its business partners and customers (Zott & Amit, 2010). Per this view, a venture with a well-designed business model outperforms its rivals because such a business model enables the venture to perform key activities better than other ventures (Patzelt, Knyphausen-Aufse, & Nikolw, 2008; Zott & Amit, 2007, 2008).

Recent studies (e.g. Foss & Saebi, 2016; Massa et al., 2016) suggest that these three interpretations are neither mutually exclusive nor are they separated. In fact, they must be thought of as complementary descriptions of the same entity. Specifically, managers use industry templates, norms and assumptions or rules of the game to develop their own views of the business. This is the adoption of the industry recipe or how firms in an industry work. Then, once this recipe is adopted, managers try to customize it for their businesses. In this stage managers modify the recipe to contemplate how their own business should work, what it should deliver and how it can be differentiated from other businesses. This phase results in the formation of business models as mental models. When managers adopt these models, they start to acquire necessary resources, and configure them to enact recognized opportunities (Najmaei, 2016a). Figure 2 schematically summarizes these complementary phases.

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[2] I thank an anonymous reviewer for suggesting to use this reference.

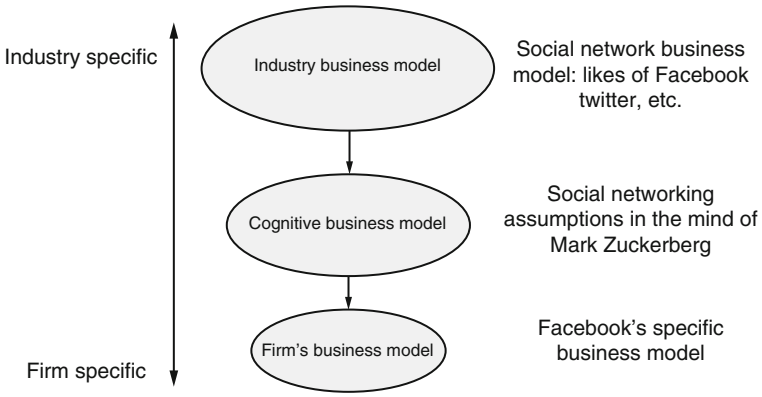

Fig. 2 Development of a business model from an industrial recipe to mental model to a business model

All ventures including technology ones start within a technological paradigm with a set of agreed upon and shared assumptions about how technologies work and can be commercialized. Then each venture adopts a tailored version of these assumptions and uses limited resources which are both core and complementary, specific to the firm's business model to create a unique position by offering various value propositions to customers in the market place (Osterwalder & Pigneur, 2010). This reasoning leads us to ask what exactly business models do to make this market positioning happen.

2.5.2 What Do Business Models Do?

A business models performs several functions to convert an idea into a venture. First, it is a narrative tool which helps a venture's founder describe his businesses and highlights its uniqueness to secure funds and other resources from key resource owners such as technology partners, banks, venture capitalists and government authorities (Magretta, 2002). This process also helps ventures gain legitimacy specially in emerging trajectories and technological paradigms where suppliers, clients and customers are uncertain about the credibility and legitimacy of new ventures (Zimmerman & Zeitz, 2002). Secondly, like 'negative' and 'positive' heuristics in scientific paradigms which inform scientists about which research directions to take and which ones to avoid to help a paradigm progress (Lakatos, 1978), business models guide managers' resource development and acquisitive behaviors by showing which resources are relevant to the business, hence should be invested in and which ones are not (Najmaei, 2013). Finally, the most important function of a business model is to determine how resources should be structured and configured to perform value creating and capturing transactions in a cohesive manner (George & Bock, 2011). In other words, business models articulate the logic of the business, show the blue print of its resource configurations and elaborate

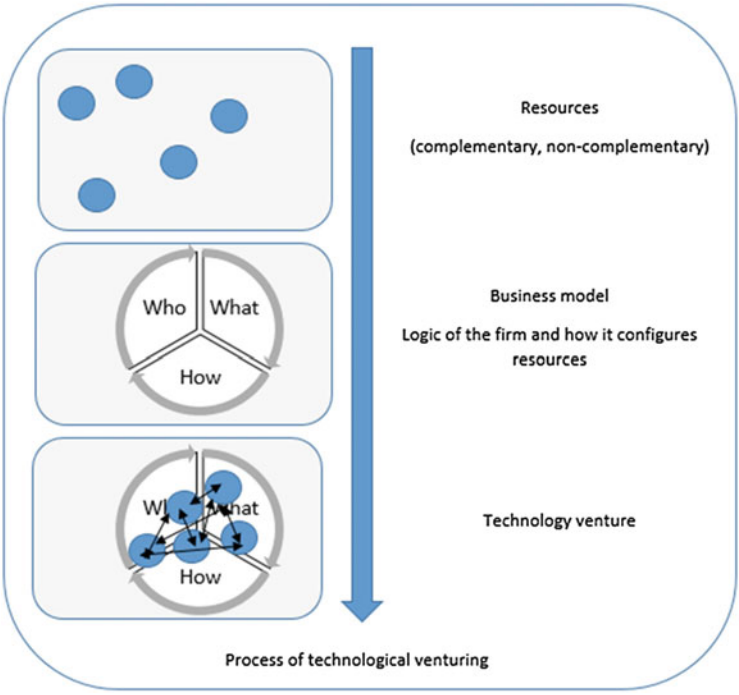

Fig. 3 Business models as the logic of resource configurations in technology ventures

formulas for creating and capturing value. As Zott, Amit, and Massa (2011) put it, business models emphasize a system-level, holistic approach to explaining how firms "do business" by seeking to explain how value is created, not just how it is captured.

Founders of technology ventures use their assumptions about who, what and how to looks for ways to develop or acquire core and complementary assets required to commercialize their technological know-how. Then using these assumptions, they bundle, link and structure resources in the form of an organization which creates and captures technology-driven value. Figure 3 depicts application of this function in the process of technology venturing.

