Exploring the Role of Technological Change in the Relationship Between Strategic Innovation and Business Model Innovation: Evidence from a Cross-Industry Multiple Case Study

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Abstract: Business Model Innovation (BMI) has recently caught the eye of academics and practitioners in the broad fields of Strategy and Technology Management. However, the relationship between BMI and Strategic Innovation (SI) remains an open issue. Thus, this study aims at investigating the relationship between SI and BMI, focusing on the role technological change plays in it. To this end, we first propose a classification of Technological Change types according to three dimensions: trajectory, intent and effect. Second, based on this classification, we conduct a cross-industry multiple case study with 16 companies to understand how the relationship between SI and BMI is mediated or triggered by the nature of Technological Change taking place, giving rise to eight "innovation paths". We also shed light on the key role played by different actors – top, middle and low management and key employees – in SI and BMI, according to their level of "technological change empowerment.

1 INTRODUCTION

The quest for technology-enabled innovation has been influencing and permeating the very foundations of theory, research and practice in strategy (Hamel, 1998). As environmental complexity grows and become increasingly multifaceted, the role of technological change has alternatively puzzled and attracted strategists. On the one hand, by questioning the validity of traditional approaches based purely on strategic positioning (Porter, 2001) and jeopardizing stable performance driven by well-established businesses and strategies (D'Aveni and Gunther, 1994). On the other, by providing ever-renewing and sometimes dramatic opportunities to update or create new sources of value (Chesbrough, 2010).

Over time, diverging answers were offered to the question of how to strategically operate in and govern a changing environment where technology acts as a major innovation trigger. While some scholars investigated the effects of volatility on industry structure and dynamics (Porter, 2001; Van Der Zande, 2001), others focused on internalizing the necessary resilience (Hamel and Valikangas, 2004), dynamic capabilities (Teece et al., 1997) and absorptive capacity (Cohen and Levithal, 1990) to accept and adapt to volatility, while still others aimed at stimulating and driving change to capture value as innovators or first movers (Christensen, 1997a; Christensen and Raynor, 2003; Kim and Mauborgne, 2005). In response to this urging issue, academics and practitioners lately seem unanimous in claiming that more research efforts should be directed towards an emerging field, to some extent transversal to the abovementioned approaches, that comprises both Business Model (BM) design and Business Model Innovation (BMI) (Schneider and Spieth, 2013).

BMI research arose quite abruptly from the relatively fuzzy BM literature (Zott et al., 2011), and such unstructured rise led to two main issues. First, BMI inherited the relatively scarce theoretical foundation characterizing the body of knowledge on BM, together with the "original sin" of a still unstructured relationship with strategy. In fact, as shown by Schneider and Spieth (2013), BMI research is still concentrated mostly on the identification of prerequisites for and impacts of BMI and its constituting processes and dynamics, but a comprehensive theoretical background is still largely lacking. Second, BMI research has not yet been related to a prolific body of research that dealt with

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similar subjects of innovation and change in the last decades: that of Strategic Innovation (SI) (Markides, 1997; Tushman and Anderson, 1997; Govindarajan and Gupta, 2001; Govindarajan, 2005).

It can be argued that BMI and SI are inherently related, and that this relationship is fundamentally influenced by the nature of change affecting the firm's strategy (e.g. see Chesbrough, 2010; Teece, 2010). Up to now, research on this nexus has been limited to exploratory studies in restricted industries subjected to disruptive change (Downes and Nunes, 2013; Ghezzi et al., 2014), but a comprehensive understanding of how different characteristics of change impact SI and BMI is still lacking (Markides, 2006).

To fill the existing gap and push the understanding of BMI forward, this study hence investigates the role of technological change in the relationship between Strategic Innovation and Business Model Innovation. Firstly, we propose a conceptual framework that classifies the paramount dimensions of technological change. Based on this framework, we employ a multiple-case study approach to investigate 16 companies in order to identify different innovation paths, i.e. different features of the relationship among BMI, SI and technological change. As result, we present eight types of innovation paths that depend on the characteristics of the technological change faced.

