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IT-Driven Business Model Innovation:
Sources and Ripple Effects

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ABSTRACT

Information technology enables disruptive innovations, causing paradigm shifts in how companies do business. IT allows companies to break with traditional business models and management thinking. This article explores IT-driven business model innovations empirically by examining how 343 Danish companies use IT to innovate their existing businesses. This systematic review of extant literature using the Business Model Canvas as an analytical framework to answer the research question; how does IT drive business model innovation? Through an exploratory factor analysis this article observes the underlying structure of IT-driven business model innovation, identifying three innovation sources: customers, infrastructures, and supply chains. The three sources demonstrate where and how innovation is most likely to occur, and how it may spread to other parts of the business model. This paper presents a framework for understanding the impact of IT on business models, providing researchers and practitioners with empirically based knowledge on how to leverage IT for business model innovation.

KEYWORDS

Business Model Canvas, Business Model Innovation, Disruptive Innovation, E-Business, E-Commerce, IT-Driven Innovation

1. INTRODUCTION

The rapid development of Information Technology (IT) has changed the way companies do business, putting pressure on traditional business models. The Internet has been a catalyst for globalization, disrupted markets, and changed established rules of competition and trade (Lee, 2001). New technology is being developed at an ever-increasing pace, resulting in transformation of existing markets and entire industries. Transactions are becoming simple and convenient, and competition is intensifying (Veit et al., 2014). As a result of the breaking IT wave, new business concepts have been introduced with "e-business" and "e-commerce" being used synonymously for the digitization of business models (Zwass, 2003). Companies are forced to adapt their business logic and behavior to new and rapidly changing conditions in order to stay competitive let alone survive. However, despite a growing number of online stores and persistent attempts to adapt to new circumstances, many companies have gone out of business. Why do some companies fail while others thrive? There is no simple answer, and the history books are littered with examples of companies that have risen and

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fallen during economic booms and busts—Apple and Kodak being prominent examples (Osterwalder & Pigneur, 2013). Nevertheless, the concept of business models may help us answer such complex questions (Veit et al., 2014). In addition, Information Systems (IS) research may help companies better understand how technology can drive and support the development of new business models (Osterwalder & Pigneur, 2013).

Consequently, the concept of business models has attracted the attention of researchers and practitioners alike, and there is a growing interest in business model innovation across academic fields. However, state-of-the-art knowledge on IT-driven business model innovation is still very limited, and extant literature is primarily conceptual in nature, e.g. Osterwalder et al. (2005). Similarly, empirical evidence of IT-driven business model innovation is anecdotal and stems from case studies—Apple being the most prominent example (Osterwalder & Pigneur, 2010). Such case studies are useful in exploring a new phenomenon, but the generated knowledge is limited by the small number of cases. Amit and Zott's (2001) study of 59 e-business cases is, however, an exception. As of now, knowledge of how business models are impacted by IT is limited, for example with regard to how IT Influences the relationship between building blocks of business models. Consequently, this article investigates how IT drives business model innovation, and the goal is to identify key sources of innovation and their impact on business models. Moreover, the article seeks to broaden our understanding of so-called "ripple effects" (see below). Previous studies have argued for an interdependency between a business model's building blocks, but have neglected to uncover the sources of IT-driven business model innovation. We present empirical evidence of "ripple effects" across building blocks and describe where they are most likely to occur. The overall research question guiding our study is: How does IT drive business model innovation?

First, we present the analytical framework—Osterwalder & Pigneur's (2013) Business Model Canvas—driving our investigation, and we define the business model concept. Second, the review methodology is described followed by a presentation of state-of-the-art knowledge of IT-driven business model innovation. Third, the measurement model is described as well as the empirical research approach. Fourth, we present our findings in terms of how IT drives business model innovation. Finally, we discuss our results, the implications for practitioners, and future directions for research.

2. ANALYTICAL FRAMEWORK

The business model concept is rather young, and despite an evident lack of consensus regarding definitions of the concept, it is still useful for the purpose of studying the impact of IT on businesses (Osterwalder, Pigneur, & Tucci, 2005; Veit et al., 2014). Existing studies have pointed in different directions. Osterwalder et al. (2005) and Zott (2011) aim at understanding and clarifying the concept, whereas others (e.g. Morris et al. 2005) use it in case analyses to describe different competitive strategies (Casadesus-Masanell, 2007). Timmers (1998) is one of the first scholars to define the business model concept by attempting to identify all its constituting elements. Amit and Zott's (2001) focus on value creation and business opportunities share several similarities with Timmer's definition with respect to structure and content. Additionally, Tecce (2010) stresses that a business model describes the business logic of a company, and how it creates customer value. Johnson & Christensen (2008) identify four interlocking elements that together create and deliver this customer value. The elements are (1) customer value proposition, (2) profit formula, (3) key resources, and (4) key processes (Johnson & Christensen, 2008). In a similar vein, Veit et al. (2014) describe the business model concept as a tool for depicting, evaluating, and innovating the business logic behind a company (Veit et al., 2014). Despite a lively debate within the literature, several authors agree that business models illustrate a company's ability to create, capture, and deliver value (Osterwalder & Pigneur, 2010). From an IS perspective, the business model concept is an appropriate unit of analysis when wanting to understand the potential for innovation through the use of IT. We have chosen the

Business Model Canvas as our analytical framework due to its conceptual clarity and its basis in theory (Osterwalder et al., 2005; Osterwalder & Pigneur, 2010).

In line with Johnson & Christensen (2008), we believe that the business model concept in general and specifically the Business Model Canvas may help identify sources of innovation and break away from traditional management thinking, departing from the more traditional focus on product and process innovation and moving toward business model innovation (Johnson & Christensen, 2008). According to Osterwalder & Pigneur (2010), "business model innovation is about challenging orthodoxies to design original models that meet unsatisfied, new, or hidden customer needs." (Osterwalder & Pigneur, 2010, p. 136). Thus, business model innovation is about discovering new and innovative ways of creating value for companies and customers alike by replacing outdated business models. Osterwalder et al. (2005) have described the business model concept as well as its application and role in the IS domain. From their perspective, "a business model describes the rationale of how an organization creates, delivers, and captures value" (Osterwalder & Pigneur, 2010, p. 14). The authors have analyzed numerous business models and suggest a conceptual model of nine interrelated building blocks that show the logic behind a company's value creation (Osterwalder et al., 2005), resulting in the so-called Business Model Canvas (Osterwalder & Pigneur, 2010).

As the business model concept has been discussed extensively in the literature, it is important for us to use an analytical framework in support of our research purposes that espouses a holistic and multi-dimensional perspective. The Business Model Canvas is such an analytical framework that draws together and synthesizes multiple perspectives from extant literature (e.g., Johnson et al., 2008 and Zott et al., 2011). We chose the Business Model Canvas for a number of reasons. First, it is firmly grounded in the academic literature as accounted for in the article "Clarifying business models: origins, present and future of the concept" by Osterwalder et al. (2005). Second, the book "Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers", which describes the canvas, is among the most cited sources on the topic. Third, the conceptual clarity makes the canvas a useful analytical tool. Since the Business Model Canvas is an analytical rather than a theoretical framework, we first present it as a basis for reviewing background theory (i.e., extant literature) before we subsequently use it for our empirical analysis.

2.1. Business Model Canvas

The Business Model Canvas (Osterwalder & Pigneur, 2010) consists of the following nine building blocks: (1) customer segments, (2) value propositions, (3) channels, (4) customer relationships, (5) revenue streams, (6) key resources, (7) key activities, (8) key partnerships, and (9) cost structure. Table 1 presents the building blocks according to four main business areas; customer (customer segments, channels, and customer relationships), offer (value propositions), infrastructure (key activities, key resources, and key partnerships) and financial viability (revenue streams and cost structure). This partition serves to illustrate how a company creates, captures, and delivers value. The Business Model Canvas is instrumental in describing how IT can help drive innovation within and across the nine building blocks, i.e. how IT affects the components of a business model. By using the canvas, it is easier to understand how IT can help a company reach new customer segments, how it can establish new relationships as well as communications and delivery channels, which new products and services are being demanded, how innovations impact resources and activities, which new partnerships and supplier networks are needed, how the basic cost structure changes, and how all nine building blocks are related to each other (Osterwalder & Pigneur, 2010).