Thus far, we established that the business model concept offers novel insights into how resources and transactions are performed in technology ventures. Before we go further to develop a more specific theory of business models for technology ventures', its seems logical to compare three endogenous views which shaped the core of this research, namely the transaction costs, resource-based or competency view and the business model view. Table 1 illustrates a summary of these three.

As depicted in Table 1, the business model view takes business model of the venture as the unit of analysis. This allows us to look at the venture as a coherent system rather than a bunch of isolated transactions or a bundle of resources in silos. Furthermore, seeing a venture as a system of activities from the lens of its business

Table 1 A comparison of three endogenous views of technology venturing

Questions	Transaction cost view	Resource-based (competency) view	Business model view
Unit of analysis	Transactions within firms and between firms and markets	Resources and capabilities	Business models
Why do technology ventures emerge?	Technology-based ventures offer more economic ways than markets to solve specific users' technological problems	Technology-based ventures can develop a unique set of resources and capabilities to tap into market niches	Technology-based ventures use novel business models which enable them to create and capture values not possible otherwise
How do technology ventures compete & grow?	Growth and competitiveness are driven by the ability to minimize costs of transactions low	Growth and competitiveness are driven by the ability to acquire, develop and configure strategic resources better than competitors	Growth and competitiveness are driven by the ability to design and constantly manage novel business models to do business in a superior way to competitors
How do technology ventures differ from non-technology ones?	Transactions are technology-driven	Resources and capabilities are technology- centered and driven	Business models are designed to make use of advanced technologies

model enables us to explore and investigate interconnections between and within value creating (i.e. design of products and services) and value capturing (i.e. profit formula and use of complementary assets such as marketing and logistics capabilities) activities.

Furthermore, although transactions and resource-based views attribute the emergence of technology ventures to the existence of ventures as an efficient governance mode to perform technology-intensive transactions and bundle of technological competencies within specific organizational structures respectively, they neglect the importance of the entrepreneurial logic which underpins the structures of resources and transactions performed through these structures. The business model view addresses these shortcomings by adding the notion of business models (i.e. sets of coherent and specific assumptions about who, what and how within a technological paradigm converted into activities carried out by resources) to the picture to clarify how resources are configured to perform various transaction.

Finally, the business model view adds to the explanations offered by the other two views about the competitiveness, growth and architecture of technology ventures. It posits that, the growth and competitiveness of technology-ventures are driven by their technology-intensive business models rather than efficient transactions and superior resource structures because without having a business model that delineates a clear logic to manage resources and perform transactions, a venture fails to create and capture value. Recent study of Gassmann, Frankenberger, and Michaela (2014)

shows that ventures with strong technological capabilities but weak business models did not survive the competition Therefore, business models not only convert technologies into value-creating machines but also add technology-specific value capturing capability to them to ensure that the venture captures value to survive and grow.

3 Proposing an Architecture of the Business Model of Technology Ventures

Considering the above, this section offers an architecture of the business model concept for technology ventures. Several studies have used the notion of business models to explain how and why technology ventures differ from other ventures but layout of a general architecture for the business model of technology ventures remains to be worked out. Table 2 illustrates a summary of a selective list of research applying the concept of business model in technology ventures.

We propose that the architecture of the business model in technology ventures is what makes them different from other ventures. The main dimensions of this architecture have not been empirically explored nor have they been conceptually studied. Deriving from the literature on technology venturing and embedded in the business model literature as discussed above, we deduce four primary dimensions of the business model of technology ventures. In what follows, it will be illustrated that, business models of technology ventures have a unique orchestration of technological know-how and complementary assets resembling a nested structure with a core and a periphery. This core-periphery architecture brings about some unique capacities in the business model of technology ventures which makes them behave in different ways than other ventures.

3.1 Business Models and the Core-Periphery Imagery

The so-called core-periphery imagery has been an important conceptual tool to describe structure of different organizations including technology ventures (Hannan, Burton, & Baron, 1996). Hannan et al. (1996) argue that "a feature forms part of the organizational 'core' if changing it requires adjustments in most other features of the enterprise. A feature lies at the periphery if it can be changed without imposing changes on other features." (P. 506). Fiss (2011) adds that, the core elements are essential and the peripheral elements are less important and perhaps even expendable or exchangeable.

An important aspect of the core-periphery imagery is its ability to describe an organization's capacity to change. Hannan et al. (1996), pp. 506–507) further add that, "coreness means connectedness, elements in the core are linked in complicated

Table 2 A selective list of research using the business model concept in the context of technology ventures

Authors	Description	Key findings
Reymen, Berends, Oudehand, and Stultiëns (2016)	A qualitative study of the design of business models in four high technology ventures in Netherlands	The design of business models is a fundamental phase in technology venturing. Executives use different decision making modes to execute this phase. The effectual logic is used to generate a value proposition for a specific customer segment. Causal logic is then used to define the other business model components in relation to the value proposition and customer segment
Najmaei (2016b)	A qualitative study of the process of business model development in five high-tech ventures in the Australian cloud-computing industry	Developing a business model involves three phases. (1) business modelling ideation (BMI) in which various ideas for a viable business model are generated and the most viable one is chosen. (2) The "business modelling strategic commitment" (BMSC) in which the strategic consensus and commitment are generated and (3) the "business model actualization" (BMAC) in which the model is reified or actualized
Najmaei (2016a)	A quantitative study of 87 Australian manufacturing technology ventures	Technology ventures who adopt process modularity gain a competitive capacity to convert modular processes to innovative business model designs which in turn result in better market performance
Raphael Amit and Zott (2015)	A qualitative study of the antecedents of business model design in nine technology ventures in the USA's peer to peer lending space	Goals (in terms of both creating and capturing value) , managerial and industrial templates, stakeholder activities, and environmental constraints are four common components of a design model which explains how business models for technology ventures are designed as system of boundary-spanning activities
Doganova and Eyquem-Renault (2009)	Single case study of the role of business models in innovative activities of a technology venture	Business model is a key market device for a technology venture. In addition to its narrative role, it has a calculative device that allows entrepreneurs to explore a market and also plays a performative role by contributing to the construction of the techno-economic network of an innovation

