



Business model risk and uncertainty factors: Toward building and maintaining profitable and sustainable business models[☆]

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Abstract Business models and business model innovation—and particularly their opportunities—have been a popular topic recently, but we find the extant literature on the subject lacking. The risk and uncertainty aspect typical of business models has not been sufficiently addressed. We draw upon the existing literature and triangulate results with an extensive expert group interview to identify 28 risk and uncertainty factor groups, creating a checklist that can be used as the first step in an integrative business model risk management process for existing and new iterations. With an established process for managing and identifying risk in business models, managers can make more conscious and well-informed decisions.

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1. Maintaining profitable and sustainable business models

Business models (BMs) and business model innovation (BMI) have increasingly gained significance over the last few years (Zott & Amit, 2010; Zott, Amit, & Massa, 2011). The importance and the need and opportunities of BMs and BMI are often discussed in theory and practice, whereas the risk and uncertainty aspect typical of BMs is rarely

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systematically addressed (Brillinger, 2018; Günzel & Holm, 2013; Taran, Boer, & Lindgren, 2013). A new BM can involve many risks and uncertainties (Euchner & Ganguly, 2014; Taran et al., 2013) due to its complexity, modularity, and integrative nature. This makes a comprehensive and reliable BM risk management system beneficial for building and maintaining profitable and sustainable BMs.

BM risk management can help reduce risks related to new models (Taran et al., 2013; Taran, Goduscheit, & Boer, 2015), as well as help identify risk and uncertainty factors in existing BMs and adapt or innovate them accordingly (Girotra & Netessine, 2011, 2014a, 2014b). Overall, a comprehensive risk management system can generate value and provide a competitive advantage if a company manages its risks better than its competitors (Girotra & Netessine, 2011). Existing works linking risk management to the field of BMs and BMI take one or more of the following approaches:

- Explain ways to integrate risk management into the BMI process (e.g., Euchner & Ganguly, 2014; Taran et al., 2013);
- Provide beneficial and comprehensive high-level BM risk frameworks (e.g., de Reuver, Bouwman, & Haaker, 2009; Shi & Manning, 2009);
- Focus on the ecosystem risk aspect of BMs (e.g., Adner, 2017; Brillinger, 2018; Costa & Cunha, 2008); or
- Suggest considering risks in the BM design (e.g., Girotra & Netessine, 2011).

Yet, to the best of our knowledge, none of the existing works present a comprehensive set of BM risk and uncertainty factors to complement existing literature and provide practitioners with a checklist that can be selectively applied as a first step in a comprehensive BM risk management system. To address this research gap, we aim to answer the question: Which specific BM risk factors and uncertainty factors can be extracted from BM literature and practice, and how can they be structured?

We present a set of 28 BM risk and uncertainty factor groups structured according to the four areas of the BM canvas (Osterwalder & Pigneur, 2010), based on the results of a detailed literature review and an interview we conducted with an expert group. The results can be used as a checklist during the risk identification phase of the risk management process. This will help managers

anticipate risk and uncertainty events, and make risk and uncertainty factors more transparent in existing or new BMs as part of a comprehensive risk management process (Romeike, 2005).

2. What are business models, risk management, and business model risks?

Three research streams serve as the theoretical basis of this work: business model, risk management, and business model risk.

2.1. Business models

Many authors agree that a BM is “how firms do business” (Zott et al., 2011, p. 1021). Casadesus-Masanell and Ricart (2010, p. 198) stated: “Business models are made of concrete choices and the consequences of these choices,” so they underline the importance of choices and decisions in BM development. Different levels of consideration are used in literature and practice (Wirtz, Pistoia, Ullrich, & Göttel, 2016). We take the product and service perspective: Different BMs for different products and services may exist as a portfolio within one firm, especially as a consequence of BMI (Sabatier, Mangematin, & Roussele, 2010; Wirtz et al., 2016). Many authors emphasize the modularity of a BM that consists of several elements (Wirtz et al., 2016). In most cases, these elements refer to the dimensions of value creation, value delivery, and value capture (Clauss, 2017; Osterwalder & Pigneur, 2010; Teece, 2010). In line with this, one of the most common BM frameworks is the Business Model Canvas, which is “a tool for describing, analyzing, and designing business models” (Osterwalder & Pigneur, 2010, p. 12). It presents nine BM components and describes four areas of a business: customers, offer, infrastructure, and financial viability (Osterwalder & Pigneur, 2010).

