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Business Models and Technological Innovation

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Business models are fundamentally linked with technological innovation, yet the business model construct is essentially separable from technology. We define the business model as a system that solves the problem of identifying who is (or are) the customer(s), engaging with their needs, delivering satisfaction, and monetizing the value. The framework depicts the business model system as a model containing cause and effect relationships, and it provides a basis for classification. We formulate the business model relationship with technology in a two-way manner. First, business models mediate the link between technology and firm performance. Secondly, developing the right technology is a matter of a business model decision regarding openness and user engagement. We suggest research questions both for technology management and innovation, as well as strategy.

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Introduction

The business model construct has become attractive to many academics, taking on its own momentum as is evidenced by the fact that, in the three years since publication, the *Long Range Planning (2010)* special issue on business models attracted more than 150,000 downloads and more than 3,500 Google Scholar and more than 500 ISI citations. Yet, the construct has also attracted criticism. Zott et al., (2011) complain that business models "have yet to develop a common and widely accepted language that would allow researchers who examine the business model construct through different lenses to draw effectively on the work of others", because there appears to be a diverse set of business model definitions and a diverse set of approaches to classification. These views reflect confusion that has taken energy away from proper dialogue on key questions — What are the components of a business model, and how does business model innovation occur?

In this piece, we explore one clear emerging view of the business model construct, and examine where this view takes us in terms of understanding an issue referred to by authors such as Chesbrough (2003, 2010) concerning the relationship between business model innovation and technical innovation. While researchers such as Osterwalder et al. (2010) and Demil and Lecocq (2010) have proposed that the business model concept lies within the traditional strategy lexicon of competitive advantage, we argue that the business model is a stand-alone concept in its own right because a business model is a model (Baden-Fuller and Morgan, 2010). Similarly, Markides and Sosa (2013) distinguish between market entry decisions and business model choice. And we also explain how this view accords with the widespread recognition in the literature that a business model should be able to link two dimensions of firm activity — value creation and value capture (Amit and Zott, 2001; Zott and Amit, 2010; Casadesus-Masanell and Ricart, 2010; Teece, 2010).

We have not mentioned technology in this conception of the business model. How do technology and business models interact? Technology development can facilitate new business models — the most obvious historical example is the way the invention and development of steam power facilitated the mass production business model. But, business model innovation can also occur without technology development, as occurred in 1980s when the Japanese pioneered the "just in time" production system. In fact, business models and technologies regularly interact. For example, when Amazon was founded in 1995, they applied new technology to make the traditional mail-order business model pioneered by Sears Roebuck work well for books. Amazon did not invent a new business model, nor did Easy-Jet (one of Europe's most successful low-cost airlines) when it copied the business model pioneered by Southwest Airlines. Both Amazon and Easy Jet applied well-known business model constructs and developed them in new contexts.

In contrast, Google's two-sided dynamic search engine developed in 2003 was not just a technological leap — it was also a business model leap. Google used Adwords to provide an interface with advertisers (one side of the two sided platform) whose choices directly influenced the search experience of users on the other side of the platform. Google was probably the first company in the world to create the type of scalable dynamic two-sided platform modeled by Rochet and Tirole (2006).

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The novelty of their approach lay in linking the two sides in a constantly changing manner that allowed greater consumer satisfaction and greater revenues for any given set of users on each side of the platform.

Discussions of the effects of business models on performance do not always separate the effects of business model innovation from technological innovations (c.f. Zott and Amit, 2007; Casadesus-Masanell and Ricart, 2010). We know that technological innovation influences performance (cf. Bierly and Chakrabarti, 1996; Christensen and Bower, 1996; Zaheer and Bell, 2005; and reviews by Evanschitzky et al., 2012; Hauser et al., 2006). But, to improve our understanding, we need a more precise appreciation of how innovation links to performance through the business model, and how changes in the business model influence technological innovation. The fact that positive effects of technological innovation on business performance are easily observed has diverted attention from questions about how business models change in the wake of innovation. At the same time, management theory requires more precision concerning the means by which business model changes enable and foster innovation.

This piece will first explore key relationships that are embedded in the business model construct, and then briefly review what we know about these relationships with a view to building a research agenda for the future. We begin by exploring what a novel business model is and how new business models are related to new technologies. We note that this approach of seeing the business model as a model is similar to the logic of reasoning and understanding that exists in economics, biology and physics. In each of these fields, as explained by philosophers of science, models are "manipulable instruments with which to reason and into which to enquire" and tools that "allow the user of the model to explore ideas" (Morrison and Morgan, 1999; Morgan, 2012). This allows us to assert that it is intellectually robust to ask: "Is business model innovation potentially separate from technological innovation?" — even though business model possibilities often rely on technology.