3. LITERATURE BACKGROUND

We have reviewed extant literature on IT-driven business model innovation in our efforts to establish a theoretical foundation for our empirical study. The *Scopus* and *Web of Science* citation databases were used in searching for journal articles and conference papers (the literature search and review

Table 1. Business model canvas (Osterwalder & Pigneur, 2010)

Building block	Description	Business area
Channels	How a company communicates with and reaches its customer segments to deliver value propositions.	Customer
Customer relationships	The types of relationships a company establishes with specific customer segments.	Customer
Customer segments	The different groups of people or organizations a company aims to reach and serve.	Customer
Cost structure	The sources of costs incurred to operate a business model.	Financial viability
Revenue streams	The sources of revenue a company generates from each customer segment.	Financial viability
Key activities	The most important activities a company must perform to operate a business model.	Infrastructure
Key partnerships	The network of suppliers and partners supporting a business model.	Infrastructure
Key resources	The most important assets required to sustain a business model.	Infrastructure
Value propositions	The bundle of products and services that create value for a specific customer segment.	Offer

process is documented in detail in Appendix A). It was decided to focus on the stream of literature on electronic business (e-business), because it centers on innovations involving new technologies used in management of internal processes and external relationships with partners and customers (Lam & Harrison-Walker, 2003; Lee, 2001b). The search included "business model", "innovation", "e-commerce", "e-business", and synonymous keywords. 800 articles were reviewed which resulted in 35 articles being selected for inclusion. Each article was read and categorized according to the nine building blocks of the Business Model Canvas. Table 2 summarizes the categorization of the literature. In the following, we summarize the review findings and describe how IT drives innovation within and across the nine building blocks, highlighting how business models are impacted by IT.

3.1. Customer Segments

Customers are at the core of all business models, since companies depend on them for revenue and survival (Osterwalder & Pigneur, 2010). IT enables companies to acquire information faster and cheaper, leading to a better understanding of customer needs, and it allows them to reach their customers in new ways. E-commerce facilitates development of markets close to customers (Loebbecke & Powell, 2002), and Amit and Zott (2001) argue that e-commerce sets new standards for reach and richness of information resulting in entirely new customer segments. This notion is shared by other authors as well, stressing the ability of companies to target previously inaccessible customers through IT (Li & Wang, 2011; Muffatto & Payaro, 2004; Runfola et al., 2012; Shouping & Zhishen, 2009; Swatman et al., 2006; Wu & Hisa, 2004; Wu & Hisa, 2008). Also, whereas I-commerce (Internet-based commerce) has put companies on the global market place, m-commerce (mobile commerce) brings a more regional focus to trade (Wu & Hisa, 2004; 2008). In other words, m-commerce enables companies to reach new customer segments both geographically and demographically. For example,

the younger generations are more likely to adopt m-commerce technologies, creating new potential customer segments (Zhu & Zou, 2008).

Understanding customer needs is key to success and IT fosters new and innovative ways of retrieving customer information, e.g. through data mining (Lee, 2001; Loebbecke & Powell, 2002; Runfola et al., 2012; Swatman et al., 2006; Tsai & Gururajan, 2007; Ulhøi, 2013; Veit et al., 2014; J. Wu et al., 2013; Zwass, 2003). Some authors argue that the market for customer data gathered by means of IT is growing (Lam & Harrison-Walker, 2003; Veit et al., 2014). Furthermore, IT may also be used for customer segmentation as it provides possibilities for structuring customer data (Pantano, 2013). As a result of m-commerce technologies such as GPS-localization (Picoto et al., 2013) along with data mining and CRM systems, tracking of customer behavior and past buying patterns is possible (Lam & Harrison-Walker, 2003; Zhang, Gang, & Jianwen, 2010; Zwass, 2003). Needless to say, knowledge about customers is very valuable to companies (Wu et al., 2013) and can be used for innovation (new products or services) purposes, allowing companies to provide value across different markets (Lee, 2001a). For example, data retrieved from one customer segment may help improve services of another segment.

3.2. Value Propositions

Value propositions explain why some customers turn to specific companies and not others. Value may be tangible or intangible and represents the bundle of benefits a company offers its customers (Osterwalder & Pigneur, 2010). Companies have leveraged IT to create synergy between products and services (Lee, 2001). The Internet has made it possible to offer complementary products and services, combining physical products with online services (Al-Mashari, 2002; Amit & Zott, 2001; Joo, 2002; Lv & Liu, 2012). E-paper is an example of this kind of synergy being created through the use of technology. E-paper has properties that resemble printed paper, but in contrast to its physical counterpart, e-paper accommodates continuously updated content anywhere and anytime (Ihlstrom & Kalling, 2007). Similarly, the music and news industries rely on IT to offer their products in different digital formats, online and on mobile platforms (Swatman et al., 2006). IT has made it possible to supply customers with real-time information about, e.g., prices, products, availability, and customization. As a consequence, customers are provided with a richer variety of choices, search costs are lowered, services are made available 24/7, and customers benefit from economies of scale by spreading fixed costs over a larger customer base (Al-Mashari, 2002; Harrison-walker, 2001; Lee, 2001; Li & Wang, 2011; Lv & Liu, 2012; Mahadevan, 2000; Pantano, 2013; Swatman et al., 2006; Wu et al., 2013; Zekanovic-Korona & Grzunov, 2014; Zhu & Zou, 2008). In addition to Internet-enabled communication, m-commerce offers value in terms of mobility, location, and personalization by providing customers with information tailored to local and individual needs. (Picoto, et al. 2013; Tsai & Gururajan, 2007; Wu & Hisa, 2004, 2008).

3.3. Channels

All companies face the decision about how to deliver value propositions to customer segments. Channels are customer touch points, and companies invest resources in identifying the most suitable and cost-effective channels of reaching different customer groups (Osterwalder & Pigneur, 2010). The literature shows that IT has changed the rules of distribution with regard to sales and marketing by changing the ways companies deliver, market, and connect with customers. (Amit & Zott, 2001; Gui & Ye, 2008; Lee, 2001; Liu, Li, & Yang, 2012; Loebbecke & Powell, 2002; Margounakis et al., 2006; Swatman et al., 2006; Wu & Hisa, 2004; Wu & Hisa, 2008; Zwass, 2003). The following examples illustrate how channels are affected by IT. First, the introduction of online sales channels, e.g. webshops and online ordering systems, facilitated by Internet technology is an example of companies allowing customers to order directly through their homepages (Lam & Harrison-Walker, 2003). IT has also provided new distribution channels as evident in, for example, the financial sector where banks have leveraged new opportunities by moving from telebanking to Internet banking,

and more recently mobile banking has been added to the e-bank concept (Zhu & Zou, 2008). The multi-channel newspaper (paper, online, mobile, and TV) industry is another example (Ihlstrom & Kalling, 2007). Transtec is an example of a company that has successfully stepped into the digital age through the use of digital distribution channels. Transtec has undergone major changes by being at the technological forefront and introducing online channels, providing customers and suppliers with company information and product catalogues. Later, the company introduced order tracking and tracing (Al-Mashari, 2002). In addition to distribution, IT enables new forms of customer support (Tsai & Gururajan, 2007). IT in the form of self-service technologies and mobile payment systems allows customers to pay for goods and services without the need for human interaction, with machines instead mediating the interaction between clients and vendors. Similarly, QR-codes is an example of new self-service opportunities available to customers (Zhang et al., 2009).

IT has also introduced new means of raising awareness about companies' products or services, not only on the global market place but also in relation to specific and sometimes local customer segments (Lv & Liu, 2012). Voyage Privé is an example of a company targeting specific customer segments through the use of IT. The sale site only targets an exclusive group of club members through an online newsletter with products at discounted prices (Runfola et al., 2012). Likewise, m-commerce has had considerable influence on IT-driven innovations within the channels building block. Picoto et al. (2013) argue that the introduction of m-commerce improves client services through sales, marketing, and after-sales customer support. Additionally, m-commerce makes it possible for companies to deliver information in real-time, e.g. promotions and advertisements based on location, personalization, and transaction feeds (Tsai & Gururajan, 2007; Veit et al., 2014).