2.2. Risk management

Risk management plays an important role and adds value to organizations (Farrell & Gallagher, 2015). The role of risk management is to lower fluctuations in cash flow and profit, preventing companies from drawing on costly sources of funding or even bankruptcy (Romeike, 2005). Risk as a measurable uncertainty “refers to the likelihood of events of a negative nature” (Knights & Vudubakis, 1993, p. 729). The main difference between risk and uncertainty is that while uncertainty is not measurable or calculable, risk is (Broadbent, Gill, &

Laughlin, 2008). Both relate to a certain event (Berdica, 2002; ISO, 2018), whereas risk factors and uncertainty factors influence “the occurrence of...[these]...undesirable events” (Barki, Rivard, & Talbot, 1993, p. 206). Risk management consists of risk identification, risk assessment, risk measures, and risk monitoring (Hallikas, Karvonen, Pulkkinen, Virolainen, & Tuominen, 2004). A valuable tool in identifying risks and uncertainties is a checklist (Romeike & Finke, 2003). After being identified, risks can be evaluated on a case-by-case basis (ISO, 2018). The evaluation is usually done by assessing the probability and the impact of a risk event (Hallikas et al., 2004).

2.3. Business model risk

Many scientific works on BMs mention the risk or uncertainty aspect, though only a few emphasize the topics of BM risk or uncertainty. One existing approach in BM literature is to integrate RM into the BMI process (Euchner & Ganguly, 2014; Taran et al., 2013) or provide beneficial and comprehensive high-level BM risk frameworks (e.g., de Reuver et al., 2009; Shi & Manning, 2009). Other authors focus on the ecosystem risk aspect of BMs (e.g., Adner, 2017; Brillinger, 2018; Costa & Cunha, 2008). Different works especially consider the aspect of risk treatment by, for example, suggesting experimentation as an RM method (e.g., Ganguly & Euchner, 2018), offering measures to reduce risk by ensuring corporate sustainability (e.g., Lueg, Pedersen, & Clemmensen, 2015), or actively considering risk in the BM design (e.g., Girotra & Netessine, 2011). In addition, a number of works elaborate BM risks for specific cases, such as specific BM types or industries (e.g., Bouwman, Zhengjia, Van Der Duin, & Limonard, 2008; Rese, Meier, Gesing, & Bloßlau, 2013; Stacey, 2011). A few authors do take the decision-making aspect into consideration (e.g., Deubener, Velamuri, & Schneckenberg, 2016).

To the best of our knowledge, no article to date has presented a comprehensive set of BM risk and uncertainty factors. We contribute to the existing body of research by providing such a comprehensive set of internal as well as external BM risk and uncertainty factors that can be used as a checklist applicable on an abstract—not a BM- or industry-specific—level. As a tool for analyzing BMs and because of its modular structure, the BM canvas serves as the structural basis for this checklist (Osterwalder & Pigneur, 2010). Risk and uncertainty factors are, as defined in Section 2.2, understood as triggers for potential risk or uncertainty events. This identification is the first

step in the RM process. Subsequently, quantitative risk evaluation and risk treatment have to be performed on a case-by-case basis (ISO, 2018). The identification and awareness of these risk and uncertainty factors in a new or existing BM makes it possible to manage risks by taking appropriate measures or adapting the BM design accordingly. Moreover, the quantitative risk evaluation for each separate case and its risk-return ratio facilitates more conscious and well-informed decisions (e.g. on whether to invest in a certain BM or not). To obtain a comprehensive checklist for risk management in different BMs and industries, we focus on risk and uncertainty factors rather than certain risk events in our research, since the latter are rather case-specific and not generalizable.

BM risks are “all risks within the business model which can endanger the profitability and sustainability of the business model or even company goals and value” (Brillinger, 2018, p. 7). This BM includes risk events such as general BM failure (Johansson & Malmstrom, 2013), image loss (Markides & Charitou, 2004), and profit loss (Tanzi, Aruanno, & Suardi, 2018).