Building the framework

As noted, work on classifying business models has proceeded along two lines. First, there are researchers and commentators who see the business model concept as part of the strategy lexicon and intertwined with technology. They talk of "novel" and "efficient" business models if a new technology is incorporated into a business to produce a superior effect (e.g., Zott and Amit, 2007; Osterwalder and Pigneur, 2010). Secondly, there are researchers, such as Teece (2010) or Baden-Fuller and Morgan (2010), who see the concept of the business model as potentially separable from technology and strategy and examine how understanding business models and business model innovation might shed light on core strategy and technology questions. This latter approach has the potential to answer the long-standing challenges posed by Chesbrough (2010), who asks when a novel technology requires a novel business model, and when the combination of a novel technology and a novel business model lead to competitive advantage.

Classification is necessary in order to understand innovation because only then can we appreciate what is meant by new. Two major approaches to classification can be found in the literature. First, classification has been approached taxonomically by trying to build a picture from looking backwards at empirical work — taking the outputs or location of the use of the model as central. Thus, we have the classification of Wirtz et al., 2010, which stressed the difference between content, commerce, context and connecting business models, and from Zott and Amit (2007), who emphasize the efficiency and novelty business models. But an alternative line of argument has emphasized the dimensions of the model rather than its consequences — a classification that could be described as typological (Hempel, 1965). This type of classification is more forward looking and has been at the heart of discussions that recognize two vital dimensions: Value creation and Value Capture. Value reaction identifies the customer or customers and how are they engaged (cf. McGrath and MacMillan, 2000), and value capture identifies how value is delivered and monetized (Teece, 2010). This classic two-part division of the business model (cf. Amit and Zott, 2001), leads to the possibility of a typological, theoretically-driven categorization that can assist in identifying basic types. In line with this argument, we develop a typology with four dimensions: customer identification, customer engagement, value delivery, and monetization; and we explore what this typology does for our understanding of business model innovation and its relationship to technical innovation. Table 1 gives examples of the classification of well-known firm-business model configurations. We explain the dimensions more fully below.

Customers

First, we address the customer identification dimensions of the business model. We stress that with modern technological possibilities, it is essential that the business model identifies the users and the customers and indicate whether users pay for what they use or another group of customers actually pays (Teece, 2010). Historically, users almost always have paid, albeit in many different ways usually at time of purchase or subsequently through a "razor-blade" model of usage charges. But with newspapers, television, and finally the internet, technology has created the possibility that users may not pay for the services they receive — payment instead being made by others such as advertisers, as indicated in Table 1. Two-sided platforms of this type (Rochet and Tirole, 2006) are hybrid business models because they incorporate two value delivery systems — one for the user (such as a consumer that wants to search) and another for the customer who pays, such as a small firm that wants to place an advertisement where it can be seen by a particular kind of consumer. The internet did not "invent" two-sided platforms — they have existed since before the 18th century — but it did facilitate their expansion (see Table 1 for the example of a dynamic, advertising-supported search engine).

Table 1
Examples of the Business Models

	Fast food chain – franchised BM	Boutique strategy consultant BM	Defense contractor BM	Newspaper (1990s) BM	Search Engine BM
CUSTOMER IDENTIFICATION Are users paying and if not who are the other customers?	SIMPLE BM User pays with franchisee as an intermediary	SIMPLE BM User pays	SIMPLE BM User is typically the government who pays	HYBRID BM Readers pay per copy Advertisers contribute bulk of revenues	HYBRID BM Free for users, but advertisers pay
CUSTOMER ENGAGEMENT "Taxi" or "Bus"	BUS Scale based	TAXI Bespoke projects	TAXI Usually project based	BUS Readers and advertisers are given bus service	BUS for users TAXI for advertisers
VALUE CHAIN LINKAGES Integrated, hierarchy or networked	Highly tiered system of suppliers and franchisees, who are linked hierarchically	Almost all value is delivered by the firm, little outsourcing	Complex system of arrangements among many partners	Content and production are typically hierarchical but sometimes network	Complex tightly controlled linkages orchestrated by firm
MONETIZATION When, What and How is money raised	COMPLEMENTARY ASSETS Franchisee collects money from consumer and passes on fee	VALUE Often priced on the basis of fee plus share of the value created	COST Staged payments and often cost plus contract	TWO-SIDED Everyone pays close to point of use	TWO-SIDED Advertisers pay after service is delivered

