

WHAT COMES FIRST, THE CHICKEN OR THE EGG: THE UNDERPINNING TECHNOLOGY OR BUSINESS MODEL?

Vinaik, Rubal; Zubac, Angelina

Strategy Link
Central Queensland University

ABSTRACT

This conceptual paper uses the extant technology and innovation management, strategic management, and strategic entrepreneurship literatures to derive a modification of the Itami and Nishino (2010) systems-based business model framework. Its objective is to provide insight at a firm level into how business model and technology change occurs as part of the global business ecosystem through learning at the firm level. It explicates how this learning is affected by four inter- and intra-firm effects, including those emanating from the global business ecosystem, as well as the rate of innovation learning across multiple levels. The paper argues that the question of what comes first, the underpinning business model or technology depends on what was learned about the firm's (potential) place within the global business ecosystem, how this knowledge is used and the innovation life-cycle. This points to why some firms fall out of the global business ecosystem, changing its diversity mix. We conclude with a discussion of some of the paper's more powerful implications for research and practice.

Keywords: business model; innovation; innovation system learning; technology trajectory; profit model; business system; business ecosystem; capabilities, business model life-cycle

INTRODUCTION

In the first part of the paper, the following extant literatures are briefly summarized and their key points highlighted: the business models, technology trajectories, technology disruption, value chain convergence, market convergence/disruption, hyper-competition, partnering and networks, and knowledge and big data literatures. In the next section, we describe Itami and Nishino's (2010) business model framework. We also derive our modified version of it using key principles from the theories highlighted in the literature review. In the following section, we go into more detail about the components of the innovation systems used by individual firms, concluding that the way in which they evolve depends on how managers access and assess endogenous and exogenous forms of knowledge, that is, that knowledge that informs the business model design and technologies of the

firm over time. In the last section, we conclude that though the business model literature and the technology change literature variously alternate between arguing that technologies are underpinned by business models and evolve accordingly while business models are underpinned by technology change and evolve accordingly, which is analogous to the chicken and egg problem, what comes first is not clear-cut; it all depends on what there is to learn from the global business ecosystem, the firm's ability to engage with it and the capacity to learn at the firm. It was also concluded that the rate of innovation that occurs within and outside of the firm's boundaries is the result of continuous learning, and those firms that cannot learn effectively and implement the 'right' learnings drop out of the global business ecosystem. This has a number of implications, including the fact that business model and technology decisions involve learnings from multiple levels over time.

LITERATURE REVIEW

The business model literature is a relatively new literature (Demil & Lecocq, 2010). This literature can be split into three broad categories of research: the static view, which involves understanding different taxonomies and typologies of business models, and also how business models are defined in practice and theory; the dynamic and/or longitudinal view of business models, which involves understanding the impact of learning and the strategies learning stimulates about business models; and a systems or boundary-delineating view of business models, which involves understanding the linkages between the global business ecosystem and its business model related subsystems.

In the static view, business models have been variously defined but mostly in systems terms where the system's objective is to create customer value using firm resources and, in turn, creates (non-)monetary forms of value for the firm (Baden-Fuller & Haefliger, 2013). In the dynamic and/or longitudinal view, the way in which the different components of business models are made to function is what gives business models their power over time, including the ability to create new versions of products or innovate them within a given set of strategic and operational constraints, that is, while using the recipe analogy, as they relate to the dish to be served up to customers (Baden-Fuller & Morgan, 2010). In a system or boundary view, business models are usually conceptualized in activity terms. This is particularly useful when understanding the business model as a vehicle for understanding how the full spectrum of activities undertaken at the firm should tie in with the pertinent activities of the global business ecosystem (Zott & Amit, 2010).

In summary, "business model choice determines the nature of complementarity between business models and technology and the paths to monetization. A poor choice can lead to low profits, a good choice to superior profits" (Baden-Fuller & Haefliger, 2013: 422).

Research on technology trajectories has been manifold. A large amount of this research has focused on the way in which technology development occurs within the firm but also how the firm is impacted by technology developed from without its boundaries. The consensus is that technology development occurring within the firm and as an outcome of the global business ecosystem involves two-way knowledge flows. Dosi (1982: 147) associates technology trajectories with the notion of a technology paradigm, since one cannot explain technology change fully without making this association.