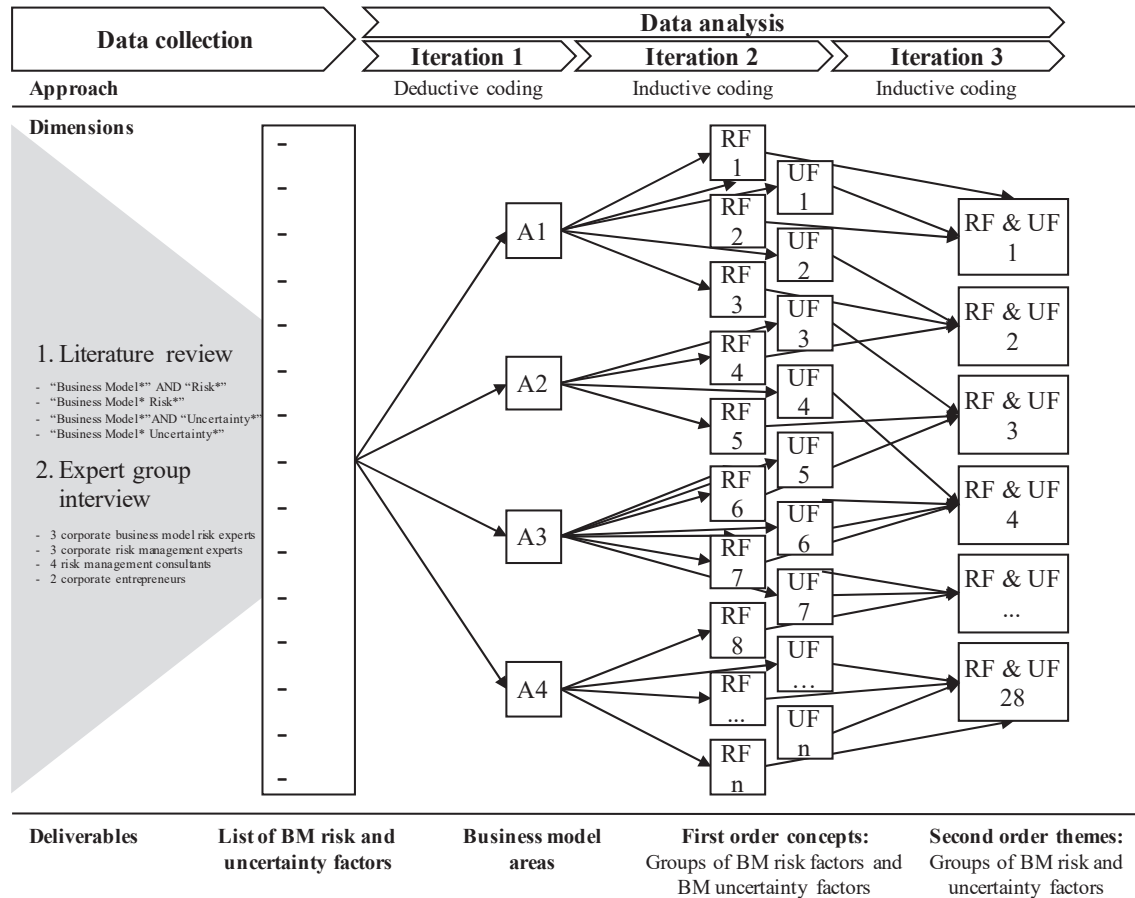
3. Research design: Literature review and expert group interview

3.1. Data collection

We follow the procedure suggested by Tranfield, Denyer, and Smart (2003) to conduct a comprehensive and detailed literature review. We base our analysis on 139 rigorously selected articles,¹ from which risk and uncertainty factors were extracted. To complement, triangulate, and validate the resulting risk and uncertainty factors of the literature review, we conducted a 2-hour, in-depth group interview (Goldman & MacDonald, 1987; see Figure 1). The group consisted of 12 corporate and external experts from the field of risk management and BM risk management. Two corporate entrepreneurs with experience setting up a BM supported the discussion with practical insights. Based on the nine building blocks of the Business Model Canvas (Osterwalder & Pigneur, 2010), the respondents discussed related risk factors. The group interview was recorded and fully transcribed for completeness and accuracy (Goldman & MacDonald, 1987) before being sorted according to the structure of the BM canvas.