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Customer engagement

Secondly, we address the question of customer engagement. This requires sensing what the customer-user or groups of customer-users need, and establishing the value proposition for each of these groups perhaps using the process explained by McGrath and MacMillan (2000), McGrath (2010), Day and Moorman (2010), and Day (2013). A long-standing distinction between "project based offerings" and "pre-designed (scale) based offerings" — often described as the "taxi' and "bus" systems — is useful in this context. Organizations such as consulting firms and movie makers use the taxi system to create value by interacting with specific clients to solve specific problems, while organizations such as automobile assemblers and providers of fast food utilize the bus system and add value by producing "one-size-fits-all" goods or services in a repetitive manner from a standardized, mass-production format. We suggest this distinction fits with the argument of Thompson (1967) and Drucker (1986), who proposed a distinction between firms organized in teams and mass production. The categories we refer to as "project" or "taxi" and "scale" or "bus" are more than just slogans; they are well established, economically-robust, model-based configurations that have been widely examined by scholars from communities both within and beyond management. These models exhibit clear features; they typically have recognized processes and mechanisms and commonality in how they utilize "knowledge" and "routines".

The project-based approach is characterized by bespoke projects responding to customer needs. Its routines are designed to be particularly effective at three things: dealing with non-routine complex tasks that require the repeated reconfiguration of organizational structures; responding flexibly to changing client needs; and integrating diverse bodies of knowledge (Davies and Brady, 2000; Hobday, 2000; Söderlund and Tell, 2010). Table 1 illustrates this with the example of a defense contractor.

In contrast, the "pre-designed" or "scale-based" approach is characterized by products made through scale-based systems using machines and routines that have a limited capacity to respond "flexibly" to unexpected client needs (e.g., Hounshell, 1984; Chandler, 1990). The fast food hamburger chain discussed in Table 1 is an example of a scale-based business. Business systems using this approach also "integrate diverse bodies of knowledge", but typically via different processes. There is a clear theoretical boundary between how project-based and scale-based organizations utilize knowledge in creating value (e.g., Chandler, 1990; Nightingale, 2000; Nightingale et al., 2011; Hobday, 2000).

Value delivery and linkages

The third component is the set of linkages between identifying the customer groups, and sensing their needs on the one hand, and monetization on the other. These linkages sometimes are described as value delivery, but they may go further than the traditional value chain, because a two-sided business model that has two sets of customers typically also involves two value chains — one for each side of the market. These linkages can be described by the architecture of information flows and system governance (Amit and Zott, 2001; Casadesus-Masanell and Ricart, 2010). We do not discuss these dimensions in any detail as they are generally very well understood. Important contributions to this idea come from the literature on vertical integration (Williamson, 1985) and on hierarchy vs. network (Lorenzoni and Baden-Fuller, 1995), and research on other arrangements that can extend beyond the firm to upstream supplier networks, and downstream linkages with and among customers.

Monetization

The last component of the business model is monetization, often labeled value capture. Discussions of monetization have often stopped with pricing ignoring important issues of timing and effectiveness which are paramount additional value capture dimensions for organizations. Concerning pricing, there are many other possibilities, including negotiated prices, and price based on value delivered. One of the most important contributions to our understanding of pricing comes from Teece (1986), who stresses the role of complementary assets. Complementary assets can leverage monetizing opportunities, particularly in the case of the razor-blade model. In cases such as the fast-food franchise-system noted in Table 1, the user pays the complementary asset provider who in turn pays the provider.

In addition, there are important questions about when the money is collected — before the sale; at the point of sale; or after the sale. A very important choice in the business model for durables is whether to rent a machine or sell it outright. The rental system implies a different form of customer engagement and different timing for collecting income that can be tailored more closely to value-based pricing.

Refining the innovation performance link

Strategy scholars have underplayed the role of business model choice in their search for establishing a link between technology innovation and competitive advantage. 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.

A given technology seldom operates in isolation from other technologies; interoperability is required in order to create the intended value. This is a well-recognized relationship, but it recently has become more intense, dynamic and uncertain, due to the arrival of sophisticated information technology and greater availability of platform technologies. Those who assume a simple relationships between technology development and the performance outcomes for a firm or firms ignore the moderating influence of business model choice. 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.