3.4. Customer Relationships

Customer acquisition, retention, and upselling depend on companies being able to establish and maintain customer relationships (Osterwalder & Pigneur, 2010). Modern technologies have changed the way companies interact with their customers (Wu & Hisa, 2004; 2008), enabling more direct and personal relationships (for example through virtual communities) (Ihlstrom & Kalling, 2007; Joo, 2002). Ultimately, relationships are established and nurtured to prevent customers from switching to competitors and increase future revenues from repeat sales. IT makes it possible for companies to increase switching costs by enrolling customers in loyalty programs, online communities, or design processes. MasterCard's bonus programs and Land's End's mass customization of trousers are examples of how IT can foster close customer relationships resulting in lock-in (Amit & Zott, 2001; Harrison-walker, 2001; Lee, 2001; Loebbecke & Powell, 2002; Lv & Liu, 2012; Muffatto & Payaro, 2004; Runfola et al., 2012; Wu et al., 2013; Zhang, 2009; Zwass, 2003). IT can also help build trust. For example, in addition to Airbnb being a website for people to rent out lodging, it also serves as a social media that creates a sense of belonging where people can share their traveling experiences (Zekanovic-Korona & Grzunov, 2014). Generally, social media creates a platform for companies to develop more close relationships with their customers and build trust resulting in new communication channels (Runfola et al., 2012; Ulhøi, 2013). Web 2.0 technologies have provided companies with new possibilities, for example allowing customers to take part in product design and innovation processes, which in turn empowers customers and gives them a sense of ownerships. Such technologies are particularly common in the news industry (Shang et al., 2009; Ulhøi, 2013). M-commerce reinforces the same trend by strengthening customer interaction and contributing to any device, anytime, anywhere services (Tsai & Gururajan, 2007).

3.5. Revenue Streams

Companies are driven by the pursuit of profit (Osterwalder & Pigneur, 2010), and IT has enabled new revenue streams. Some industries are even facing radical changes in revenue models (Amit & Zott, 2001; Wu & Hisa, 2004; 2008). For example, the content industry has undergone changes both in how payments are made and in terms of customers' willingness to pay. Nowadays customers expect

basic Internet services to be free (Loebbecke & Powell, 2002; Mahadevan et al., 2000; Margounakis et al., 2006), and companies are able to price their products below unit costs by using IT. Revenue generation can, for example, be referred to online advertising (Lee, 2001a). In the news industry, the following IT-enabled revenue streams have been identified: subscription fees, pay per view (e.g. The Wall Street Journal), free portable devices (financed through paid content, for example in the form of e-paper), and sales of advertising space (Ihlstrom & Kalling, 2007; Lam & Harrison-Walker, 2003; Swatman et al., 2006). Also, some Danish newspapers have capitalized on their brands by launching new websites offering a variety of goods and services (Ulhøi, 2013). This is referred to as opaque selling where consumers do not know some of the attributes of the service or when the service will start at the time of purchase. This information, including the name of the supplier, remains hidden until after the purchase has been completed (Runfola et al., 2012).

3.6. Key Resources

Business models depend on key resources (Osterwalder & Pigneur, 2010), including physical resources for manufacturing purposes as well as human and intellectual capital to sustain and support the organization. IT can support and advance these key resources. For example, information is an important asset in all businesses, and it is increasingly being made available through IT as basis for decision-making in pursuit of efficiency and effectiveness. Internal communication is no longer constrained by time and space, making it possible for different organizational units to communicate freely (Amit & Zott, 2001; Gui & Ye, 2008). By using IT, it is possible to disseminate and share knowledge among groups of people, which in turn helps them streamline and improve existing work processes. Knowledge management can, however, be leveraged not only in terms of intra-organizational collaboration through intranets, but also with regard to inter-organizational knowledge sharing over extranets (Lee, 2001; Muffatto & Payaro, 2004; Venkatraman, 1994; Vladimir Zwass, 2003b). Also, IT innovations such as m-commerce can be used to enhance employee efficiency by providing any device, anytime, anywhere access to organizational resources (Tsai & Gururajan, 2007; Wu & Hisa, 2004; Wu et al., 2008) in, for example, ERP and CRM systems (Picoto et al., 2013).

3.7. Key Activities

In some instances, adoption of IT in support of business processes changes key activities of the business model (Osterwalder & Pigneur, 2010). IT allows customers and clients to be tied into the production process, resulting in higher market response ratios and zero stock production when companies produce exactly what customers want when they want it (Shouping & Zhishen, 2009). The leap from telebanking to Internet banking in the financial sector is an example of how technology has changed business processes and challenged the mindset of employees. Employees are forced to adapt their working practices as new technologies emerge (Zhu & Zou, 2008). Similarly, the content industry has experienced drastic changes to key activities due to the shift from selling physical products to digital products (Li & Wang, 2011; Liu et al., 2012; Margounakis et al., 2006; Swatman et al., 2006). Companies such as the Danish media giant Egmont have restructured core business processes, gearing the organizations for the digital age by, for example, investing in data warehouses for content storage (Loebbecke & Powell, 2002). Another example is how activities related to sale of music have changed, no longer requiring production of physical media and distribution through intermediaries but instead calling for online streaming and downloading. Thus, IT-driven innovation of key activities involves streamlining the supply chain and encompasses both incremental and radical changes to the organization and execution of business processes. This is also evident in the news industry's having to manage more than just writing articles, for example managing audio and video clips for their online presence (Ihlstrom & Kalling, 2007). Similarly, m-commerce drives changes to the way things are done, e.g. enabling employees to work whenever and wherever—no longer being restricted to office hours and buildings (Tsai & Gururajan, 2007).

3.8. Key Partnerships

Global competition forces companies to create partnerships, improving coordination, reducing risks, and acquiring resources (Osterwalder & Pigneur, 2010). On account of IT, more traditional value chains have been transformed and digitized increasing efficiency of operations. Coordination and communication tools create and facilitate new value streams in which activities are outsourced to suppliers and partners (Al-Mashari, 2002; Amit & Zott, 2001; Lee, 2001; Venkatraman, 1994; Zekanovic-Korona & Grzunov, 2014; Zwass, 2003). IT increases both reach and richness of information and changes supply chains of companies across industries. New networks of partners are being established and new means of supplier-partner integration have become a reality (Lee, 2001; Li & Wang, 2011; Loebbecke & Powell, 2002; Muffatto & Payaro, 2004; Shouping & Zhishen, 2009; Venkatraman, 1994). For example, Jyllands Posten, a large Danish newspaper, has outsourced printing and distribution to focus on core competencies (Ulhøi, 2013). IT, such as extranets, gives customers and suppliers easy access to a companies' internal databases, which increases supply chain efficiency and switching costs of supply chain partners (Amit & Zott, 2001; Swatman et al., 2006). Muffatto and Payaro's (2004) Integrated Enterprise is a textbook example of how revolutionary information and communication systems enable new supplier networks and value creating alliances. Among others, Aprilia, the Italian motorcycle manufacturer, which is known for having many suppliers and multi-brand customers, has used IT to develop a platform for partners to interact with each another. IT not only allows for an extension of current networks, but also enables a reduction of supply chain members. The flow of information across the supply chain increases network efficiency and streamlines operations by making it possible to bypass distributors, retailers, and other former supply chain partners (Lam & Harrison-Walker, 2003). Furthermore, Picoto et al. (2013) demonstrate that m-commerce applications may improve supplier coordination and communication.

3.9. Cost Structure

Minimizing costs associated with any business model is important, though low cost structures are more essential to some business strategies than others (Osterwalder & Pigneur, 2010). Staying competitive in the digital age requires investments in novel and sophisticated IT infrastructures (Swatman et al., 2006). Whereas fixed costs may be high, marginal costs are low in the network economy and will be reduced concurrently with an increasing focus on cost-effectiveness (Lee, 2001; Tsai & Gururajan, 2007). IT facilitates cost savings due to new and more cost-effective ways of marketing and delivering products and services. Additionally, as possibilities for outsourcing key activities increase, the results are leaner inventory, decreasing salary expenses, and lower transaction costs. In other words, new value chains emerge and make organizational operations more cost-effective (Al-Mashari, 2002; Amit & Zott, 2001; Ulhøi, 2013; Wu & Hisa, 2004; 2008; Zhu & Zou, 2008). A good example is the retail industry's investment in online sales, marketing, and delivery channels. Such online initiatives require heavy investments, though the potential benefits are appealing due to the prospect of lowering costs of brick-and-mortar stores and employees as well as getting access to low-cost storage and unlimited display space (Lv & Liu, 2012).