Following on from the previous section on technology trajectories, technology trajectories can be defined in two ways according to the intensity and the nature of the change in technology involved, that is as *sustaining* or *disruptive*. (Christensen & Bower, 1996).

There are a number of drivers that contribute to convergence of value chains in the global business ecosystem. These include the emergence of common and dominant platforms (Pfaffman & Stephan, 2001), the reality that global efficiency is a function of national competitive advantage (Porter, 1990), and the strategic responses that occur within the domain of the firm when market/industry convergence is evident (Wirz, 2001).

When managers (everywhere) strategize they now have to consider the consequences of national competitive advantages becoming more marked. Sometimes this leads to the decision to relocate to another country or invest in a greenfield venture or acquire another firm to ensure the firm has a presence in a country that is strategically important, including the ability to gain access to a complementary or strategic technology rapidly (Pfaffmann & Stephan, 2001).

Likewise, markets have also been disrupted and forced to converge because firms everywhere are more able to than ever before pursue cost innovation strategies. In the last decades, the Internet and the demand for digital products and services it has stimulated has intensified the rate of change in global markets. The Internet has changed the way business is conducted forever. There is increased demand and supply of new digital forms of content, e-commerce platforms, streamlined and simple digital services and connectivity. Markets continue to disintermediate too as a result of the flexibility the Internet has provided firms of all sizes (Wirze, Schilke & Ullrich, 2010). In addition to the digitalization of world markets, intelligent network structures and the convergence of media structures have led to profound change. Firms have adopted common platforms as a result of the ready availability of these technologies, regulations and customers expecting firms to use common platforms (Wirz, 2001).

In the past, managers assumed it was possible to sustain a competitive advantage once the firm had achieved market dominance. However, globalization, the widespread adoption of proven business methods, continual innovation in technology, and new concepts in information technology have

created a situation where the old model of management, once an advantage was achieved, is no longer relevant (D'Aveni & Gunther, 1994). A series of temporary advantages essentially is a proxy for a sustainable competitive advantage in this modern era (D'Aveni, Dagnino & Smith, 2010). This means that managers must invest in their firm's resource base knowing that transient advantages via "disruptive strategic moves" may in the long-run be all that is possible to achieve (Thomas & D'Aveni, 2009:415). In addition to the abovementioned forces, hypercompetition has also been caused by deregulation across sectors (Wirz, 2001).

Globalization has led to the acceptance that business can rarely take place without some partnering and networking. This is reflected in the strategic partnering/network literatures, which confirms firms need to eschew the parochial, particularly in regard to how they configure their value chain with global partners. All kinds of partnering and network arrangements have been studied in the partnering and network literatures. Strategic alliances and constellations are undertaken to give the firm prominence and give it access to diverse forms of information, particularly information that is entrepreneurial (Koka & Prescott, 2008).

In recent times, 'big data' has emerged as another important way in which firms can benefit, from possessing and utilizing performance differentiating forms of knowledge. Big data in general terms is "large and varied data that can be collected and managed" (George, Osinga, Lavie & Scott, 2016: 1493).

Summary of the literature review

The literature review confirms Dosi's (1982: 158) view that "the establishment of a defined technological paradigm is likely to be paralleled by a process of 'internalization' within companies of the so-called 'externalities' related to the innovative activity, capitalizing on the previous experience of attempts, successes and failures, etc.: within an established technological paradigm the fluid market structure characterized by the 'heroic entrepreneurship' often described in the literature on new industries is likely to disappear."