2 STRATEGIC INNOVATION AND BUSINESS MODEL INNOVATION

To understand the relationship between strategic innovation and business model innovation, we need to investigate the relationship between BM and strategy. Initially, the two concepts were closely linked (Porter, 2001), but in recent years the distinction between them has been consolidated. In its essence, a BM describes how an enterprise creates and delivers value to customers, enticing them to pay and converting payments into profits (Teece, 2010). It is, in this sense, a novel unit of analysis that simultaneously considers internal firm specific factors as well as external relationships (Amit and Zott, 2001; Schneider and Spieth, 2013). As such, Casadesus-Masanell and Ricart (2010) argue that BM refers to the way the firm operates and creates value, while strategy refers to the choice of the BM to compete. BM, thus, becomes a valuable tool for developing and implementing strategy: a mechanism to both map the business in static conditions and describe the internal strategic context during change (Hacklin and Wallnöfer, 2012).

If BM is a tool to develop and implement strategy, it is arguable that SI and business model innovation (BMI) are closely related. Kim and Mauborgne (1997), for instance, praised the benefits of value innovation, a new strategic logic which refers to fundamentally changing the basis of a business' dominant value proposition in order to create and dominate new competitive landscapes. Similarly, Hamel (1998) proclaimed that competitive advantage in the dynamic environment of the 21st century would reside in "changing the rules of the game", that is, performing a non-linear BMI.

Both Kim and Mauborgne (1997) and Hamel (1998) were writing in the context of SI (Govindarajan and Gupta, 2001; Charitou and Markides, 2003), a research stream in management theory that aimed at developing firms' capabilities to continuously generate innovations as a competitive response in changing environments. SI is alternatively defined as the strategic process responding to or triggering change (Martinsons, 1993; Markides, 2006), the innovation of strategy in itself (Hamel, 1998), or innovation with strategic impact (e.g., see Afuah, 2009).

Building on the nature of the relationship between BM and strategy, it can be posited that BMI serves as a means to operationalize SI endeavors. However, not every strategic innovation is the same.. Ghezzi et al. (2014), for instance, found evidence that in some cases, BMI can lead to emergent SI rather than the other way around. Thus, it becomes important to investigate the role of technological change in the relationship between SI and BMI.

3 THE ROLE OF TECHNOLOGICAL CHANGE IN THE SI-BMI RELATIONSHIP

In strategy research, the nature and classification of technological change vary. As Drucker (1969) states, changes can take place in the form of technological environment uncertainties, due to the rise of new technologies ("technological discontinuity") that affects the industry structure. Additionally, discontinuities can occur in competences and resources necessary for designing and producing products; changes in the product itself as physical changes; and price/performance changes (Ehrnberg, 1995).

Another characterization of environmentally-driven change is found in Miller (1985), who describe changing environments in terms of dynamism (that is, the rate of change in customers' expectations, technologies, or competitors' responses). However, technological change not only originates in the external environment. Instead, it can also be triggered inside the firm, by emerging phenomena within the internal environment (Ghezzi et al., 2015). Such endogenous discontinuities are often linked to gaps in the "work setting", "tasks" or "relations" (Watson-Manheim et al., 2002). Indeed, technological change within an enterprise can manifest itself as either a prominent or a local modification in processes, practices or routines, or a variation in products (by creating different outputs due to an innovation) (Anderson and Tushman, 1990). Interestingly, such internal phenomena may take place unintentionally, due to the risk component which resides in the planning processes of every enterprise and makes it impossible to achieve perfect forecasting (Schreyögg and Steinmann, 1987).

Intent is indeed another key dimension that characterizes technological change and its influence on strategy and BM. The discussion on the explicit or implicit intention to change manifested by a company's top management can be borrowed from the literature on the strategy making process, which contrasts a deliberate approach to strategy making and strategic planning (e.g. see Armstrong, 1982; Lorange, 1980; Chermack et al., 2001) to an emergent (and possibly bottom-up) process made of a set of informal strategic decisions (Mintzberg, 1994; Christensen, 1997b).

Considering that BMI is the operationalization of strategy making process (Shafer et al., 2005; Casadesus-Masanell and Ricart, 2010), BMI can therefore be indirectly influenced by technological change factors, which impact or modify the BM constituting building blocks or parameters (e.g. Ghezzi et al., 2014). Therefore, depending on its characteristics, change may have different forms of influence on Strategy Innovation and BMI.