3.10. Relationships Between Building Blocks

Looking at Table 2, it is evident that many articles deal with both key activities and key resources when discussing IT-driven business model innovation, which indicates a correlation between these two building blocks. Osterwalder and Pigneur (2010) argue for the existence of "ripple effects" in relation to business model innovation. They refer to "epicenters" when discussing the starting points of innovations, suggesting impacts on multiple building blocks. The starting point can be any of the nine building blocks and may impact the rest of the canvas. The process of categorizing literature content according to the business model canvas did not only uncover innovation drivers within each of the nine building blocks, but also revealed "ripple" or "spillover" effects across building blocks.

Table 2. Literature categorization

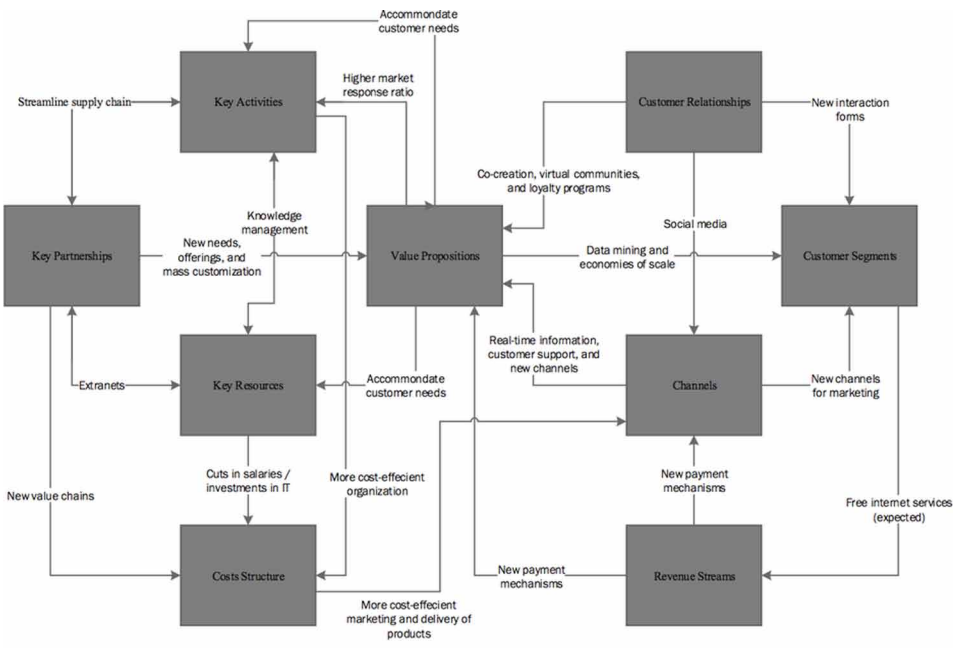
	Customer segments	Value propositions	Channels	Customer relationships	Revenue streams	Key resources	Key activities	Key partnerships	Cost structure
(Al-Mashari, 2002)	X	X	X	X		X	X	X	X
(Amit & Zott, 2001)	X	X	X	X	X	X	X	X	X
(Chan & Swatman, 2006)	X		X	X			X	X	
(Chen & He, 2009)		X					X		
(Gui & Ye, 2008)	X		X			X	X	X	
(Harrison-walker, 2001)	X	X	X	X	X			X	
(Ihlstrom & Kalling, 2007)	X	X	X	X	X		X	X	
(Joo, 2002)		X		X					
(Lee, 2001)	X	X	X	X	X	X	X	X	X
(Li & Wang, 2011)	X	X	X				X	X	
(Liu et al., 2012)			X				X	X	
(Loebbecke & Powell, 2002)	X		X	X	X		X	X	
(Lv & Liu, 2012)		X	X	X					X
(Mahadevan et al., 2000)		X			X				
(Margounakis et al., 2006)			X		X		X		
(Muffatto & Payaro, 2004)	X			X		X	X	X	
(Pantano, 2013)	X	X	X						
(Picoto et al., 2013)	X	X	X			X		X	
(Runfola et al., 2012)	X	X	X	X	X				
(Shang et al., 2009)				X					
(Swatman et al., 2006)	X	X	X	X	X		X	X	X
(Tsai & Gururajan, 2007)	X	X	X	X		X	X	X	X
(Ulhøi, 2013)	X		X	X	X			X	X
(Veit et al., 2014)	X		X						
(Venkatraman, 1994)						X	X	X	
(Wu & Hisa, 2004)	X	X	X	X	X	X			X
(Wu & Hisa, 2008)	X	X	X	X	X	X			X
(Wu et al., 2013)	X	X	X	X					
(Yin, 2010)			X	X		X	X	X	
(Zekanovic-Korona & Grzunov, 2014)		X		X	X		X		
(Zhang, 2009)				X					
(Zhang et al., 2010)	X		X	X					
(Zhu & Zou, 2008)	X	X	X				X	X	X
(Zwass, 2003)	x	x	x	x		x		x	

These effects are revealed when innovation within one building block affects innovation within another as evident, for example, when companies make use of data mining tools (e.g. to enhance their understanding of customer segments) to improve their value propositions. Lee (2001) argues that e-commerce targeting different customer segments affects value propositions; "E-commerce makes it possible for companies to track and collect information on their customers, which helps businesses to redefine their economics of scope and thus provide value across many different markets…" (Lee, 2001, p. 352). IT-driven innovation within channels is also assumed to interact with customer segments as e-commerce involves new communications and delivery channels, enabling companies to reach new customer segments (Amit & Zott, 2001). This is evident in companies' attempts to leverage m-commerce to reach young customer segments (Picoto et al., 2013). Besides satisfying customer needs, the value propositions building block is also linked to several other building blocks in terms of innovation "ripple effects". In describing lock-in effects, Amit and Zott (2001) demonstrate that IT-driven innovation within customer relationships provides value to customers by offering them new ways of interacting with the company, suggesting a link between value propositions and customer relationships (Co-creation, virtual communities, loyalty programs etc.) . Similarly, these

new ways of interacting target different customer segments, and social media have become channels for strengthening customer relationships. New channels for customer engagement and real-time information exchange affect companies' value proposition, and mobile payment methods are examples of new revenue streams. Likewise, customers expect basic internet services to be free which influences and challenges existing revenue streams. IT-driven innovation within revenue streams is argued to impact value propositions as well. New revenue models create additional sources of income, new payment mechanisms and add value in terms of speed and convenience. Furthermore, new IT-enabled partnerships, such as XML-based web platforms that allow customers and suppliers to collaborate, not only redefine logistical flows and make business processes more efficient, but affect the entire business model by streamlining supply chains and introducing new value chains. The creation of such networks makes it possible to co-create products, allow for mass customization, and help companies to penetrate new markets (Chen & He, 2009; Muffatto & Payaro, 2004). Knowledge sharing is leveraged both by intra-organizational intranets and inter-organizational extranets. Customers can be tied into the production process resulting in higher market response ratios, and the low marginal costs in the network economy facilitate more cost-effective organizational operations as well as more efficient ways of delivering and marketing products. Companies invest in new and sophisticated IT infrastructures in support of digital transformation and new opportunities for outsourcing, which not only decrease salary expenditures but also exemplify the relationship between key resources and cost structure.