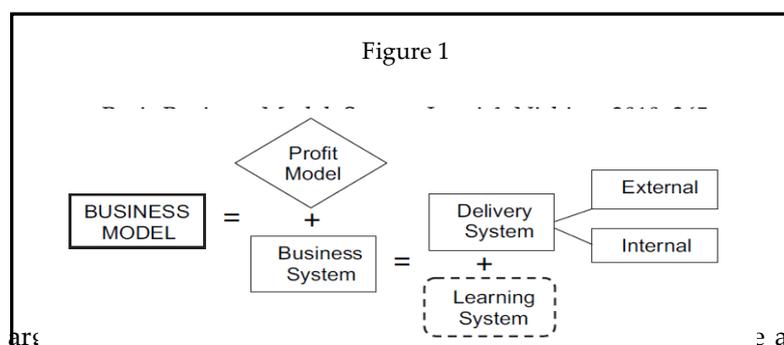
Likewise, it confirms that business models are highly manipulable but also that "the typical assumption that a radically improved product or service offering will, over time, automatically lead to increased profits for the innovating firm(s) ignores the enormous problems that firms face in working out the interdependencies between business model choice and technology effectiveness." The choice of business model cannot be made without clarifying what might be commercially viable as part of a global business ecosystem, as well as the technologies that the firm should invest in to create customer value. Thus, business models mediate the link between technology and firm performance. Developing

the right technology is a business model decision regarding openness and user engagement (Baden-Fuller & Haefliger, 2013: 419, 422).

ITAMI AND NISHINO'S (2010) BUSINESS MODEL FRAMEWORK: THE BASIC MODEL AND OUR MODIFIED VERSION

In this section, we discuss and build upon Itami and Nishino's (2010: 364) business model framework, which is systems based. Itami and Nishino (2010: 364) define a business model as composing two elements: "a business system and a profit model. A profit model "is a pattern of the firm's intention about how it will make a profit in its given business." It summarizes the way in which the firm will achieve its financial goals and differentiate itself from its competitors. A business system, on the other hand, is the "system of works" that the firm uses to deliver value to its target customers through its products and services. While the latter often gains the higher profile, the former is arguably the real 'meat' of a firm's business model. Not only does it act as the 'system of works' that actually produces and delivers the firm's products or services, it is also the locus where a firm can learn about its operations and the behaviors of its suppliers and customers." Because the Itami and Nishino framework incorporates learning, it too suggests that managers will move from one mental frame to another of what the business model should constitute, that is, what it is at the current time and should be in the future as determined by the strategy and the dynamic capabilities³ required to realize it. Although it is acknowledged that not all firms have strategies though they will all have a business model (DaSilva & Trkman, 2014).

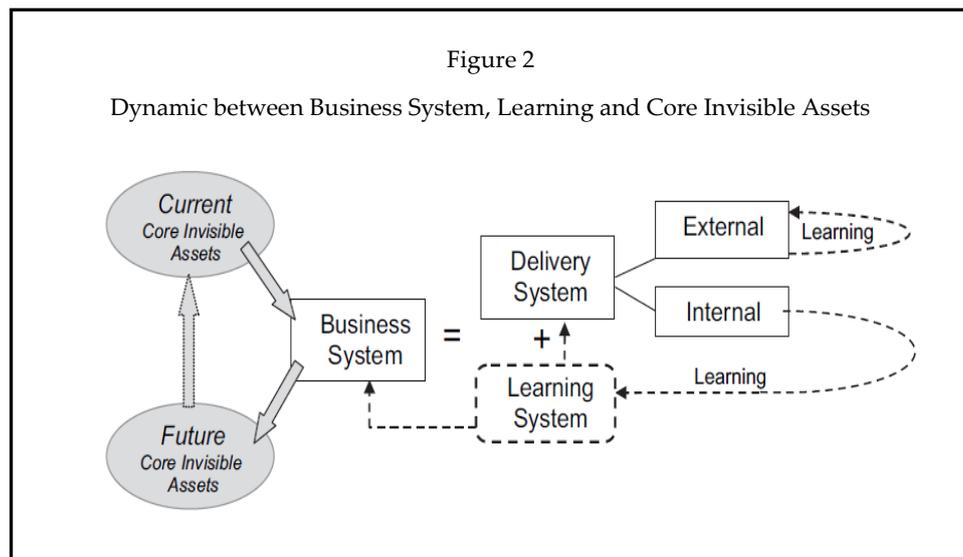
In Itami and Nishino's framework the learning system of the organization is a sub-system of the business system, as is the delivery system, as shown in **Figure 1**. The learning system is the means by which the business system can be rationalised. Its focus is the longer term strategic use of knowledge. It is that part of the business system that renders the business system more than just a delivery system.