(continued)

Table 2 (continued)

Authors	Description	Key findings
Zott and Amit (2008)	A quantitative study of the fit between the business model design and product-market strategies of 300 e-commerce ventures in the US and Europe	Novelty-centered business models, coupled with product market strategies that emphasize differentiation, cost leadership, or early market entry enhance firm performance
Zott and Amit (2007)	A quantitative study of the associations between business model design and performance of 190 technology ventures in the US and Europe	Novelty-centered business model design enhance performance. This positive relationship is stable across time, even under varying environmental regimes. Additionally, entrepreneurs' attempts to incorporate both efficiency- and novelty-centered design elements into their business models could be counterproductive
Chesbrough (2007)	Conceptual analysis of the importance of novel business models to the growth and competitiveness of technology ventures	A better business model often will beat a better idea or technology. Technology-ventures need the capacity to adopt novel business models and constantly sharpen the value creating and capturing edges of their business models
Calia, Guerrini, and Moura (2007)	A qualitative study of the role of business model in the management of the innovative network of a Brazilian Metallurgy Venture	Technology ventures use a more outward oriented R&D which is guided by their business model. Such an outside-in approach helps them manage a sequence of innovative activities which not only provide the venture with a competitive product technology, but also provided the necessary resources for the venture to reformulate its business model as markets change
Morris, Schindehutte, and Allen (2005)	A conceptual analysis of the application of the business model concept in entrepreneurial Technology venturing	A business model has three levels, the foundation level which shows what components are included in the operation of the venture. The proprietary which includes a firm-specific unique combination of these building blocks and the rules level which involves a set of operating rules which link the business models to ongoing strategic actions of the venture
Zimmerman and Zeitz (2002)	A conceptual analysis of the role of legitimacy in the growth of technology ventures and how business models enhance achievement of legitimacy	Technology ventures can use four strategies (conformance to the existing rules, selecting a favorable environment, manipulating rules in creative ways and developing new

(continued)

Table 2 (continued)

Authors	Description	Key findings
		social contexts and norms to achieve legitimacy and their business model is a core component in the successful execution of these four strategies
Chesbrough and Rosenbloom (2002)	Single case study of the role of business models in technology venturing activities of the Xerox corporation	New ventures which span off the Xerox have unique business models which enabled them to successfully commercialize their products and services because a successful business model creates a heuristic logic that connects technical potential with the realization of economic value
Amit and Zott (2001)	A qualitative study of the value-creating logic of 59 high tech ventures in the US and Europe	High-tech ventures use business models as the source of value-creating logic. Business models in e-commerce sector can have four generic design themes: novelty, efficiency, complementary and lock-in, each imposing different rules with regard to the creation of value from the technological innovation used by the venture

webs of relations with each other and with peripheral elements. Because dense webs of connections retard change, core features are more inert than peripheral ones (Hannan & Freeman, 1984)." Analogously, peripheral elements are more flexible, fluid and agile. The core-periphery view also suggests that a set of interconnected elements in a core-periphery view cannot have more than one core (Borgatti & Everett, 1999) but more than one constellation of different peripheral elements may surround the core. These permutations of peripheral elements are equally effective in the performance of the system (Fiss, 2011). All in all, a set of core factors can be used in conjunction with multiple sets of peripheral factors to create multiple flexible configurations which are different in periphery but relatively similar in core. Teece (1986) used this notion to conceptualize how technological innovations are commercialized. He proposed that technological innovations have a core technological know-how and a set of peripheral complementary assets which are tailored to make the technology fit into markets. Winter and Szulanski (2001) extended this view and added that, technology ventures may fail to replicate their core technological know-how because reproducing business models with a core and a periphery is riddled with structural challenges caused by the complex and sticky knowledge at core. In view of this, since business models encompass the structure of all resources owned and used by the firm, we propose that:

Proposition 1: Technology ventures are based on business models which have a technological core and a marketing periphery.

Proposition 2: Having a technological core and a marketing periphery gives technology ventures a degree of stiffness and rigidity at core and versatility at periphery which enables them to be flexible to tap into new markets quickly.

3.2 From Market-Driven to Market Driving Business Models

The technological core and marketing periphery implies a complementary relationship between technological and marketing knowledge base of technology ventures. Burgers, Van Den Bosch, and Volberda (2008) show that a fit between the creation of this technological and market knowledge is a fundamental challenge faced by managers of technology ventures. They further argued that, although the two types of knowledge are intertwined, their management in the wider organizational context (i.e. business mode) could substantially differ. Najmaei, Rhodes, and Lok (2014) studied this difference and found a set of complementary relationships between marketing and technological knowledge acquired by managers. They argued that differences in these relationships result in different mental models hence business model designs. More recently, Najmaei (2016a) showed that founders of technology ventures proactively seek to find and combine new marketing ideas with their technological core to commercialize their technologies in novel ways. All in all, technology ventures exhibit tendencies to use their technologies to proactively seek for new markets or develop new structures in markets by carving out niches (Jaworski, Kohli, & Sahay, 2000). These tendencies are consistent with market driving rather than market driven orientations (Kumar, Scheer, & Kotler, 2000; Mele, Pels, & Storbacka, 2015).

Market driving is a unique feature of highly innovative firms. Kumar (1997) observed that rapidly growing retailers embrace high technologies like ICT to drive markets. Technological intensiveness enables these firms to look for and even create new market space for their expansion. Further work on market driving-ness by Kumar et al. (2000) suggests that market driving companies, are generally new entrants into an industry like high tech ventures, who can gain a more sustainable competitive advantage by delivering a leap in customer value through a unique business system. Market driving strategies entail high risk, but also offer a firm the potential to revolutionize an industry and reap vast rewards (Jaworski et al., 2000) hence appealing to ventures with technological innovations.