The interplay between business models and business processes is often facilitated through IT (Veit et al., 2014), which underscores the importance of understanding sources of IT-driven innovation and how they affect business models. Figure 1 illustrates the relationships between building blocks as documented in extant literature. For example, when exploring new e-commerce channels in targeting specific customer groups, it is evident that innovation in the building block *Channels* affects *Customer Segments*. These relationships were uncovered through our literature review in which we identified drivers of innovation in more than one building block. Adjustments were made to Figure 1 on the account of our empirical analysis as findings emerged. During this data analysis process, we also

Figure 1. Ripple effects



identified general themes that cover specific relationships. However, the figure does not reveal the sources of IT-driven business model innovation. On the basis of these identified "ripple effects", the empirical study seeks to close this gap and assist researchers and practitioners alike in understanding the sources of IT-driven innovation and their impacts on business models. The purpose of the empirical study is therefore to identify groups of building blocks within which "ripple effects" are more likely to occur, i.e. mapping the anatomy of IT-driven business model innovation and locating IT sources of business model innovation.

4. EMPIRICAL RESEARCH

The unit of analysis for the empirical survey is private sector companies. To test the identified "ripple-effects", an online survey of Danish companies was conducted. Data was collected from two different sources—a random sample of 3500 companies drawn from the Danish Business Register (http://datacvr.virk.dk/data/) and by distributing survey links through the newsletters of three associations of IT professionals. The main sample from the Danish Business Register was not limited to certain company sizes or particular industries because we wanted to ensure a high degree of external validity. It was important for us to investigate IT-driven business model innovation in such a way that generalization across contexts and industries was possible. The questionnaire was designed based on the Business Model Canvas and the extant literature (see Appendix B). Prior to the survey being distributed broadly, two pilot tests were performed with experts from the associations of IT professionals. Feedback from these tests resulted in minor layout changes and some rewording of questions. The survey link was sent out via newsletters and distributed by e-mail to companies in the sample late 2014. The questionnaire was addressed to IT managers and top executives (managing directors and CEOs). These respondents were selected for the purpose of this study, because not all SMEs can be expected to have people or departments responsible for IT. The questionnaire recipient was asked to forward it to whom it may concern. Respondents were then requested to answer several questions in relation to IT-driven innovation within all nine building blocks. Two rounds of reminders were sent out resulting in additional responses, followed by phone calls to solicit participation in the survey. In the beginning of 2015, a final pool of 343 responses was obtained, yielding a response rate of nine percent. The low response rate is a common issue in IS research, and it underscores the challenges of obtaining responses from top executives (Baruch, 1999; Daniel & Grimshaw, 2002). As it turned out, the majority of respondents were top executives and IT managers.

4.1. Operationalization of Constructs

The questionnaire is based on the Business Model Canvas and the extant literature presented earlier (see Appendix B). It includes questions asking the respondents to indicate their level of IT use in different areas of their business (the nine building blocks). The operationalization of the conceptual framework is illustrated in Appendix B. In the extant literature, we were not able to identify any existing measurements of IT-driven business model innovation based on the Business Model Canvas. Therefore, such measurements were developed on the basis of the literature for the purpose of our empirical investigation. In the questionnaire, we placed "hints" explaining various IT concepts under selected questions in order to avoid confusion and guide respondents through the survey without suggesting answers. Questions were measured on a five-point Likert scale (1 = "not at all" to 5 = "to a high degree") and arranged randomly. Additionally, open-ended questions were included for each building block to give respondents the opportunity to elaborate and reflect on their answers. These questions allowed respondents to explain how IT is used for innovation purposes at the companies they work for and thus provide a qualitative perspective on how IT drives business model innovation.

4.2. Data Analysis

An exploratory factor analysis (EFA) was performed to identify factors of IT-driven business model innovation. EFA was preferred over a more common and popular variation of factor analysis, namely the Principal Components Analysis (PCA). PCA is, according to some authors, only a means of data reduction (Jensen & Knudsen, 2006; Hair, 2009) and was therefore not used to explore the underlying structure of IT-driven business model innovation. (Costello and Osborne 2005). 24 variables were subject to principal axis factoring with the aim of examining the underlying structure of the data. A high degree of correlation between variables was observed as all variables had a correlation (SPSS correlation matrix) greater than or equal to 0.30 with at least two other variables. This shows that the nine building blocks are related to each other, meaning that innovation within one building block affects innovation within others. The result of the Kaiser-Meyer-Okin test was 0.879, which is above the threshold of 0.6, and Bartlett's test showed statistical significance demonstrating a significantly high correlation for exploratory factor analysis (Jensen & Knudsen, 2006). We coded the open-ended questions manually in support of a nuanced analysis of factors influencing innovation. Initially, responses were grouped according to the results of the factor analysis. Each response was read to enhance our understanding and identify patterns across factors, and themes were subsequently developed. Each response was labeled and grouped according to theme, and subsequently major categories were developed based on a bottom-up approach in which themes were grouped according to their affinity. The analysis of these open-ended responses helped us increase our understanding of each factor. Table 4, 6, and 7 summarize coding themes and major categories for each factor.

5. RESULTS

Customers, infrastructures, and supply chains were identified as factors explaining 56,08% of the variance. Despite reducing 24 variables to three factors, these three factors still explain more than half of the variance in the data. Although no consensus of what constitutes a good model exists, the result is considered acceptable (Peterson, 2000). Visual inspection of the scree plot and the number of indicators loading on factors were used to determine whether to keep or discard a factor (Costello & Osborne, 2005). Three variables (see Appendix B, variable name: CH_self, Rs_online, and KP_ exchange) were discarded due to either cross-loading or poor factor loading (< 0.30). Cronbach's α was used to determine whether the factor would be positively affected by removing a variable. Factors were obliquely rotated (factors are assumed to correlate with one another) using Promax rotation, and the interpretation of the three factors was in line with the relationships between building blocks identified in the literature. Cronbach's α was also used to assess the consistency of all factors, yielding an acceptable value ranging from 0.7-0.9. Table 3 presents each factor. Since the lower limit of 0.7 is observed, all factors are considered reliable measures. Finally, convergent validity was evaluated by measuring average variance extracted (AVE), and all latent constructs were above the acceptable limit of 0.5 (Hair, 2009).

Our research suggests that IT-driven innovation must impact more than two building blocks before it makes sense to speak of business model innovation. Consequently, IT-driven innovation within one building block cannot be characterized as business model innovation. The factor analysis strongly supports the notion of "ripple effects" since more than half of the variance in the data is explained by the three factors. These factors present clusters of building blocks in which the likelihood of "ripple effects" is high. For example, if a company wants to implement a new website design to provide customer segments with a new online channel for buying and interacting with sales personnel, it needs to make changes within multiple building blocks (e.g. customer segments, customer relationships, and value propositions). Utilizing new and innovative online channels to market products and services is not tantamount to business model innovation, but is more accurately referred to as process innovation. Business model innovation is about discovering new and innovative ways of

Table 3. Three-factor solution

Factor		1	2	3
1. Customers	New channels for customer support	0,834		
	New channels for marketing	0,751		
	New channels for distribution	0,738		
	New channels for feedback	0,737		
	Value-added services to customer segments	0,643		
	Interaction with customers	0,628		
	New products and service innovation	0,600		
	Reaching new customer segments	0,596		
	Expansion to new market domains	0,583		
	A better understanding of customer segments	0,529		
	Co-creation of products and services	0,473		
	New revenue models due to new products and services	0,450		
2. Infrastructures	Support of existing activities		0,978	
	Streamlining existing activities		0,926	
	IT is considered a key resource		0,745	
	Radical changes in internal activities		0,579	
	IT-driven innovation enables optimal use of existing resources		0,547	
3. Supply chains	Changes to allocation of costs associated with business models			0,721
	IT-enabled cost reduction			0,625
	Bypassing members in the supply chain			0,542
	Streamlining trade between partners			0,415

creating and commercializing customer value (Osterwalder et al., 2005), whereas process innovation is about discovering new and innovative ways of improving work practices within organizations. Consequently, the empirical research demonstrates "ripple effects" and shows that IT-driven business model innovation requires IT-enabled changes within more than one building block to warrant the label "business model innovation". Companies would do well to understand the consequences of "ripple-effects". For example, when planning the transition to a new business model the company should know how the effects of IT on one building block leads to changes within another. Similarly, the three factors present clusters of building blocks where a particular technology (e.g. ERP) may overlap several building blocks or where IT (e.g. in the form of Business Intelligence) is likely to induce innovation within other building blocks. This understanding of the underlying structure of IT-driven business model innovation bridges the business and IT domains and helps researchers and practitioners understand how IT may drive innovative business models in the future (Veit et al., 2014). Since this distinction between sources of IT-driven business model innovation is new to the literature, the following section discusses each source as well as correlation between factors. The qualitative statements from the respondents serve to enhance our understanding of the concept of IT-driven business model innovation.