Many examples exist of these interdependencies. Business models for navigation systems, for example, present solutions as standalone units or as mobile applications that take into account information shared by other drivers — such as Waze, a mobile map application acquired by Google in 2013. In this example, the map and the satellite navigation systems of Waze link users to each other via the Internet, and they can share local information. The technology's main platform is the mobile phone operating system. The application also links to Facebook, which allows drivers to discover friends from their social network while on the road. Localized advertisement and news monetize the value created through what Waze vice president Elish describes as an "improved driving experience" (Elish, 2013). In the example of Waze, the business model choice determines the profitability of the technology. By choosing a two-sided business model that links customers with each other and with advertisers — as opposed to a simple single sided business model — Waze appears to have increased its value many times to nearly $1 billion.

Competitive dynamics not only influence product margins but also the viability of the business model. Recent work by Eisenmann et al., 2011 analyzes competition between platform firms showing that survival of the entire platform depends on complementarity of the offering, which in turn depends on technology, features and interoperability. The interactions between technology and business model are substantially more complex and more dynamic with two-sided business models (see for instance Casadesus-Masanell and Yoffie, 2007 on Wintel; Casadesus-Masanell and Zhu, 2010 on two sided platforms).

We can explore this issue further with a simple example: the video game industry. Video games originally were played on either a home computer or a specialist console. Technological innovations, in the form of better animation, better controls, or better visual experience, typically yielded profits for the innovator. Recently, the industry has become more complex. Although many games are still available via traditional routes, some of the most successful firms are offering games through other channels, including the web. Firms often adopt a two-sided business model where most users pay nothing and monetizing occurs through advertising and "freemium" pricing models. This development highlights the sensing dimension of the business model — firms are offering the same product or service to customers in different ways with different methods of engagement and different monetization routes. These engagement and monetization structures have to adapt to the changes taking place on the platform, including those initiated by providers of complementary assets in other sectors that influence the other side of the platform.

Zynga, a leading web-based game publisher in 2013, offers the popular game FarmVille in the freemium mode. Users can play for free and acquire in-game assets, if they wish. Game play happens via a social network, such as Facebook. Zynga earns money from a small fraction of its users, depending largely on social networks to do business, earning money from cross-sellers and advertisers. Zynga chose Facebook for its main platform, and took advantage of a number of critical features the platform offers, such as comparability of game scores among friends and advertisements. But, Zynga also has to consider whether and when it makes sense to switch between platforms and which new features of Facebook are appropriate for the context of gaming. Product extensions that take advantage of user content shared on the social network touch upon the element of customer engagement for the service provider, and critically depend on available technology that may or may not be appropriated. The negotiation processes between the involved parties about innovation in gaming and access to platform

technology also impact monetization through decisions about questions such as whether financial transactions should run via Facebook, or bypass the platform.

Therefore, an important research agenda for technology strategy scholars is to unpick the interdependencies between business model choice, technology development, and success. Theory building needs to be matched by skillful empirical work. Making business model choice a moderator, and including the factors that influence business model change in a dynamic manner, will lead to a better understanding of the fundamentals of the relationship. And it will also allow strategists to comment more succinctly and usefully on key contingencies – such as, why so many innovative products fail; how successful firms conceive the relationship between technology and business model; and how they conceive the dynamics of the process of business model adjustment.

Developing the right technology

A number of actors — including systems integrators (Prencipe et al., 2003), entrepreneurs (Garud and Karnøe, 2003), or users (Von Hippel, 1988) — play a key role in trying to answer the long-standing question: What determines the direction of technology evolution? These actors will be driven by the cognitive frames they hold that connect perceived customer desires to the innovation agenda. Business models are not just statements of economic linkages but also cognitive devices; business models held in the minds of these actors influence technological outcomes.

These cognitive business models exist even before the technology is designed and the products are built. At one extreme, the developer's business model could be something very simple and formed by the developer's own preferences concerning who the customer is and the method of customer engagement (Denyer et al., 2011; Haefliger et al., 2011). Or, it may be driven by the current belief system of the company (e.g., the discussion of Kodak by Tripsas and Gavetti, 2000; or Xerox by Chesbrough, 2010). At the other extreme, the actor may have a very rich and free-flowing view of the world, influenced by deep knowledge and understanding of social and technical possibilities and unencumbered by immediate external biases. It is not the purpose of this paper to explore how the cognitive frames come about; this is a separate concern (e.g., Baden-Fuller and Mangematin, 2013 forthcoming). Our purpose is to explain why differences in these business model frames produce widely different outcomes.