More specifically, although all ventures need to monitor changes in the marketplace and adapt to customer needs to enhance firm performance, high tech industries necessitate firms to drive markets by choosing minimal adaptation to local market trends in favor of introducing proprietary value propositions that satisfy customers' latent needs(Ghauri, Wang, Elg, & Rosendo-Ríos, 2016; Kumar et al., 2000). Therefore, instead of reactively responding to players and following the existing structures, market driving firm influence the structure of the market and/or the

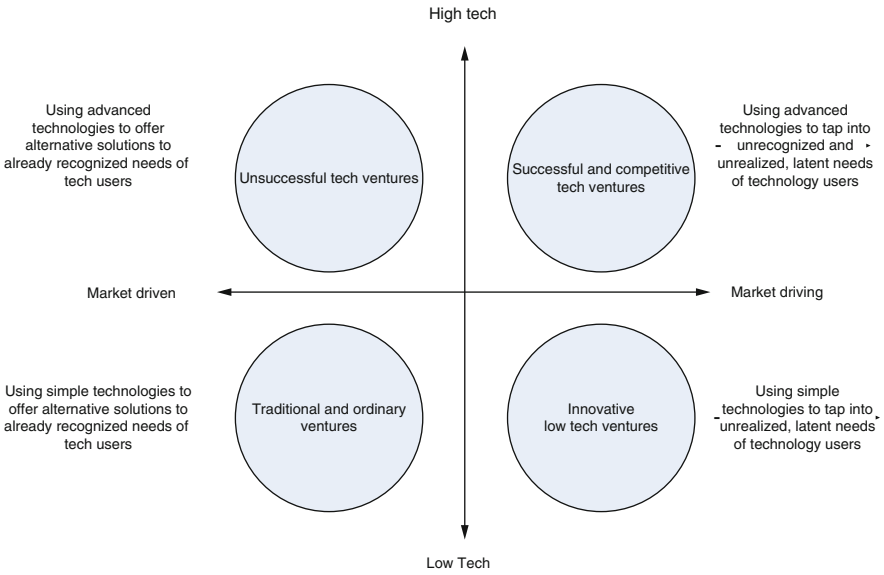

Fig. 4 Technological driven and market driving nature of the business model of technology ventures

behavior (s) of market players proactively in a direction that enhances the competitive position of the business. (Jaworski et al., 2000). Market driving-ness, hence, requires business models with the capacity to proactively search for customers' latent needs and cater for them via disruptive value offerings (i.e. revolutionary products and services). Taken together, the intersection of two forces: creative power of high-technologies and the need to be market driving creates a space for technology ventures to design their business models. This is perhaps a fundamental difference between technology ventures and other ventures (Fig. 4). The growth of disruptive ventures such as Uber, Airbnd, Menulog, and Cochlear exemplifies this fact. The following two propositions summarize this line of reasoning:

Proposition 3: The core-periphery structure of technology ventures enables them to be technology driven and market driving.

Proposition 4: The market driving business model of technology ventures makes them proactive and disruptive.

All in all, technology ventures have business models with a technological core and a marketing periphery. This core-periphery structure enables technology ventures to (1) tap into emerging markets quickly (2) proactively drive markets and (3) disrupt industries. These features distinguish technology ventures from ordinary ventures and explain how and why they make greater contributions to local and international economies. Figure 5 synthesizes these points into a simple framework.

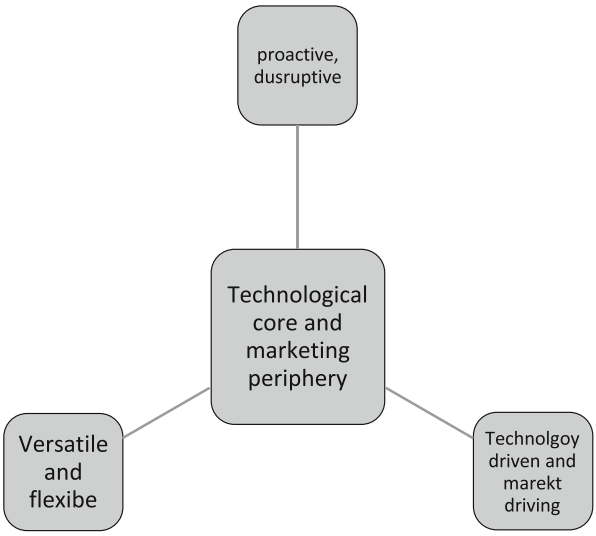

Fig. 5 Four characteristics of the architecture of the business model of technology ventures

On the ground that any theoretical deduction needs empirical support and as a step further, a preliminary empirical study was conducted to explore the extent to which these theoretical predictions hold in a sample of technology ventures. The next section reports the design and results of this study.

4 Empirical Illustrations from Three Technology Ventures

4.1 Design: Data and Sample

To substantiate the proposed framework, a qualitative hypothesis-testing approach was adopted (Hak & Dul, 2010). Unlike theory-building case studies (Eisenhardt, 1989), this qualitative approach seeks to confirm rather than explore theoretical postulations. As Hak and Dul explains, a theory-testing case study involves "the process of ascertaining whether the empirical evidence in a case or in a sample of cases either supports or does not support a given theory." (p. 937).

Five technology ventures were chosen from a sample of technology ventures based in Sydney Australia. Founders of the ventures were contacted and asked to participate in a short interview about their ventures, business models and technological and marketing capabilities. Five entrepreneurs from three ventures (one pharmaceutical, one cloud computing processing and one biotechnology) agreed to participate in the research and consented to interviews. Interviews were scheduled in September, October and November 2016. Each interview was tape recorded and transcribed for analysis. Descriptions of interviews are given in Table 3.