The way technological change phenomena manifest varies according to a set of key features and characteristics that we bring back to three dimensions: *trajectory*; *intent*; and *effect* (Table 1).

Table 1: Three classification dimensions of Technological Change.

Dimension	Alternatives
Trajectory *(e.g. Miller, 1985; Schreyögg and Steinmann, 1987; Watson-Manheim et al., 2002; Anderson and Tushman, 1990)*	*Endogenous*
	Exogenous
Intent *(e.g. Lorange, 1980; Armstrong, 1982; Mintzberg, 1994; Christensen, 1997b)*	*Deliberate*
	Emerging
Effect *(Drucker, 1969; Miller 1985; Ehrnberg, 1995; Bessant et al., 2005; Ghezzi et al., 2014)*	*Continuous*
	Discontinuous

The three classifications dimensions can be presented in different combinations of their alternatives in terms of continuous-discontinous, exogeneity-endogeneity, emerging-deliberate, resulting in a set of 8 configurations. Based on them, , one research question (RQ1) rises up: *how does the typology of technological change influence the relationship between SI and BMI*? We argue that technological change may act as an influencer – either a mediator or a trigger – of the relationship between SI and BMI. In summation, we suggest that the relationship between SI and BMI may depend on the direction (trajectory), causality (intent) and intensity (effect) of technological change that takes place in a specific context.

4 RESEARCH METHOD

For this study, we adopted an empirical qualitative multiple-case study research (Yin, 2009). Qualitative multiple-case study is useful for theory building based on extensive field analysis, when researchers need to understand how a given phenomenon happens (Yin, 2009; Eisenhardt and Graebner, 2007).

The cases were selected by means of theoretical sampling (Eisenhardt and Graebner, 2007), where the companies included in the theoretical sample were drawn from a cross-industry database created by researchers involved in a two-year international research project on firms undergoing technology-enabled BMI. Due to the explorative nature of the topic, the research favoured depth of analysis over width, and a limited population of 45 firms from different industries and countries was selected. After a preliminary contact, 28 companies expressed interest in participating, and 22 were ultimately selected due to the inability to gather necessary information from 6 of them. Through cross-case analysis, some cases with similar dynamics were

excluded, resulting in the final sample size of 16 companies. The final sample included at least two cases for each of the eight configurations. For data collection, we followed Yin (2009), employing a descriptive case study method based on 88 semi-structured interviews and documental analysis with 57 informants during a period of 14 months. Each meeting had an average length of 1h 42 minutes.

The need for assessing SI and BMI processes, nature of technological change and the sequence of relationships linking them led to the adoption of an "embedded" case study (Yin, 2009), with multiple units of analysis, related to: (i) technological change (ii) strategic innovation; and (iii) BMI.

The reference framework selected to assess BMI is that proposed by Osterwalder and Pigneur (2010), which considers nine parameters a BM is made of: (BMi) Value Proposition; (BMii) Customer Segments; (BMiii) Channels; (BMiv) Customer Relationship; (BMv) Key Activities; (BMvi) Key Resources; (BMvii) Key Partners; (BMviii) Revenue Streams; and (BMix) Cost Structure. Such framework is widely adopted and employed both by practitioners and academics (e.g., see Chesbrough, 2010). For data analysis, we used the Technological Change configurations and the details collected during the interviews about the sequence in which BMI occurs considering the SI process and the need or opportunity of change. We codified interviewees' statements and comments into the three units of analysis; thus, we performed qualitative content analysis based on the chronological perspective of the technological change process for each company.

5 RESULTS

Next, we discuss the cases and the observed innovation path that describes the relationship between strategy and BMI when considering the role of each type of technological change.

Type 1: Exogenous, Deliberate and Continuous Change and the First Innovation Path

In both cases A and B, change had an outside-in thrust, originating from the external environment and influencing firms' strategy and BM. Notwithstanding its external origin, change was deliberately interiorized by top managers, and a SI process was hence triggered to include the features and outcome of change within firms' strategy. In turn, SI was concretized and executed through BMI, and drove a redesign of one or more dimensions in the current BM. In this type, the continuous trait of change determines incremental variations of those BM dimensions affected by innovation. Consequently, our cases A and B suggest that change was hence the trigger of a deliberate SI, which later reflected top-down on BMI and incremental variations of the performance of the current BM.