We highlight two important factors in the business model that influence development: the role of openness, and the role of users. Openness refers to the permeability of the company boundaries. Chesbrough (2003) initially coined the term "open innovation" to acknowledge the potential value for firms in buying and selling intellectual property that has not yet reached the product stage (Arora et al., 2001). Openness now has come to have a broader meaning with recognition that process technology may not be patented and is difficult to protect. It may nonetheless be valuable for users or even competitors to share technology without asking for compensation (Henkel, 2006), because sharing may lead to learning and to the establishment of communities with similar, professional interests.

We argue that it is not just openness that matters in determining technological trajectories, but the connectivity between openness and user engagement — again a business model choice. The paternalistic view that management knows what is best for the customers is being challenged by the growth and success of mass customization business models (where mass customization is taken to mean organizational responsiveness to customer requests for differentiation – see Ogawa and Piller, 2006). This responsiveness can be fostered by crowd sourcing and by open and user innovation (Jeppesen and Lakhani, 2010; Hienerth et al., 2011), as well as by the advent of information technology that makes these new business models scalable.

This responsiveness can allow involvement by customers deep into the fabrication process, and offer toolkits to customers that allow them access and express choice in technology development and design (Franke and Piller, 2004). These involvements have been associated with new discoveries and innovations across many industries, from extreme sports (Baldwin et al., 2006) to software (Bonaccorsi et al., 2006).

For example, we know that software development flourishes in online communities (Roberts et al., 2006) and that companies have increasingly taken advantage of linking and liaising with these communities to share technology and knowledge (Colombo et al., 2013; Dahlander and Magnusson, 2008). By definition, choice of engagement with online communities and the integration of customers into the development process is a business model choice. Customer engagement may occur through a tool kit of standard choices, or through contributed innovative ideas and technical solutions (Franke and Piller, 2004; Füller et al., 2008). Greater customer engagement leads to increased value creation for both sides (Franke et al., 2010). Firms contributing to online communities as clients and developers of software products share their adaptations of the product with vendors and competitors, for improved next release and to increase system good will (Henkel, 2009). Thus, we can see that there is an interaction between business model choice and the direction of technology development.

And in another example, that of the T-shirt, we see how business model choice about openness and scalability has influenced development. The textile industry was at the core of the industrial revolution in the 19th century. Throughout most of the subsequent history of the industry, producers followed a traditional business model of customer sensing and engagement that involved professionals designing, large scale manufacturers assembling and the results sold in shops and by mail order. In the late 20th century, more advanced printing and stitching machines brought about the option of customization at the final stage of production. Customers could bring their own designs and have T-shirts made to order. Firms that adopted this novel business model became highly successful and changed the industry. More recently, the T-shirt maker

Threadless has followed an even newer business model — inviting both designers and consumers to directly interact, making T-shirts for themselves offering the same designs to others for cash prize rewards.

Firms such as Threadless exploit novel two sided business models that match designers to consumers. In the new Threadless system, freelance professional designers work with far greater freedom than was possible in the old system, and a large group of consumers experience what it is like to be a designer giving them new experiences and pleasure. This has opened up a new innovation path — the possibility of novel designs that become popular faster than traditional designer-led or user-led methods. Threadless can also minimize production risks by not producing shirts unless enough customers have pre-ordered the designs they endorse.

Thus far we have talked of the way that business model choice influences technological and firm development, but it is pertinent to ask if technology also acts on business model possibilities. Looking at the T-shirt example, we would argue that it might have been possible to set up a similar business model before the advent of the Internet. Designs could have been posted in a public space and pre-orders could be made known to the manufacturer. In fact, this business model did exist. Fashion design has always involved elite circles of customers who influence design. However, the scale at which this model works today is unprecedented. Scale influences both the reach of openness — so that anyone with access to the Internet can submit designs and vote and buy — and, it influences the possibilities for collaboration. Published designs receive comments from registered customers and designers can react, adapt and resubmit their designs.