Table 3 Types and mode of data collection

	Pharmaceutical venture	Cloud computing venture	Biotechnology venture
Interview 1	• 25 min • Face to face • 3 pages of transcript		
Interview 2		• 15 min • Face to face • 3 pages of transcript	
Interview 3		• 18 min • Phone interview • 3.5 pages of transcript	
Interview 4			• 12 min • Skype • 2.5 pages of transcript
Interview 5			• 20 min • Face to face • 4 pages of transcript

Table 4 Content analysis if interviews regarding theoretical propositions

	Proposition 1	Proposition 2	Proposition 3	Proposition 4
Interview 1	3	3	3	2
Interview 2	2	2	2	2
Interview 3	3	2	2	2
Interview 4	2	2	2	3
Interview 5	3	2	3	3

4.2 Analysis and Results

Since the purpose of the empirical part of this research is to explore if four theoretical propositions can be validated in a sample of technology ventures, a content analytic approach was used in which the content of interviews was analyzed for conforming or disconfirming evidence (Hak & Dul, 2010; Hillebrand, Kok, & Biemans, 2001). All four propositions received considerable support. The number of confirming statements for each proposition was counted (Table 4) and mapped (Fig. 6) to graphically visualize how different venture founders see their business model and venture as theoretically proposed in this research.

Finally, to better illustrate evidence gathered to validate our theoretical propositions, a set of support and proof quotes from interviews was selected to demonstrate how each proposition is supported by at least two statements from executives of technology ventures. Table 5 illustrates these quotes.

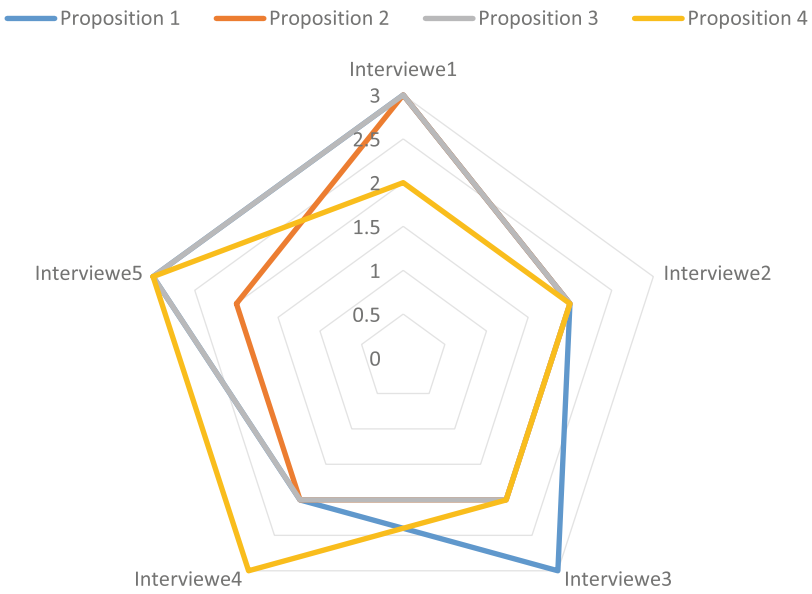

Fig. 6 Visualization of the content analysis of interviews

Table 5 Support and proof quotes for theoretical propositions

	Support quote	Proof quote
P 1	"Our business is based on a unique proprietary tool which can be used ibn different ways depending on what our clients want" (Interviewee 1)	"It is our core technology which drives our business. It is basically our only source of revenue" (Interviewee 4)
P 2	"Using our technology and marketing potential of our business we have constantly sought for emerging markets domestically and internationally" (Interviewee 5)	"Our business has used its core technology to create a wide range of solutions for diverse clients in different markets" (Interviewee 2)
P 3	"Since we started this business, we have, pretty much, defined our markets. It is the uniqueness of our technology that let us create markets for our products" (Interviewee 3)	"Our business model is like our motto to be the frontrunner in this emerging industry. Our core knowledge makes us a pioneering venture with a potential to shape future markets" (Interviewee 1)
P 4	"Our business is to discontinue old technologies and help the industry to transit to the way we do the business" (Interviewee 2)	"Traditional IT is becoming increasingly obsolete but business models like ours. By very nature of our technology we disrupt markets while generating new ones" (Interviewee 3)

5 Discussion and Conclusion

Technology ventures are expected to run different modes of value creation and capture from other ventures. Building on this premise, it was argued that business models of technology ventures is different from that of other ventures in that they have a technological core which determines the operational scope of the venture and a flexible marketing periphery which enables the venture to tap into multiple markets. Furthermore, the core-periphery architecture enables these business models to be proactively market driving and disruptive.

To substantiate these theoretical deductions, we case studied three ventures and found supportive evidence for this theorization. We believe, the core-periphery imagery is a useful conceptual tool to develop this theoretical perspective. In fact, "cognitive researchers have argued that the human mind's ability to classify is better understood in terms of a conceptual structure consisting of core and peripheral categories" (Fiss, 2011, p. 397). Thus, the proposed view is expected to help readers of this work, in both academic and business worlds, better classify ventures into high and low tech and distinguish high-tech ventures by their technological core and marketing periphery. As such, our approach is a theoretically different and somewhat novel way to speculate about, explain and observe the behavioral dynamics of technology ventures. In this way, this view extends previous work on the applications of core-periphery imagery in technology ventures. Importantly, our model adds to the insights developed by Fiss (2011) who showed that technology ventures have a strategic core and tactical periphery which enable them to adopt different strategic paths some of which lead to high performance while others result in poor performance and Hannan et al. (1996) who attributed the inertia of technology ventures to the imprinting process in which founders' models of the employment relation affect the core of the firm hence limiting its capacity to change. Additionally, although technological ventures are usually thought of as engines of economic growth and drivers of new markets (Jaworski et al., 2000; Kumar et al., 2000), factors behind this orientation is less understood. Our model proposes the architecture of their business models as a plausible force behind market driving-ness of ventures, hence shedding new light of the theory of market driving firms (Mele et al., 2015).