¹ For a full list of the 139 articles, please contact the corresponding author.

Figure 1. Process of the data analysis



Source: Based on Gioia et al. (2013)

3.2. Data analysis: Coding

In analyzing the data and structuring BM risk and uncertainty factor groups, we followed Gioia, Corley, and Hamilton (2013). As visualized in Figure 1, we differentiated between first-order constructs and second-order themes and implemented an inductive coding mode, starting out with the four BM elements—customer, offer, infrastructure, and financial viability—as the interview was partially structured following the Business Model Canvas (Osterwalder & Pigneur, 2010). The category ‘environment’ was added to consider not only internal but also external BM risk and uncertainty factors. The extracted risk factors were deductively coded and classified and duplicates were removed. We then inductively coded the data, creating separate groups of risk factors and uncertainty factors, namely first-order concepts (Gioia et al., 2013). Different subjects mentioned—including risks, uncertainties, uncertainty factors, or risk factors—were evaluated and categorized as risk factors or uncertainty factors. Then, we consolidated the first-order concepts and

summarized them into second-order concepts (i.e., combined risk and uncertainty factor groups; see Figure 1). To complete the process, we referred to the literature to complete the descriptions of the groups and related examples.

4. Results: A business model risk and uncertainty factors framework

We took the results of our findings and created a framework of 28 groups of BM risk and uncertainty factors²; we organized the factors into risk internal categories—customer, offer, infrastructure, and financial viability—and one external category—environment. This framework is depicted in Table 1.

In the customer category, customer risk and uncertainty factors refer to all critical aspects concerning the (potential) customer of the BM. This concerns factors related to customer

² Eight groups consist of only risk factors

relationship, customer solvency, customer access, and factors linked to the operation of multiple BMs as well as customer demand. We look at critical factors in the fashion industry as an example. In this industry, customer demand and fashion trends are fast-changing and might be difficult to predict. Firms need to be flexible and react quickly. Yet, many fashion companies optimize their whole process from sourcing to distribution in terms of costs and outsource their production. This can lead to long processes, making it difficult to adapt orders and collections in a flexible and fast mode, and might keep a firm from meeting current customer needs and demand (Girotra & Netessine, 2011; Tokatli, 2008). These factors can put customer demand and the entire BM at risk.

In the second category, offer, BM risk and uncertainty factors comprise those that jeopardize the value proposition. Among factors linked to the quality of the offer (i.e., quality of the offer, new technology or its innovativeness), this area contains data risk and uncertainty factors like data security, data privacy, and data ownership. This is mainly relevant for digital BMs that collect and use data or sell their goods online; specific examples include Google, Facebook, Amazon, or Flyeralarm (Gassmann, Frankenberger, & Csik, 2014). These potential risk factors (e.g., data loss) can lead to a loss of trust, image damage, and customer churn, each of which can put the whole BM at risk. Another important group of offer risk factors is related to the availability and maintenance of a value proposition. This can be relevant in a rental BM (e.g., a car-sharing BM; Cohen & Kietzmann, 2014; Gassmann et al., 2014). Two crucial components of a value proposition for this type of BM are availability and the trouble-free performance of the rental service secured by regular maintenance. This includes car maintenance, refueling, and uniform distribution of a fleet of vehicles throughout the city (Cohen & Kietzmann, 2014). Possible risk and uncertainty events induced by this type of factors are customer dissatisfaction that could potentially lead to customer churn, a decrease in profitability, and image loss.

The third category covers all aspects related to BM infrastructure. In addition to factors related to the partnerships in a BM—as well as critical capabilities, resources, and intellectual property—this grouping includes operational risk and uncertainty factors connected to errors in human or technical behavior (e.g., machine failures). This type of risk and uncertainty factors can be very critical for manufacturing companies like those producing goods in a chain consisting of many mutually dependent steps. If there is

machine failure in one of the steps, then this can affect the whole production process. This is an important aspect in BMs of industrial product-service systems (e.g., Zheng, Ming, Li, & He, 2015) as potential risk and uncertainty events like this can cause bottlenecks, delays, or defaults in the process and thus risk the delivery of the value proposition, leading to customer dissatisfaction, image loss, or even BM failure.