Itami and Nishino argue that the business system is where learning takes place and accumulation and development of core invisible assets. This is because the business system is where learning takes place about the firm's delivery system, which is a system that gathers data from within the firm itself and from outside of its boundaries. They are referring to the whole value chain system the firm uses and

engages here. In Itami and Nishino's framework the firm's core invisible assets are continually in a state of change as a result of the learning that originates from the business system. (It is clearly taken as a given in their article that core invisible assets are dynamic capabilities; dynamic capabilities make it possible for firms to keep pace with changes in markets and they derive their power from the knowledge they represent.)

The business system in broad terms is comprised of: "(1) the division of labor between the firm and its trading partners (typically a decision between outsourcing and internal procurement) (2) internally, how should the firm organize its in-house working system and (3) externally, how it should control the activities of its trading partners" (Itami & Nishino, 2010: 365-366). As indicated, Itami and Nishino apply value chain logic. They also explicate the learning system that must underpin it for the firm to be effective and, critically, innovative in the longer-term. In other words, the business system is more than just about operational activities; it is about value creation, value appropriation and learning. The firm benefits the most from its learning system if it ensures it uses its learning to build its core invisible asset base. See **Figure 2**.



Notwithstanding the power of the Itami and Nishino framework, we believe that the framework could be enriched by considering four learning-based inter- and intra-firm effects, including those emanating from the global business ecosystem:

1. Innovation outcomes toward global business ecosystem efficiency;
2. Innovation diversity determinants (within and outside firm);
3. Knowledge asymmetries and the big data phenomenon; and
4. The innovation system.

These are discussed below and their relationships illustrated in **Figure 3**.

1. *Innovation outcomes toward global business ecosystem efficiency*

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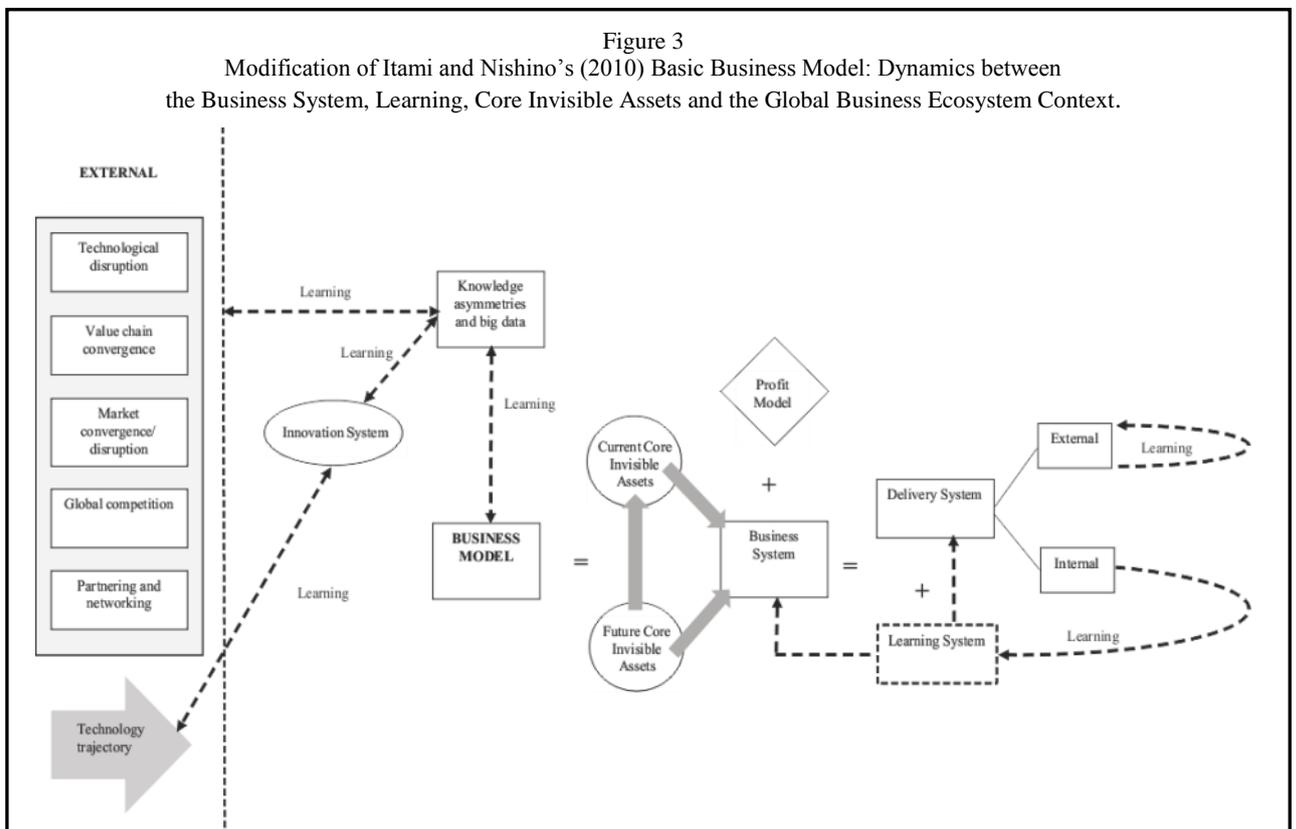
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The literature review highlighted the fact that the business model literature has approached the problem of explaining and defining business models from three perspectives: the static, dynamic or longitudinal, and systems view. The literature review also confirmed that when talking about business models but also technology change, trajectories of technology innovation, etc. there is necessarily a two-way flow of knowledge between the firm and the global business ecosystem. Disruptive technology change will disrupt the existing business models in the global business ecosystem, which means that individual firms that do not ride the wave of change do not survive.