Finally, our model has several implications for practicing managers. First, an overemphasis on the technological core could have detrimental effects on the venture's capacity to grow and adapt because the technological core is relatively rigid and difficult to change whereas the marketing periphery is a key complementary component of a venture's business model necessary for its commercialization (Teece, 1986, 2006). This component is also flexible, making the business model adaptive and resilient. The way Uber is using its technology to deliver foods (via the Uber food model) in addition to its usual passenger-transporting model is an example of how a balanced emphasis on both the technological core and marketing periphery enables technology ventures to tap into multiple markets.

Secondly, technology ventures are market driving. Executives can harness the power of market driving-ness in multiple ways. As outlined by Jaworski et al. (2000)

technology ventures can either eliminate traditional players in a market like Uber and taxi driving industry or build a new or modified set of players in a market like the collaborations between multiple biotechnology firm or syndications of nanotechnology firms and bio technology firms to create injectable nanomachines to cure diseases or attack cancerous tumors or change the functions performed by traditional players as in the case of Airbnb and the hotel industry and the Cochlear and traditional hearing aid devices. To perform these strategies, we echo Kumar et al. (2000) who encourage executives of technology ventures to be forward sensing to detect new markets and constantly try to explore new applications of their core technologies.

5.1 Moving Forward

Although, the model presented in this chapter sheds new light on the nature and anatomy of technology ventures form the business model vantage point, much more research is needed to fully validate and extend the business modelling view of technology ventures. As noted by Borgatti and Everett (1999) "any formalization of an intuitive concept needs to identify, in a precise way, the essential features of a particular concept." (p. 376). In this sprit, one way to move forward is to develop more precise explanations for the nature of core-periphery relationships which define technology ventures. The case study methodology has a long tradition of enabling scholars to explore complex and dynamic relationships within organization (Eisenhardt, 1989; Eisenhardt & Graebner, 2007). Therefore, more focused case studies on the business models of technology ventures aimed at exploring dynamics of relationships between their technological cores and marketing peripheries seem to be a promising direction to advance this line of thinking.

In addition, although much is known about key characteristics of technology ventures (e.g. Byers et al., 2011; Li & Atuahene-Gima, 2001; Roure & Maidique, 1986; Zahra, 1996; Zhang et al., 2011) and their business models (e.g. Chesbrough & Rosenbloom, 2002; Zimmerman & Zeitz, 2002; Zott & Amit, 2008), relatively little work has been done on typologies or configurations of factors which shape business models of technology ventures. Fuzzy Set Qualitative Comparative Methods (FSQCM) represent a promising direction to advance this line of thinking because they help researchers develop better configurational and typological organizational theories (Fiss, 2011).

Finally, although it was not the initial objective of the paper, but we documented some preliminary empirical support for our theoretical predictions and propositions. This is by no means a definitive proof for our theoretical model. More confirmatory and perhaps replicating qualitative work is necessary to confidently establish the empirical accuracy and consistency of our work. Such work should provide a more detailed analysis of the core-periphery architecture from a broader range of cases across industries and contexts (Pratt, 2009).

5.2 Concluding Remarks

The question of what technology venture are and how and why they differ from other ventures is multifaceted, encompassing a wide range of theoretical perspectives generally stemming from the theory of the firm. However, there is by no means a singular, unified normative articulation of the essence and nature of technology ventures. This chapter pushed for a systematic, integrative and comparative approach that recognizes the unique role of technology-based business models in the anatomy and architecture of technology ventures. It argued that the business model concept is a useful theoretical means to generate integrative theories which enrich our understanding of technology venturing. While this approach is promising, it is only a starting point toward more complete theories of technology ventures. Hence many important questions remain and thus there is much work yet to be done to fully understand technology ventures and their business models. It is hoped that, the ideas presented here encourage scholars and practitioners to continue this line and add to a cumulative body of knowledge on the design and architecture of business models in technology ventures.

References

Abell, D. (1980). *Defining the business: The starting point of strategic planning*. Englewood Cliffs, NJ: Prentice Hall.

Abernathy, W. J., & Clark, K. B. (1985). Innovation: Mapping the winds of creative destruction. *Research Policy, 14*(1), 3–22.

Abernathy, W. J., & Utterback, J. (1978). Patterns of industrial innovation. *Technology Review, 80*(7), 40–47.

Al-Debei, M. M., & Avison, D. (2010). Developing a unified framework of the business model concept. *European Journal of Information Systems, 19*(3), 359–376.

Amit, R., & Zott, C. (2001). Value creation in e-business. *Strategic Management Journal, 22*(6–7), 493–520. https://doi.org/10.1002/smj.187.

Amit, R., & Zott, C. (2015). Crafting business architecture: The antecedents of business model design. *Strategic Entrepreneurship Journal, 9*(4), 331–354.

Anderson, P., & Tushman, M. (1990). Technological discontinuities and dominant design: A cyclical model of technology change. *Administrative Science Quarterly, 35*, 604–633.

Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of Management, 17*(1), 99–120.

Barney, J. (2001). Resource-based theories of competitive advantage: A ten-year retrospective on the resource-based view. *Journal of Management, 27*(6), 643–650.

Borgatti, S. P., & Everett, M. G. (1999). Models of core periphery structures. *Social Networks, 21*, 375–395.

Bowman, C., & Ambrosini, V. (2000). Value creation versus value capture: Towards a coherent definition of value in strategy. *British Journal of Management, 11*(1), 1–15.

Burgers, J. H., Van Den Bosch, F. A. J., & Volberda, H. W. (2008). Why new business development projects fail: Coping with the differences of technological versus market knowledge. *Long Range Planning, 41*(1), 55–73.

Byers, T. H., Dorf, R. C., & Nelson, A. J. (2011). *Technology ventures: From idea to enterprise*. New York: McGraw-Hill.