The fourth BM category, financial viability, includes factors related to financial resources, costs, monetization, and the revenue model of a BM. Risk and uncertainty factors regarding high investments are part of this category as well. Investment risk and uncertainty risk factors can be relevant if high early investments or capital tie-ups are necessary when setting up a new BM or when an existing BM is very capital-intensive. Examples include large retail organizations like supermarkets, which offer a big variety of different products and need to stockpile their assortments. Many multisided platform BMs such as credit card networks (e.g., American Express) needed high initial investments to build up communities and infrastructure in order to facilitate the exchange between the affiliated groups before getting serious financial returns (Evans, 2003). This kind of BM involves investments and capital tie-ups, which can lead to different risk and uncertainty events (e.g., lack of profitability or even BM failure).

The external category, environment, comprises aspects such as political, environmental, and economic risk and uncertainty factors, as well as competition or technological change risk and uncertainty factors. Environmental risk and uncertainty factors include natural disasters such as flooding, storms, or droughts that damage or destroy a production site. Such events can result in disturbances in the BM or even the whole business ecosystem by harming suppliers or ecosystem partners.

5. Why business model risk and uncertainty factors matter for theory and practice

By presenting a comprehensive and detailed set of 28 BM risk and uncertainty factor groups, the findings we offer contribute to both theory and practice in the field of BM risk management and BMs. With this study, we prove a comprehensive and detailed set of risk and uncertainty factor groups which can be selectively applied on a case-by-case basis. We include aspects and approaches from different case-, industry- and BM-

Table 1. Framework of business model risk and uncertainty factor groups

BM Areas	Groups of business model risk and uncertainty factors	
	Groups of BM risk and uncertainty factors	Description
Customer	Customer demand risk and uncertainty factors	All factors related to misinterpreting or not meeting customer demand, such as not focusing on the customer and customer needs, not attracting or retaining customers, or not meeting the community requirements
	Customer relationship risk and uncertainty factors	All factors that can damage the relationship with customers, such as losing the customer interface, opportunistic or adverse behavior on the side of the customer, or inflexible agreements
	Customer solvency risk factors	All risk factors related to the customer solvency, including bad credit rating, insolvency, or default of the customer
	Customer access risk factors	All risk factors that hinder the customer's access, such as missing market access, a strong intermediary, high market entry barriers, or a strong competitor
	Multiple BM risk factors	Critical aspects attributed to the emergence of multiple BMs within one organization, causing cannibalization of the existing customer base, losing loyal customers, or offending existing customers by becoming a competitor
Offer	Quality risk and uncertainty factors	All aspects that are related to the quality of an offer, such as a gap in expected vs. delivered performance, durability, and functionality
	Availability and maintenance risk factors	All critical aspects that relate to the availability and maintenance of an offer as an important component of the value proposition and the related consequences of the offering's poor performance
	Data risk and uncertainty factors	All risk and uncertainty factors related to data usage such as data security, data ownership, data privacy, and data quality
	(New) technology risk and uncertainty factors	All risk and uncertainty factors that are linked to the utilization of technologies that are new or still in a premature state, highly complex, or for which the company lacks experience
	Innovativeness risk factors	All risk factors linked to the dependency on the innovativeness of the value proposition of a company or BM (e.g., not using state-of-the-art technology)
Infrastructure	BM ecosystem risk and uncertainty factors	All risk and uncertainty factors within a business ecosystem and value network that constitute multilateral relationships between the different parties
	Bilateral cooperation risk and uncertainty factors	All critical aspects within the cooperation and bilateral relationship with partners or customers that impact the stability of the relationship
	Capabilities and resources risk and uncertainty factors	Factors related to critical capabilities or resources required to realize a certain BM, such as special equipment, data, or human and technical resources
	Operational risk and uncertainty factors	Factors related to the operations in business processes that are often connected to errors in human or technical behavior

Table 1 (continued)