Type 2: Exogenous, Deliberate and Discontinuous Change

In both cases C and D, change had an outside-in thrust, originating from the external environment and influencing firms' strategy and BM. Notwithstanding its external origin, change was deliberately interiorized by top managers, and a SI process was triggered to include the features and outcome of change within the firms' strategy. In turn, SI was concretized and executed through BMI, and drove a redesign of several dimensions in the current BM. The discontinuous trait of change determined radical variations of those BM dimensions affected by innovation. Cases from Companies C and D suggest that in this type, change is the trigger of deliberate SI, which later on reflects top-down on BMI and radical variations of the current BM.

Type 3: Endogenous, Deliberate and Continuous Change

In these two cases E and F, the rise of internal resources, competencies and know-how was embraced within a deliberate and continuous strategic innovation and BMI represents the execution of such deliberate strategy. Consequently, change was the effect of a deliberate strategic decision made by the top management, who, by means of SI, aimed at modifying the current strategy, BM and performance. Therefore, change determined by SI followed an inside-out trajectory, stemming from inbound processes and dynamics and later reflecting on the firms' BM, and being executed through BMI. The continuous trait of change determined incremental variations of the performance of those BM dimensions affected by innovation. Change was hence the mediator between deliberate incremental SI and its top-down concretization through incremental BMI.

Type 4: Endogenous, Deliberate and Discontinuous Change

In both cases G and H, change was the effect of a deliberate strategic decision made by top management, who, by means of SI, aimed at modifying the current strategy, BM and performance. Thus, SI generated change according to an inside-out trajectory, stemming from inbound processes and

dynamics and later reflecting on the firms' BM, and being executed through BMI. The discontinuous trait of change determined radical variations of those BM dimensions affected by innovation. Consequently, this particular type of change was the mediator between a deliberate radical SI and its top-down concretization through a radical BMI.

Type 5: Exogenous, Emerging and Continuous Change

In these cases I and J, change had an outside-in thrust, originating from the external environment and influencing firms' strategy and BM. Change propagates and spreads in the firm in an emerging and unstructured fashion, not immediately reflected in a variation of the overall strategy, but rather being absorbed locally in one or more BM dimensions that represent the strategy's implementation. Emerging variations in the BM characterize a BMI. The continuous trait of change determined incremental variations of those BM dimensions affected by innovation. Following a bottom-up diffusion process, BMI is later caught up by and formalized within the overall strategy through SI. Change was hence the trigger of an emerging incremental BMI, which then propagated bottom-up to cause an incremental update of the firm's Strategy through SI.

Type 6: Exogenous, Emerging and Discontinuous Change

In these two cases K and L, change had an outside-in thrust, originating from the external environment and influencing firms' strategy and BM. Change propagated in the firm in an emerging and unstructured fashion, not immediately reflected in a variation of the overall strategy, but rather being absorbed locally in one or more BM dimensions that represented the strategy implementation. The emerging variations in the BM caused a subsequent BMI, as the other BM dimensions must be adapted to cope with localized evolutions. The discontinuous trait of change determined radical variations of those BM dimensions affected by innovation. Following a bottom-up diffusion process, BMI was later caught up by and formalized within the overall strategy through SI. Change was hence the trigger of an emerging radical BMI, which then propagated bottom-up to cause a radical update of the firm's Strategy through SI.

Type 7: Endogenous, Emerging and Continuous Change

The type of change appearing in cases M and N had the effect of implicit, unstructured or local modification of the firms' current BM. Such change propagated and spread in an emerging and unstructured fashion, not immediately reflected in a variation of the overall strategy, but rather being absorbed locally in one or more BM dimensions. Emerging variations in the BM characterize a BMI. The continuous trait of change determined incremental variations of those localized BM dimensions affected by innovation. Following a bottom-up diffusion process, BMI was later caught up by and formalized within the overall strategy through SI. Thus, change was the mediator between an emerging incremental BMI and SI that causes an incremental bottom-up update of the firms' strategies.