This is illustrated in **Figure 3** which shows that at a global level managers must pay attention to the knowledge flows coming from the global business ecosystem. **Figure 3** suggests change is a two-way process when it comes to technology and business model change.

2. Innovation diversity determinants (within and outside firm)

In the literature review it was determined that the rate of innovation is captured by the S-curve, and this explains the rate by which technology is able to be used and its life-cycle prior to any significant structural breaks, indicating technology disruption (Christensen & Bower, 1996). In terms of sustaining and disruptive change, when this occurs this means the S-curve that was relevant is no longer the source of value creation. It is this event that makes it necessary for firms, in the focal ecosystem market to change (business model and/or technology). Those firms that cannot change will not survive or will evolve into something entirely different.



Another way of saying all of the above and as **Figure 3** illustrates, the factors that stimulate innovation diversity within the global business ecosystem itself - the technological disruptions that are currently prevalent, and the degree of value chain convergence, market convergence/disruption, global competition, and partnering and networking occurring within the business ecosystem – lead to widespread change. Thus, diversity is the result of learning. It is also the product of change occurring at individual firms and spilling out to other firms in the global business ecosystem (as a result of endogenous processes). Obviously, as a rule of thumb, individual firms will have a much smaller ability to influence but they will nonetheless influence. In regard to endogenous change that occurs within individual firms this is change that originates from the innovation system at the firm.

3. *Knowledge asymmetries and the big data phenomenon*

In the literature review section, which highlighted how knowledge relating to technology creates (dis)advantaging asymmetries and that the big data phenomena is intensifying the rate at which innovation is necessary, it is clear that more knowledge management and data mining capabilities are needed than ever before. This is illustrated in **Figure 3** which shows that not only is knowledge (data) accessed and analysed from the global business ecosystem but that knowledge (data) is accessed and analysed at the firm level, that is, as it relates to the business model of the firm at the current time and in the future.