Management agenda

Managers need to be creative in the face of this complex interplay between innovation and business model elements. They can approach these problems experimentally (McGrath, 2010) or by following recipes (e.g. Sabatier et al., 2010). Models also may help them expand their reasoning (Baden-Fuller and Morgan, 2010), and recognize the value of involving others such as the developer of technology in the design of the business model. This is what Baldwin and Clark (2006) call the "architecture of participation".

Managers need to decide who should be involved, where control should be exercised in these domains and where self-organization should lead the way (von Krogh et al., 2012). Different stakeholders perceive different domains as more central or dominant. Technology developers understand the agenda and possibilities for a technology to be used but may miss the implications for monetization or market demand. On the other hand, marketing experts may hold deep insights into customer behavior but may not understand what a given technology could be expected to deliver.

Taking an ecosystem perspective may also help because it focuses attention on how the systems integrators need to form expectations about the scientific and technological fields underlying the components and sub-systems (Dosi et al., 2003). Even where innovation is not "open" beyond the specification of interfaces, the supplier needs to understand and link to the technological and organizational environment within which their components are sold in order to understand the market. Systems integrators, platforms, and multi-sided markets share what is sometimes referred to as a business ecosystem. For managers, the ecosystems perspective holds the promise of opening up the wider entrepreneurial and collaborative space that a new technology affords — and provides room for novel business models to succeed.

Discussion

In summary, we first noted that choice of business model influences the way in which technology is monetized and the profitability for the relevant firms. We then noted that the business model frames managers, entrepreneurs, and developers hold in their heads also determine the way in which technology gets developed — and that these connections are capable of being very powerful. This means that the connection between business model choice and technology is two-way and complex — something that has received little attention. But this relationship is capable of being unpicked and understood (see Jacobides and Billinger, 2006, on make-or-buy decisions). And we also recognize that technology will itself influence business model possibilities.

This means that technology from other sectors such as information technology influences the way in which a business model can be created and adapted. The mobile phone application is one such technology that serves as a process innovation for gaming or navigation. For example, Waze and Zynga (described above), use app technology extensively. Waze relies entirely on mobile phone applications, and Zynga needs application technology to work reliably on tablet computers such as the Apple iPad series of hardware. If performance improvements rely on both process innovation and business model changes the traditional S-curve in technology management needs to be re-visited.

Whether we are trying to understand the past or influence the future, we need to model the link between technology development and firm performance, taking into account competitive dynamics, the influence of technology on business model innovation, and the organization of technology development. In many markets — especially those influenced by new digital technology — it is not obvious how to develop and appropriate technology because customer demands are shifting and technology possesses agency of its own (Orlikowski, 1992; Leonardi, 2011). The business model may have to change in order to appropriate features of a technology that create customer value. Also, elements of the model may change in order to allow technology to be developed that fits customer needs or that emerges from the customer directly (Hienerth et al., 2011).

We note that a larger theoretical issue behind this observation is to what extent the organization of technology can and should mirror the structure of the underlying technology. The question is known as the "mirroring hypothesis" (Colfer and

Baldwin, 2010). Sosa et al. (2004, 2007) demonstrated for large engineering projects that an alignment of team structures with technical modules enhances development effectiveness and saves costs. This points to an important open question, to what extent business model elements can and should map the modularity of the technology applied and under development, and vice versa. Modularity has a long history in strategy and innovation (Alexander, 1964; Garud and Kumaraswamy, 1995; Baldwin and Clark, 2000), and, both cognitively and practically, it offers insights that link the stage of technology development with the organization of innovation and customer engagement (Brusoni and Prencipe, 2006; Baldwin & Clark, 2006, Argyres, 1999). Modularity is a model of technology development that could help explain technological development and the joint implications of changing customer demands and technological evolution for the business model.

Lastly, business models are recipes and represent tools for management. They can be blindly replicated or applied to settings that deserve attention to difference and creativity. Business models contain theory and assumptions about customer behavior and agency that may not hold in a specific situation. Some of the key assumptions deal with rationality in decision making. Recent work on performativity shows the existence of purposeful efforts to uphold rationality in organizations (Cabantous and Gond, 2011). Rationality may be served by modeling but may not necessarily help business and managerial decision-making in practice. Creativity and innovation emerge from passion and non-rational pursuits (Rindova et al., 2009), or from unusual sensitivity to discover and disclose (Spinosa et al., 1997) in business, as much as in technology or the arts. Thus, we call for drawing this distinction more clearly in business model research to recognize where rational decision-making deserves its rightful place, and where other, possibly finer forms of deliberation and perception should guide managerial action.

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