Type 8: Endogenous, Emerging and Discontinuous Change

Change, in cases O and P, was the effect of an implicit, unstructured or local modification of the firms' current BM. Change propagated in an emerging and unstructured fashion, not immediately reflected in a variation of the overall strategy, but rather being absorbed locally in one or more BM dimensions. The emerging variations in the BM cause a subsequent BMI. The discontinuous trait of change determined radical variations of those BM dimensions affected by innovation. Following a bottom-up diffusion process, BMI is later caught up by and formalized within the overall strategy through SI. Change was hence the mediator between an emerging radical BMI and SI that caused a radical bottom-up update of the firms' strategy.

6 DISCUSSION AND CONCLUSIONS

The proposals and findings presented in this study touch upon and relate two key themes in the research stream on BM, strategy and technology: (i) the relationship between SI and BMI and the nature of technological change's influence on it; and (ii) the actors and roles in technology-enabled BMI as a process.

First, this study focuses on clarifying the relationship existing between BMI and SI. The link between BM and technological change was already postulated in several works (Lindgardt et al., 2009; Teece, 2010; Chesbrough 2010; Casadesus-Masanell and Ricart, 2010), whose main findings claim that: (i) BM and BMI research still suffers from fuzzy definitions and lack of a common theoretical frame; (ii) BM is closely related to business strategy, in the

sense that it acts as strategy execution; and (iii) entrepreneurs and managers innovate BMs by means of technological experimentation and learning, although the efficient development and implementation of new business models in corporate practice is a complex process.

Although previous studies pointed in the same direction, they showed a largely conceptual approach to the problem, and mostly focused on the dyadic relationships strategy-BM and BM-technological change only. Our study's contribution refers to the investigation of a wide multiple case study which reports and compares findings from diverse industries and allows to ground on empirical evidence the claim that strategy and BMI are closely coupled. We establish a more formal and systematic relationship between these concepts, thus confirming and extending the conceptual work from Teece (2010). More specifically, we extend the insightful proposals from Casadesus-Masanell and Ricart (2010) and Richardson (2008) to their natural (but still implicit) consequences: being the BM the way a firm executes its strategy, we claim that Business Model Innovation is the concretization of Strategic Innovation. Indeed, as our cases show, SI choices affect one or more BM parameters, ultimately determining BMI – or conversely, BMI will eventually lead to SI. Business Model Innovation is hence "Strategic Innovation in action". This finding suggests a transitivity in the BM-Strategy and BMI-SI relationships which helps connecting the so far parallel streams on BMI and Strategic Innovation. In addition to consolidating and extending the BMI-SI relationship, our study makes one key step further, by finding that the nature and characteristics of technological change significantly matters in such relationship. Indeed, positioning the cases in the Technological Change Types Matrix shows that technological change acts as an influencer – either a mediator or a trigger – of the relationship between SI and BMI.

Since change is the essence of BMI and SI, both their origin and outcome, and acts as the *fil rouge* that connects SI with its execution through BMI, including the nature of change in the equation helps shedding light on the idea that a relationship exists, though its direction and sequence is not predetermined. The relationship between SI and BMI depends, in its direction (trajectory), causality (intent) and intensity (effect), on the type of technological change in place.

Our framework which classifies the 16 cases on the basis of eight change types gives rise to eight different "innovation paths" for the relationship between SI, BMI and technological change itself. This finding relates to the second key theme that concerns the actors and roles in BMI and SI as a process. We find that the dimension of change intent plays a fundamental role in shaping the causality of the SI-BMI relationship. The comparison between the eight cases belonging to change types 1 to 4, where a deliberate intent characterized innovation, with cases in change types 5 to 8, where intent was emerging, shows that in the former innovation paths SI determines BMI, where in the latter it is BMI that triggers SI.

Hence, two different streams of innovation in strategy seem to exist: (i) the formal, top-down and overarching one, which aims at innovating the firm's explicit mission, vision and strategic goals (innovation paths 1 to 4); and (ii) the rather informal, bottom-up, possibly local and undercurrent one, which emergently changes the way a firm operates in its attempt to create value and reap a share of it (innovation paths 5 to 8).