5.1. Customers

Variables that constitute customers represent customer-driven IT activities, and this factor contributes with more than half (37.92%) of the total factor solution. In other words, more than one third of the variation in the data can be explained by customer-driven innovations, demonstrating that building blocks related to customers (customer segments, customer relationships, revenue streams, value propositions, and channels) are more likely to be affected by IT-driven innovation. This perspective is also evident in the current literature (see Table 2) that emphasizes customer-centered building blocks rather than, e.g., cost structure and key resources. The factor analysis shows high correlation between the following building blocks: customer segments, channels, value propositions, customer relationships, and revenue streams, indicating that "ripple effects" are likely to occur among these interrelated elements. Indicators for channels load very high on this factor (0.737-0.834). This study shows correlation between channels and customers, which indicates that channels is most likely involved when companies use IT for customer-centered innovation. This may explain why value-added services also load high on this factor. New channels for customer support, feedback, and distribution appear to add value to customers. Indicators for customer segments also load high on this factor and are therefore likely to change as a result of IT-driven innovation within related building blocks. For example, the use of data mining for the purpose of understanding customer segments may provide new knowledge of demands resulting in value being added in the form of new online channels for distribution, revenue models, or virtual communities. In analyzing answers to the open questions, it is obvious how these building blocks relate to each other, since there is no distinction between value propositions, channels, customer relationships, and customer segments when it comes to using IT. The respondents explain how IT has provided them with new ways of reaching customer segments in terms of communication, sales, and distribution. Communication channels, such as social media, chat applications on websites, and similar tools, make getting feedback and providing customer support convenient and effective. This in turn explains the correlation between customer relationships, channels, customer segments, and value propositions. Advertising has also been made easier and more effective through the use of IT. Several respondents describe how social media, homepages, and banner ads on websites have created customer awareness. Generally, respondents describe how IT has increased the use of inbound marketing to attract new customers. Today, customers are well educated and more knowledgeable when engaging with the company for the first time. Also, new revenue models have emerged as a result of IT, such as those associated with web shops and self-service technologies. Finally, respondents exemplify how IT has enabled the design of new products and services, e.g. m-services; how existing products have moved to other platforms; and how revenue models have changed as a result of new value propositions. Analyzing respondents' answers, a pattern is discernible and their answers to the open questions can be sorted into three categories that help explain this factor in a more nuanced manner. According to the respondents, IT is used in three ways to drive business model innovation with regard to customers (see Table 4): 1) it provides knowledge of customer segments (Understanding), 2) it opens up possibilities for involving customers in internal processes and decisions (Integration), and 3) it increases the value provided to customer segments (Value).

5.2. Infrastructures

The second factor is composed of variables focused on optimizing and streamlining internal activities as well as ensuring optimal use of resources. Thus, it is comprised of the building blocks key activities and key resources with strong factor loadings (0.547-0.978). IT is considered a vital asset in support and streamlining of existing activities. IT also yields a high factor loading (0.745) as a key resource, indicating that IT is important for internal infrastructures and that key activities are likely affected through an increase in use of IT. Answers to the open questions indicate consensus concerning IT as an essential resource in most companies, and several respondents state that their companies exist only on the account of IT. Similarly, the respondents agree that IT is crucial in ensuring optimal use of resources and helps support work processes. IT-driven innovation within key activities may, however, require exploitation of human capital through the use of knowledge management systems.

Table 4. Customers (open question coding)

Factor	Customers		
Category	**Understanding**	**Integration**	**Value**
Themes	• Consumer behavior • Customer purchases • Market trends • Statistical analyses • Customer databases	• New networks (cloud computing, social media, etc.) • Design, development, presentation, etc. • Support and problem solving • Self-service • Accessibility • Increased communication and interaction	• New products and services • Relationship selling • Speed and (lower) price • Convenience • Agility • New revenue streams (subscriptions, SaaS, webshops, etc.)

Knowledge sharing is used by the respondents to ensure diffusion of best practices throughout their companies, e.g. by using cloud based systems, wikis, intranets, and similar tools. Consequently, IT-driven innovation within, e.g., key resources will affect key activities and vice versa. According to the respondents, IT is used to achieve competitive advantages. IT-driven changes to infrastructures fall into two categories: 1) management of information and knowledge (Information/knowledge management) and 2) changes in workflows and work procedures (Process streamlining). In other words, IT-driven innovations of infrastructures may improve information management, knowledge sharing, and streamline existing work practices (see Table 5).

5.3. Supply Chains

This third factor represents the relationship between the cost structure and key partnerships building blocks. It captures that IT-driven innovations introduce new ways of organizing and streamlining supply chains and the allocation of costs among supply chain partners. Especially, cost structure loads high on this factor (0.721 and 0.625). Consequently, a change in this factor (i.e. supply chains) will most likely affect costs associated with the business model. Bypassing members in the supply chain loads relatively high on this factor as well (0.542), whereas the streamlining trade between partners loads more moderately (0.415). However, these results suggest a pattern in how supply changes affect costs. The supply chain is an important element of many business models, and this factor indicates that streamlining interaction with partners and bypassing intermediaries affect the allocation of costs and may result in cost reductions. From answers to the open questions it is clear that IT has changed

Table 5. Infrastructures (open question coding)

Factor	Infrastructures	
Category	**Information/knowledge management**	**Process streamlining**
Themes	• Real-time data • Knowledge sharing • Improved communication • Support for cooperation • Support for data structuring	• Process automation • Process simplification • Improved process efficiency • Improved workflows

the cost structure. Whereas investments in IT have increased, operational costs have decreased. Cuts in manpower and thus salaries are common examples of such cost reductions. IT, such as cloud based systems, EDI, and e-mail are considered important in improving communication and trade with partners. Invoice handling is one of the examples mentioned by respondents, making supply chains more effective. IT is therefore not only used for improving information quality but also for improving and streamlining trade among partners. Several respondents stress the importance of integrating supply chain partners through the use of IT. Answers to the open questions confirm the correlation between the two building blocks and indicate that streamlining of cooperation among supply chain partners results in cost reductions. There are three categories (see Table 6) of IT-driven changes to supply chains: 1) improved information exchange among partners (Information exchange), 2) cost reductions (Change in costs), and 3) reorganization of internal activities (Reorganizing internal activities).

5.4. Correlation Across Factors

Whereas Table 2 presents an overview of the current literature on IT-driven business model innovation, Table 3 and 8 show the structuring of building blocks and correlations between them. The three factors in Table 7 capture different sources of IT-driven business model innovation. These factors do not represent elements that operate independently in the business model but interlocking elements that affect each other and result in business model innovation. This contribution to our knowledge is new compared to the extant literature. Table 2 does not show, for example, how customer-centered building blocks relate to infrastructures. IT in the form of CRM and ERP are examples of systems that operate across factors. Table 7 summarizes the correlation among factors, highlighting possible "ripple effects". These findings substantiate Osterwalder and Pigneur's (2010) claim that business model innovation may have many different points of origin and disseminate to other areas, profoundly impacting other business elements. In other words, innovations may spring from one of the three sources and cause ripple effects that spread to a number of building blocks. For example, the implementation of IT to create customer value may affect the supply chain or the internal infrastructure of a company. Table 7 shows a correlation of 0.523 between customers and infrastructures, indicating a relatively strong relationship between the two factors (Hair, 2009). Similarly, the creation of customer value may

Table 6. Supply chains (open question coding)

Factor	Supply Chains		
Category	**Reorganizing internal activities**	**Change in costs**	**Information Exchange**
Themes	• Reduced number of intermediaries • New value streams	• Investments in IT • Improved efficiency	• Streamlining across partners • Improved efficiency

Table 7. Factor characteristics

						Factor correlation matrix		
Factor	Innovation source	# of indicators	Loading range	Cronbach's α	% variance explained	1	2	3
1	Customers	12	0.84-0.45	0.90	37.92	1	0.523	0.444
2	Infrastructures	5	0.98-0.55	0.88	11.00	0.523	1	0.464
3	Supply chains	4	0.72-0.42	0.73	7.17	0.444	0.464	1

derive from improved knowledge management or streamlining the supply chain through the use of IT. The factor analysis confirms a relationship between, on the one hand, customers and supply chains (0.444) and, on the other hand, infrastructures and supply chains (0.464).