Calia, R. C., Guerrini, F. M., & Moura, G. L. (2007). Innovation networks: From technological development to business model reconfiguration. *Technovation, 27*(8), 426–432.
Caridi-Zahavi, O., Carmeli, A., & Arazy, O. (2016). The influence of CEOs' visionary innovation leadership on the performance of high-technology ventures: The mediating roles of connectivity and knowledge integration. *Journal of Product Innovation Management, 33*(3), 356–376.
Casadesus-Masanell, R., & Ricart, J. E. (2010). From strategy to business models and onto tactics. *Long Range Planning, 43*(2–3), 195–215.
Ceccagnoli, M., & Rothaermel, F. T. (2008). Appropriating the returns from innovation. In G. D. Libecap & M. Thursby (Eds.), *Technological innovation: Generating economic results* (Vol. 18, pp. 11–34). London: Emerald Group.
Chesbrough, H. (2007). Business model innovation: It's not just about technology anymore. *Strategy & Leadership, 35*(6), 12–17.
Chesbrough, H., & Rosenbloom, R. S. (2002). The role of the business model in capturing value from innovation: Evidence from Xerox corporation's technology spin-off companies. *Industrial and Corporate Change, 11*(3), 529–555.
Coase, R. H. (1937). The nature of the firm. *Economica, 4*(16), 386–405.
Deeds, D. L., DeCarolis, D., & Coombs, J. (2000). Dynamic capabilities and new product development in high technology ventures: An empirical analysis of new biotechnology firms. *Journal of Business Venturing, 15*(3), 211–229.
Doganova, L., & Eyquem-Renault, M. (2009). What do business models do?: Innovation devices in technology entrepreneurship. *Research Policy, 38*(10), 1559–1570.
Dosi, G. (1982). Technological paradigms and technological trajectories. *Research Policy, 11*(2), 147–162.
Dosi, G., & Marengo, L. (2007). Perspective-on the evolutionary and behavioral theories of organizations: A tentative roadmap. *Organization Science, 18*(3), 491–502.
Eisenhardt, K. M. (1989). Building theories from case study research. *Academy of Management Review, 14*(4), 532–550.
Eisenhardt, K. M., & Graebner, M. E. (2007). Theory building from cases: Opportunities and challenges. *Academy of Management Journal, 50*(1), 25–32.
Eisenhardt, K. M., & Martin, J. A. (2000). Dynamic capabilities: What are they? *Strategic Management Journal, 21*(10–11), 1105–1121.
Fiss, P. C. (2011). Building better causal theories: A fuzzy set approach to typologies in organization research. *Academy of Management Journal, 54*(2), 393–420.
Foss, N. J., & Saebi, T. (2016). Fifteen years of research on business model innovation: How far have we come, and where should we go? *Journal of Management*. https://doi.org/10.1177/0149206316675927.
Gassmann, O., Frankenberger, K., & Michaela, C. (2014). *The business model navigator: 55 models that will revolutionise your business*. Harlow: Pearson Education.
George, G., & Bock, A. J. (2011). The business model in practice and its implications for entrepreneurship research. *Entrepreneurship Theory and Practice, 35*(1), 83–111.
Ghauri, P., Wang, F., Elg, U., & Rosendo-Ríos, V. (2016). Market driving strategies: Beyond localization. *Journal of Business Research, 69*(12), 5682–5693.
Gruber, M., Heinemann, F., Brettel, M., & Hungeling, S. (2010). Configurations of resources and capabilities and their performance implications: An exploratory study on technology ventures. *Strategic Management Journal, 31*(12), 1337–1356.
Hak, T., & Dul, J. (2010). Theory-testing with cases. In A. J. Mills, G. Durepos, & E. Wiebe (Eds.), *Encyclopedia of case study research* (pp. 937–941). Thousand Oaks, CA: Sage.
Hannan, M. T., & Freeman, J. (1984). Structural inertia and organizational change. *American Sociological.Review, 49*(2), 149–164.
Hannan, M. T., Burton, M. D., & Baron, J. N. (1996). Inertia and change in the early years: Employment relations in young, high technology firms. *Industrial and Corporate Change, 5*(2), 503–536.
Hillebrand, B., Kok, R. A., & Biemans, W. G. (2001). Theory-testing using case studies: A comment on Johnston, Leach, and Liu. *Industrial Marketing Management, 30*(8), 651–657.

Jaworski, B., Kohli, A. K., & Sahay, A. (2000). Market-driven versus driving markets. *Journal of the Academy of Marketing Science, 28*(1), 45–54.

Kumar, N. (1997). The revolution in retailing: From market driven to market driving. *Long Range Planning, 30*(6), 830–835.

Kumar, N., Scheer, L., & Kotler, P. (2000). From market driven to market driving. *European Management Journal, 18*(2), 129–142.

Lakatos, I. (1978). *The methodology of scientific research programmes*. Cambridge: Cambridge University Press.

Li, H., & Atuahene-Gima, K. (2001). Product innovation strategy and the performance of new technology ventures in China. *Academy of Management Journal, 44*(6), 1123–1134.

Magretta, J. (2002). Why business models matter. *Harvard Business Review, 80*(5), 86–92.

Malmström, M., Johansson, J., & Wincent, J. (2015). Cognitive constructions of low-profit and high-profit business models: A repertory grid study of serial entrepreneurs. *Entrepreneurship Theory & Practice, 39*(5), 1083–1109.

Markides, C. C. (2008). *Game-changing strategies how to create new market space in established industries by breaking the rules*. Hoboken, NJ: Jossey-Bass.

Massa, L., Tucci, C., & Afuah, A. (2016). A critical assessment of business model research. *Academy of Management Annals, 11*, 73–104.

McGrath, R. G. (2010). Business models: A discovery driven approach. *Long Range Planning, 43* (2–3), 247–261.

Mele, C., Pels, J., & Storbacka, K. (2015). A holistic market conceptualization. *Journal of the Academy of Marketing Science, 43*(1), 100–114.

Morris, M., Schindehutte, M., & Allen, J. (2005). The entrepreneur's business model: Toward a unified perspective. *Journal of Business Research, 58*(6), 726–735.

Najmaei, A. (2012). Business model: Strategic logic of disruptive innovation. In K. Rezaul (Ed.), *Strategic and pragmatic e-business: Implications for future business practices* (pp. 100–131). Hershey, PA: IGI Global.