4. *The innovation system*

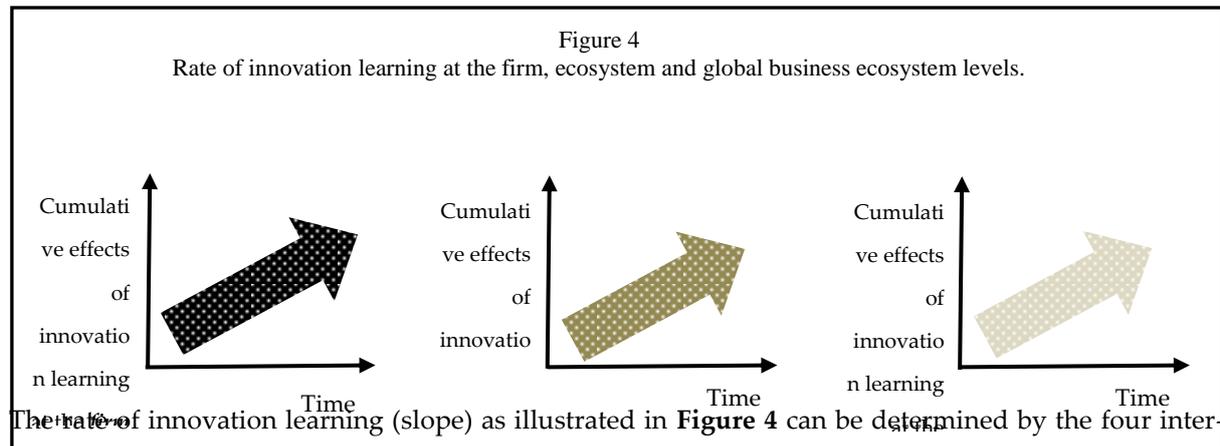
The literature review and as highlighted in the previous three subsections confirms the innovation system firms use can be described as the means by which firms recombine knowledge or generate new knowledge to identify novel opportunities from within and from outside the firm's boundaries. This is possible because it is made up of three knowledge-based components:

1. Business model innovation;
2. Technology change or technology innovation; and
3. Learning from and during innovation from assessing knowledge, including knowledge which was derived from big data; this is illustrated in **Figure 3**.

RATE OF INNOVATION IN THE GLOBAL BUSINESS ECOSYSTEM: A FIRM LEVEL (MANAGERIAL) VIEW

In the previous section, we explained how the Itami and Nishino (2010) framework could be enriched by considering four inter- and intra-firm effects as described in the previous section.

The power of this is that we can get real insight into how firms that succeed and remain competitive in the global business ecosystem contribute to innovation globally, that is, the upward trend in innovation. This can be described as the rate of innovation that occurs within and outside of the firm's boundaries as a result of continuously learning. The assumption is that those firms that cannot learn effectively drop out of the global business ecosystem or morph.



and intra-firm effects and defined as follows:

$$Y = Y_1 + Y_2 + Y_3 + Y_4,$$

Whereas,

Y = Rate of innovation learning

Y₁ = Innovation outcomes toward global business ecosystem efficiency

Y₂ = Innovation diversity determinants (within and outside firm)

Y₃ = Knowledge asymmetries and the big data phenomenon

Y₄ = The innovation system

This equation suggests that the rate of innovation learning is the result of all the four factors coming into play and the fact that the three systems (at the firm, ecosystem and global business ecosystem levels) are interdependent. It demonstrates that though it is cognitively useful to have a static approach or even dynamic/longitudinal approach when thinking about business models and the effects of technology change, or vice versa, a system approach that incorporates learning is most useful when thinking about different time horizons. The way in which value is created will be dependent on learnings that tell managers what should be the focus/foci at any one time.

CONCLUSION AND IMPLICATIONS

This paper developed the Itami and Nishino (2010) framework, which was a high-level systems explication of business models taking learning into account. Though potentially very powerful in its own right, the Itami and Nishino model only focussed on how managers continually learn about the

business system with an emphasis on how managers continually learn about the delivery system (which is a subsystem of the business system). In other words, their framework is focussed on explaining how learning occurs in regard to value chain activities. This means their framework did not provide insight into how business models change in response to change that is not value chain-centric, including global business ecosystem-centric change.