6. DISCUSSION

In our analysis, we categorized IT-driven business model innovation according to three sources (factors) depending on the correlation between factors. These three sources of IT-driven innovation may help researchers and practitioners understand how companies can innovate their existing business models by focusing efforts on customers, infrastructures, and supply chains. The primary contribution of this study lies in providing empirical evidence of "ripple effects" and identifying the primary sources of innovation. We show both how customer-centered building blocks are impacted and how IT affects previously under-researched business model components, e.g. cost structure and key resources (see Table 2). Our empirical findings contribute to state-of-the-art knowledge of how IT impacts the business model by broadening our understanding of the relationships between building blocks (see Table 2 and Figure 3). By implication, the findings suggest that if a company wants to innovate for the purpose of creating customer value, channels may be a good starting point, since it is very likely to affect multiple building blocks. Additionally, IT-driven innovation of key activities will often impact key resources as well and vice versa. It is important to recognize this relationship since resources and activities constitute the backbone of any company, indicating that companies must consider both building blocks when implementing IT to ensure successful business model innovation. For example, if IT has changed core business processes within the company, knowledge sharing with the purpose of diffusing best practices will increase the chances of success. Finally, if a company wants to reduce costs associated with its business model, streamlining the supply chain may be the preferred course of action.

Our research suggests possible avenues for future research. Further empirical investigations of IT-driven business model innovation are needed—both qualitative and quantitative studies. The degree of innovation may be hypothesized to vary depending on organization size and industry sector in which a company operates. Future studies may investigate how IT-driven business model innovations differ across company types. Although not generalizable across industries and companies, qualitative studies may be undertaken to enhance our understanding of the described relationships between building blocks and to explore customers, infrastructures, and supply chains as sources of innovation. Finally, additional quantitative testing may shed further light on the causal effects and linkages within and between factors. Structural equation modeling would be one way of performing confirmative factor analyses and path analyses of IT-driven business model innovation.

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APPENDIX A

Appendix A shows our review methodology. The following subsections describe the literature search and analysis approach.

Literature Search

This subsection describes the search for literature on how IT drives innovation within and across the nine building blocks. The *Scopus* and *Web of Science* citation databases were used in search for journal articles and conference papers. Since business model innovation as a research topic is still embryonic in nature and has only recently appeared on the IS agenda (Veit et al., 2014), it stands to reason that results are currently being presented at conferences before finding their way into peer-reviewed journals. We therefore decided to include conference papers. In the following, we refer to both journal and conference publications as articles.

IT has found its way into many academic disciplines with multiple and sometimes divergent meanings, which makes it all the more important to be specific in terms of literature streams to focus on when searching for articles. It was decided to focus on the stream of literature on electronic business (e-business), because it centers on innovations involving new technologies used in management of internal processes and external relationships with partners and customers (Lam & Harrison-Walker, 2003; Lee, 2001b). The e-business literature zooms in on the interplay between IT and business, and compared to other streams of literature it is far more business-oriented and less technical in nature. E-business and e-commerce are often used interchangeably, making it difficult to distinguish between the two. E-commerce refers to activities conducted in collaboration with external stakeholders and can be defined as "… sharing of business information, maintaining business relationships, and conducting business transactions using digital networks…" (Zwass, 2003, p. 8). E-commerce is a subset of e-business, which involves internal activities as well (Harrison & Walker, 2003). Consequently, e-business embraces a broader set of activities than e-commerce. However, both concepts were included in the search to ensure a comprehensive perspective on the literature. In the following, we refer to innovation in relation to e-business and e-commerce as IT-driven innovation. Therefore, "business model", "innovation", "e-commerce", "e-business", and a slew of synonymous keywords were included in the search based on experiences from a pilot study. The aim of this pilot study was to validate the search strategy, the selection criteria, and to identify meaningful combinations of keywords. The literature search was conducted in several steps, illustrated in Figure 2.

Step 1: Searching for literature in Web of Science and Scopus.

We searched the literature by using a combination of "business model innovation" and e-business or synonymous keywords. The same search string was applied to both citation databases, limiting the searches to the title, abstract and keywords of articles. The following keywords where used for locating articles focusing on business model innovation: business model and innovation, develop, or emerge; and for e-business related literature: e-commerce, electronic commerce, electronic business, and e-business.

Step 2: Collecting and screening for duplicates.

The first step yielded a large pool of articles. Consequently, the second step served to screen the articles and determine their relevance. Titles and abstracts of all 800 articles were read, which resulted in 24 articles being selected for inclusion in the review. The screening process relied on two action cards (Table 8) to ensure that only articles on IT-driven business model innovation (e-commerce or e-business) espousing an organizational or managerial focus were included in the review. An organizational or

Figure 2. Search of literature

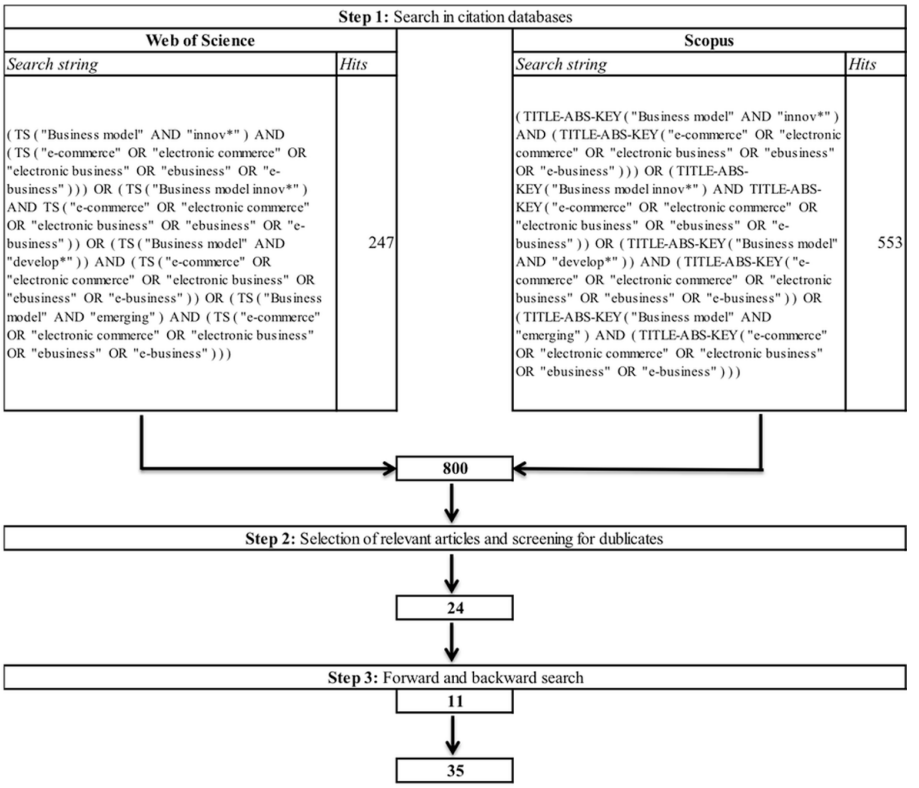

Figure 1: Literature search

Table 8. Action cards

Does the article focus on business model innovation enabled by e-commerce or e-business?

IF	Action
Yes	Keep
No	Remove

Does the article have an organizational or managerial focus?

IF	Action
Yes	Keep
No	Remove

managerial focus was specified as a condition to ensure that articles that did not apply a business perspective on innovation were discarded, e.g. articles describing technologies without discussing their business model impact. Consequently, articles focusing on technical rather than managerial or organization aspects of IT-driven business model innovation were not included. A lot of articles were

therefore discarded due to their explicit focus on particular technologies and not their use in practice. Other articles were discarded due to their focus on aspects not directly related to business models, for example articles describing and assessing customer satisfaction with new e-business initiatives. Additionally, some articles were deselected because they described particular elements of business models without an explicit focus on innovation. Several articles had rather vague abstracts with ambiguous foci on business model innovation and needed to be scrutinized to determine their relevance. Other articles revealed discrepancies between abstracts and the actual article content, and were later excluded despite their abstracts suggesting a focus on business model innovation. Several articles required discussions between the authors to determine their relevance. Such discussions resulted in more nuanced perspectives on some concepts. It was decided to include, for example, studies on "new business models" and "business model transformation" in the context of e-business.