The first stream clearly refers to the traditional research stream on the strategy making process (Armstrong, 1982), with the addition that a change in strategy eventually reflects on a change in the BM (Casadesus-Masanell and Ricart, 2010; Johnson et al., 2008). The second stream contributes to the discussion on "business model lifecycle" (Morris et al., 2005) and "experimentation" (Lindgardt et al. 2009; Chesbrough, 2010), particularly in the context of strategic experimentation (Govindarajan and Trimble, 2005). According to Morris et al. (2005), the business model lifecycle consists on: an initial period during which the model is fairly informal or implicit; a process of trial and error where number of core decisions are made that constraint the directions in which it can evolve; and a final step where a fairly definitive, formal model is established. Subsequently, adjustments are made and on-going experiments are undertaken. Chesbrough (2010) wrote that companies must adopt an effectual attitude toward business model experimentation. Thanks to effectuation (Sarasvathy, 2008) they can create actions based on the initial results of experiments, generating new data which may point towards previously latent opportunity.

The four change types related to an emergent intent are examples of these BMI dynamics, with a significant addition referring to the role of managerial leadership in the survival of emerging BMI resulting from experimenting. If it is true that new ideas and opportunity discover can arise from everywhere in the company, it is also proved that without the right authority mobilized for change, it will not take place (Hamel, 1998). Mansfield and Fourie (2003) state that

developing and implementing new or changed business models requires entrepreneurial flair and careful management of risk. The discussion is revisited in Chesbrough (2007), who underlines the "business model innovation leadership gap" existing in many organizations: no one in the organization has both the authority and the capability to innovate business models. Since it takes a lot of time to develop business model experiments, obtain clear results, interpret and understand the results, and then carry out a broad deployment of those results, top managers usually represent a barrier to innovation. Indeed, top managers normally reach their level of responsibility by executing within the current business model, so that the model is familiar and reassuring to them (Chesbrough, 2007). It is almost like an opportunistic behavior that immobilizes company's practices and prevents business models to adapt to fast changing environmental conditions. An organization needs to identify internal leaders for business model change (Chesbrough, 2010) and give senior managers the resources and authority to define and launch business model experiments (Chesbrough, 2007).

Our study contends that it is true that technology-enabled innovation will not take place at a planned formal strategy level without a top-down deliberate approval, though it will survive and live at an operational strategy level, and may drive performance change even before the overarching strategy catches up. To different extents, this is the case for the eight companies who followed innovation paths 5 to 8, where innovation was led by middle/low management and employees with a strong grip on BM's operational execution, thanks to specific technological skills and know how. This is to some extent consistent with the recent notion of "big bang disruption" and "undisciplined strategy" posited by Downes and Nunes (2013) where technology-enabled innovations may not be led by a strategy and shared by a top manager, since change may not require a budget approval and may be based on experimenting and combining different resources and asset, either internal (see cases M, N, O and P) or external (see cases I, J, K and L).

Our study shows that BMI may survive the lack of supervision and strategic commitment by the top management, being primarily led by line managers and employees invested in experimentation on operational level. This claim may attenuate the risk of encountering top managers that impair rather than enable BMI; also, it sheds light on the need to focus the attention of practitioners on the "technological change empowerment" or strategic independence they wish to vest the line management and employees with. Such technological empowerment should be properly balanced with an ability to supervise and eventually consolidate BMI, thus avoiding any strategic inconsistencies deriving from a bottom-up approach.

Value for practitioners is equally important, since this study provides a set of tools to: (i) categorize technological change; (ii) relate technological change types to SI and BMI, and map the "innovation path" a firm has – explicitly or implicitly – undertaken; and (iii) disclosing the strategic role of technological change empowerment assigned to different actors.

Like all studies attempting to frame reality in a model, this work is not without limitations, deriving from: any observer bias in the activities of case data gathering and analysis; and the possible information loss determined by case selection. Although the sound methodologies and the use of a wide cross-industry sample attenuate such limitations, a validation of these finding through quantitative analyses on a larger sample should be the objective of future research. Other opportunities for future research could: relate to the investigation of how firm size can influence the SI-BMI relationship and the chance to actually trigger BMI without a deliberate strategic commitment; define managerial guidelines to confer technological change empowerment, by recognizing it as a possible source of BMI; and assess the opportunities and risks deriving from a distributed strategic independence allowing managers and employees to leverage their technological skills endowment, which could lead to local or contingent approaches (a sort of uncontrolled explosion of case-specific BMs) possibly diverging from the institutional strategic intent.

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