Neither did it provide insight into what comes first, that is, decisions about changing or innovating the business model or decisions about changing or innovating the technologies taken up and used at the firm level. The reality is that these learning processes and decisions thereof require managers not to just engage with value chain partners but to engage in learning activities about the whole global business ecosystem, including the specifics of the ecosystem that most concerns the firm. In other words, using Darwinist principles to analogise, over long periods of time one can see the overall effect of change, that is, the business models and technologies that emerged to be dominant, but what might be most interesting is the interplay of individual factors that lead to natural selection.⁵ This kind of equifinality is worthy of further exploration quite clearly. Just like the chicken and the egg problem, we know that they evolved together to some extent within the ecosystem but at some point a happenstance affecting one or both of them occurred that explained the problem of which came first or achieved pre-eminence.

To reiterate, although our discussion provides insight into what occurs in the global business ecosystem, the objective of this paper was not to explain the whole global business ecosystem or, in other words, provide a macro level explanation of how innovation occurs but to provide insight into the way in which individual firms gather data and then change their business model, as well as the technology they decide to use and develop.

The business model literature and the technology change literature variously alternate between arguing that technologies are underpinned by business models and evolve accordingly while business models are underpinned by technology change and evolve accordingly. As indicated, this is analogous to the chicken and egg problem about what comes first. Our framework is a step toward understanding what might be the answer here in regard to business models and technology change, and which comes first. Thus, in addition to the concept of a technology trajectory, which has been studied extensively, the concept of a business model life-cycle, including one that develops alongside different technology trajectories, may need to be developed as a construct and studied in detail.

As a conceptual piece, bearing in mind that no empirical work using our framework has been undertaken yet, our paper suggests that the what comes first decision is learning based and over time business models and technology necessarily (mostly) evolve together, that is, in the long-run.

Presumably, the managers of a firm at start-up stage must make two either/or decisions in the first instance: should the focus be on the choice of business model or the choice of technology? When we are talking about firms that are mature and part of a global business ecosystem success could be contingent upon the ability to see where the firm sits within the global business ecosystem and to what extent it can contribute to the richness of diversity within it. In this paper, this was elaborated upon in **Figure 4** where the rate of innovation that occurs within and outside of the firm's boundaries as a result of continuous learning was depicted, supporting our argument that learning is essential for global business ecosystem relevance.

Implications for theory and research

This paper contributes to a number of literatures, including the technology and innovation management, strategic management, and strategic entrepreneurship literatures. It has the potential to be a basis for learning much more about how firms learn about customers and make decisions about investing in capabilities to achieve business model outcomes and different technologies, and the iterative nature of this learning process, including how managers translate their learnings about customer value into new capabilities able to deliver on different dimensions of customer value. The modified framework in our paper focuses on the iterative nature of learning about business models and technology trajectories, as well as their various drivers; it provides the means for understanding how learnings about customer value creation can be used to help managers decide how to change their firm's business model and invest in technology.

Likewise, our modified framework can be used to help researchers better understand how the four inter- and intra-firm effects affect business model and technology change decisions, including across different time horizons. The business model life-cycle is a new concept and considerable scope exists to develop it via the abovementioned literatures. It may also be the situation that in different countries, etc. the way in which managers make decisions as a result of learning about these effects are significantly different, as well as the notion of a business life cycle. This too could lead to a rich research agenda.

The paper also highlighted the fact that big data has added another layer to the learning processes at firms; it has changed what it means to develop a dynamic capability. The modified framework could be used as a starting point for embarking on research that provides insight into the strategic implications of knowledge asymmetries and, in particular those that are the result of different capacities to make sense of big data. In this regard it could contribute to theory of the firm research using the knowledge-based view of the firm as its starting point (Grant, 1996; Spender, 1996). It could

also lead to greater focus on the customer value-oriented marketing information system from a strategic and/or technology and innovation management research perspective.

Implications for management

The implications for managers are potentially vast. However, in the first instance, it is clear that the modified framework and what it implies about the rate of innovation learning at the different levels as defined in this paper, and depicted in **Figure 3** and **Figure 4**, respectively, could make it easier for managers to understand: (1) timing issues about decisions to change the business model and/or the technology at the firm; (2) when the global business ecosystem or the ecosystem that most concerns the firm is about to change drastically; (3) the importance of big data and developing capabilities to take advantage of it; (4) how to better learn about the firm's systems and the systems of partners, etc.; and (5) better cope with hyper-competition.

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