Step 3: Forward and backward searches.

Having collected an initial pool of relevant articles, the third step served to conduct forward and backward searches based on the articles resulting from step 2 (Webster & Watson, 2002). The forward and backward searches resulted in 31 new articles being added, all of which were considered relevant at the outset. However, this list was subsequently reduced to 11 after applying the same criteria (i.e. the action cards) used during step 2. These 11 articles were added to the total pool of relevant articles.

Literature Analysis

Each of the 35 articles were read and categorized according to the nine building blocks of the canvas. Some articles focus on the impact of IT on one building block, whereas others describe the influence across several building blocks. The matrix in Table 8 shows the contribution of each article to our understanding of how IT drives business model innovation. For example, the article by Zhang (2009) describes customer-centered innovations in the tourism industry enabled by e-business; "…to develop e-commerce effectively, companies should build the virtual community … guiding customers to participate actively, customer is the sources of business model innovation and application of new technology…" (Zhang, 2009, pp. 4-5). Consequently, the article was categorized under customer relationships. Another example is Swatman et al.'s (2006) study of the changing landscape in the content industry. The study reveals how IT enables business model innovation through digitization of physical products, eliminating wholesalers and manufactures and introducing new distribution channels over the Internet. The authors demonstrate how IT enables changes across several business model components, i.e. how key activities, key partnerships, and channels are affected. Categorizing the articles proved to be challenging as some articles address several building blocks whereas others focus more narrowly. Only through careful consideration and rigorous interpretation we were able to categorize the articles using the business model canvas, linking statements and descriptions to specific building blocks. Table 8 summarizes the categorization of the literature.

APPENDIX B

Appendix B shows our measurement model (Table 9). It was developed based on extant literature presented in the article. Each building block consists of a number of variables.

Table 9. Measurement model

Building blocks	Questions	Variable name	Source
Customer segments	The extent to which IT-driven innovation enables…		(Amit & Zott, 2001; Lam & Harrison-Walker, 2003; Lee, 2001; Li & Wang, 2011; Loebbecke & Powell, 2002; Muffatto & Payaro, 2004; Osterwalder & Pigneur, 2010; Pantano, 2013; Runfola et al., 2012; Shouping & Zhishen, 2009; Swatman et al., 2006; Tsai & Gururajan, 2007; Ulhøi, 2013; Veit et al., 2014; Wu & Hisa, 2004; Wu & Hisa, 2008; Wu et al., 2013; Zhang et al., 2010; Zhu & Zou, 2008; Vladimir Zwass, 2003)
	Reaching new customer segments	CS_dialog	
	A better understanding of customer segments	CS_understand	
Value propositions	The extent to which IT-driven innovation enables…		(Al-Mashari, 2002; Amit & Zott, 2001; Harrison-walker, 2001; Ihlstrom & Kalling, 2007; Joo, 2002; Lee, 2001; Li & Wang, 2011; Lv & Liu, 2012; Mahadevan et al., 2000; Osterwalder & Pigneur, 2010; Pantano, 2013; Picoto et al., 2013; Swatman et al., 2006; Tsai & Gururajan, 2007; Wu & Hisa, 2004; Wu & Hisa, 2008; Wu et al., 2013; Zekanovi-Korona & Grzunov, 2014; Zhu & Zou, 2008)
	Value-added services for customer segments	VP_value	
	New product and service innovations	VP_new	
	Expansion to new market domains	VP_expand	
Channels	The extent to which IT-driven innovation enables…		(Al-Mashari, 2002; Amit & Zott, 2001; Gui & Ye, 2008; Ihlstrom & Kalling, 2007; Lee, 2001; Liu et al., 2012; Loebbecke & Powell, 2002; Lv & Liu, 2012; Margounakis et al., 2006; Osterwalder & Pigneur, 2010; Picoto et al., 2013; Runfola et al., 2012; Swatman et al., 2006; Tsai & Gururajan, 2007; Veit et al., 2014; Wu & Hisa, 2004; Wu & Hisa, 2008; Zhu & Zou, 2008; Vladimir Zwass, 2003)
	New channels for marketing	CH_ad	
	New channels for feedback	CH_feed	
	New channels for customer support	CH_support	
	New channels for distribution	CH_distri	
	Self-service	CH_self	
Customer relationships	The extent to which IT-driven innovation enables…		(Amit & Zott, 2001; Harrison-walker, 2001; Ihlstrom & Kalling, 2007; Joo, 2002; Lee, 2001; Loebbecke & Powell, 2002; Lv & Liu, 2012; Muffatto & Payaro, 2004; Osterwalder & Pigneur, 2010; Runfola et al., 2012; Shang et al., 2009; Tsai & Gururajan, 2007; Ulhøi, 2013; Wu & Hisa, 2004; Wu & Hisa, 2008; Wu et al., 2013; Zekanovic-Korona & Grzunov, 2014; Zhang, 2009; Zhang et al., 2009; Zwass, 2003)
	Interaction with customers	CR_interact	
	Co-creation	CR_cocreate	
Revenue streams	The extent to which IT-driven innovation enables...		(Amit & Zott, 2001; Ihlstrom & Kalling, 2007; Lam & Harrison-Walker, 2003; Lee, 2001; Loebbecke & Powell, 2002; Mahadevan et al., 2000; Margounakis et al., 2006; Runfola et al., 2012; Swatman et al., 2006; Ulhøi, 2013; Wu & Hisa, 2004; Wu & Hisa, 2008)
	New revenue models due to new products and services	RS_newpronserv	
	New revenue models due to online management of customer data	RS_online	
Key resources	The extent to which...		(Amit & Zott, 2001; Gui & Ye, 2008; Lee, 2001; Muffatto & Payaro, 2004; Osterwalder & Pigneur, 2010; Picoto et al., 2013; Tsai & Gururajan, 2007; Venkatraman, 1994; Wu & Hisa, 2004; Wu et al., 2008; Zwass, 2003)
	IT-driven innovation enables optimal use of existing resources	KR_optimal	
	IT is considered as a key resource	KR_Resource	
Key activities	The extent to which IT-driven innovation enables…		(Ihlstrom & Kalling, 2007; Li & Wang, 2011; Liu et al., 2012; Loebbecke & Powell, 2002; Margounakis et al., 2006; Osterwalder & Pigneur, 2010; Shouping & Zhishen, 2009; Swatman et al., 2006; Tsai & Gururajan, 2007; Zhu & Zou, 2008)
	Support of existing activities	KA_support	
	Streamlines existing activities	KA_effecient	
	Radical changes in internal activities	KA_change	
Key partnerships	The extent to which IT-driven innovation enables…		(Al-Mashari, 2002; Amit & Zott, 2001; Chen & He, 2009; Ihlstrom & Kalling, 2007; Lam & Harrison-Walker, 2003; Lee, 2001; Li & Wang, 2011; Liu et al., 2012; Loebbecke & Powell, 2002; Muffatto & Payaro, 2004; Osterwalder & Pigneur, 2010; Picoto et al., 2013; Shouping & Zhishen, 2009; Venkatraman, 1994; Zekanovic-Korona & Grzunov, 2014; Zwass, 2010)
	Information exchange with partners	KP_exchange	
	Bypassing members in the supply chain	KP_bypass	
	Streamlining trade between partners	KP_effecient	
Cost structure	The extent to which IT-driven innovation...		(Al-Mashari, 2002; Amit & Zott, 2001; Lee, 2001; Lv & Liu, 2012; Swatman et al., 2006; Tsai & Gururajan, 2007; Ulhøi, 2013; Wu & Hisa, 2004; Wu et al., 2008; Zhu & Zou, 2008)
	Changes the allocation of costs associated with the business model	CoS_change	
	Enables cost reductions	CoS_reduction	

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