Najmaei, A. (2013). How and why business model matters in acquisition of knowledge in small and entrepreneurial firms. In *Enterprise development in smes and entrepreneurial firms: Dynamic processes* (pp. 1–21). Hershey, PA: IGI Global.

Najmaei, A. (2014). A behavioral view of business modeling. In T. K. Das (Ed.), *Behavioral strategy: Emerging perspectives* (pp. 177–203). Charlotte, NC: Information Age.

Najmaei, A. (2016a). How do entrepreneurs develop business models in small high-tech ventures? An exploratory model from Australian IT firms. *Entrepreneurship Research Journal, 6*(3), 297–343.

Najmaei, A. (2016b). Revisiting the modularity-performance nexus: Business model innovation as a missing mechanism. *International Journal of Innovation Management, 20*, 1650065.

Najmaei, A., Rhodes, J., & Lok, P. (2014). Exploring the dynamism of complementarities in executives' business modelling knowledge structures. *Journal of Strategy and Management, 7* (4), 398–421.

Najmaei, A., Rhodes, J., & Lok, P. (2015). Practice-based view of business modeling: Cognition and knowledge in action. In T. K. Das (Ed.), *The practice of behavioral strategy* (pp. 77–104). Charlotte, NC: Information Age.

Osterwalder, A., & Pigneur, Y. (2010). *Business model generation: A handbook for visionaries, game changers, and challengers*. Hoboken, NJ: Wiley.

Park, H. D., & Tzabbar, D. (2016). Venture capital, CEOs' sources of power, and innovation novelty at different life stages of a new venture. *Organization Science, 27*(2), 336–353.

Patzelt, H., Knyphausen-Aufse, D. z., & Nikolw, P. (2008). Top management teams, business models, and performance of biotechnology ventures: An upper echelon perspective. *British Journal of Management, 19*(*2*), 205–221.

Pratt, M. G. (2009). For the lack of a boilerplate: Tips on writing up (and reviewing) qualitative research. *Academy of Management Journal, 52*, 856–862.

Reymen, I., Berends, H., Oudehand, R., & Stultiëns, R. (2016). Decision making for business model development: A process study of effectuation and causation in new technology-based ventures. *R&D Management, 47*, 595–606.

Roure, J. B., & Maidique, M. A. (1986). Linking prefunding factors and high-technology venture success: An exploratory study. *Journal of Business Venturing, 1*(3), 295–306.
Schumpeter, J. (1934). *The theory of economic development*. Cambridge, MA: Harvard University Press.
Schumpeter, J. (1942). *Capitalism, socialism and democracy*. New York: Harper.
Siegel, R., Siegel, E., & Macmillan, I. C. (1993). Characteristics distinguishing high-growth ventures. *Journal of Business Venturing, 8*(2), 169–180.
Teece, D. J. (1986). Profiting from technological innovation: Implications for integration, collaboration, licensing and public policy. *Research Policy, 15*(6), 285–305.
Teece, D. J. (2006). Reflections on "profiting from innovation". *Research Policy, 35*, 1131–1146.
Teece, D. J. (2010). Business models, business strategy and innovation. *Long Range Planning, 43* (2–3), 172–194.
Tushman, M. L., & Romanelli, E. (1985). Organizational evolution: A metamorphosis model of convergence and reorientation. In L. L. Cummings & B. M. Straw (Eds.), *Research in organizational behavior* (Vol. 7, pp. 171–222). Greenwich, CT: JAI Press.
Tzokas, N., Kim, Y. A., Akbar, H., & Al-Dajani, H. (2015). Absorptive capacity and performance: The role of customer relationship and technological capabilities in high-tech SMEs. *Industrial Marketing Management, 47*, 134–142.
Voudouris, I., Dimitratos, P., & Salavou, H. (2011). Entrepreneurial learning in the international new high-technology venture. *International Small Business Journal, 29*(3), 238–258.
Wernerfelt, B. (1984). A resource-based view of the firm. *Strategic Management Journal, 5*(2), 171–180.
Williamson, O. E. (1975). *Markets and hierarchies: Analysis and antitrust implications*. New York: Free Press.
Williamson, O. E. (1979). Transaction-cost economics: The governance of contractual relations. *Journal of Law and Economics, 22*(2), 233–226.
Williamson, O. E. (1981). The modern corporation: Origins, evolution, attributes. *Journal of Economic Literature, 19*(4), 1537.
Williamson, O. E. (1991). Strategizing, economizing, and economic organization. *Strategic Management Journal, 12*(1), 75–94.
Wirtz, B. W., Pistoia, A., Ullrich, S., & Göttel, V. (2015). Business models: Origin, development and future research perspectives. *Long Range Planning, 49*(1), 36–54.
Winter, S. G., & Szulanski, G. (2001). Replication as strategy. *Organization Science, 12*(6), 730–743.
Zahra, S. A. (1996). Technology strategy and new venture performance: A study of corporate-sponsored and independent biotechnology ventures. *Journal of Business Venturing, 11*(4), 289–321.
Zhang, J. J., Baden-Fuller, C., & Pool, J. K. (2011). Resolving the tensions between monitoring, resourcing and strategizing: Structures and processes in high technology venture boards. *Long Range Planning, 44*(2), 95–117.
Zimmerman, M. A., & Zeitz, G. J. (2002). Beyond survival: Achieving new venture growth by building legitimacy. *Academy of Management Review, 27*(3), 414–431.
Zott, C., & Amit, R. (2007). Business model design and the performance of entrepreneurial firms. *Organization Science, 18*(2), 181–199.
Zott, C., & Amit, R. (2008). The fit between product market strategy and business model: Implications for firm performance. *Strategic Management Journal, 29*(1), 1–26.
Zott, C., & Amit, R. (2010). Business model design: An activity system perspective. *Long Range Planning, 43*(2–3), 216–226.
Zott, C., Amit, R., & Massa, L. (2011). The business model: Recent developments and future research. *Journal of Management, 37*(4), 1019–1042.