BM Areas	Groups of business model risk and uncertainty factors	
	Groups of BM risk and uncertainty factors	Description
	Intellectual property (IP) risk and uncertainty factors	Concerned with the drainage of IP or know-how from the BM managers' point of view; Such IP and knowledge also includes sensitive data on the firm's customers and partners
	BM portfolio risk factors	All risk factors that are linked to the management of a wide variety of offerings and the complexity and defocusing related to a BM portfolio
Financial Viability	Financial resources risk factors	These factors comprise all aspects that impact the BM manager's capability to finance the BM
	Investment risk and uncertainty factors	Factors linked to high investments and capital tie-up necessary to create, deliver, or capture a value proposition of the BM, including production plants or inventory costs
	Monetization risk and uncertainty factors	Include all factors that could risk the monetizability of a certain value proposition or offer
	Revenue mechanism risk factors	Factors related to the revenue mechanism of a BM and its related taxation regulations, which influences the buying sensitivity for a certain value proposition and the choice of a revenue model and has an impact on taxation and accounting as there may be model-specific regulations a company has to comply with
	Pricing risk and uncertainty factors	This category comprises all risk and uncertainty factors related to the price setting of a BM value proposition and directly corresponds to the customer price sensitivity and its value perception of the value proposition of the BM.
	Lifecycle risk and uncertainty factors	This group describes lifecycle risk and uncertainty factors that come with a possible uncalculated change of costs and revenues in the lifecycle of a BM.
Environment	Political risk and uncertainty factors	Factors that include aspects related to political, social, or governmental factors
	Environmental risk and uncertainty factors	Factors that cover all aspects linked to acts of nature
	Economic risk and uncertainty factors	This group includes all risk and uncertainty factors in the business environment or market (e.g., customs, currency exchange rates, taxation, economic cycle)
	Legal and regulatory risk and uncertainty factors	All aspects regarding the commitment of regulatory and legal circumstances
	Competition risk and uncertainty factors	Factors that cover all critical aspects relating to existing or new competitors
	Technological change risk and uncertainty factors	This group covers all aspects related to technological change

Source: Based on [Osterwalder and Pigneur \(2010\)](#)

type-specific contexts, and analyze and evaluate these factors according to their general applicability as risk and uncertainty factors and as potential triggers for “undesirable events” (Barki et al., 1993, p. 206) abstracting and summarizing them into a comprehensive set. Thereby, our article adds to existing high-level frameworks and serves as a step in the RM process prior to risk treatment.

The comprehensive and detailed set of BM risk and uncertainty factors can be applied in different ways. As a first step in the RM process, this set can be used as a checklist to identify risk and uncertainty factors, helping to build profitable and sustainable BMs by ensuring awareness of certain risk and uncertainty factors. By checking the individual relevance of the factors in the framework and selectively taking these aspects into account, a BM manager can check, for example, whether availability and maintenance are central elements of the value proposition. If this is the case, the manager can make sure that all availability- and maintenance-relevant aspects, as well as the potential consequences of nonfulfillment, are considered in the BM design. After becoming aware of these aspects, the BM manager can adapt the BM design accordingly as risk measure. If availability and maintenance cannot be securely provided by the BM design, the manager can consider a change to the whole BM design as a risk treatment measure.

After the relevant BM risk and uncertainty factors in the framework are identified, the risks can be quantitatively evaluated on an individual case level and the BM risk-return ratio can be calculated. This can help a company to decide whether or not to invest in that BM. If, for example, the BM is primarily a platform BM like Facebook (Gassmann et al., 2014), one critical group of risk and uncertainty factors might be customer demand risk and uncertainty factors. Because of network effects, the existence of a critical number of participants on the supply side is a precondition for the attraction of other participants on the demand side of the platform. In the case of Facebook, these two groups are users and advertisers (Gassmann et al., 2014). Users are attracting other users and thereby advertisers. If this critical number cannot be achieved, the whole BM is at risk and can potentially fail. Awareness of these risk and uncertainty factors and the relating risk-return ratio can serve as a first step in evaluating the potential financial and image loss resulting from a BM failure. This knowledge can help decision makers to make more profound decisions to

either knowingly invest in the BM, and decide to start a prototype and test it or launch the BM, or to actively rule against investing and decide to exit the BM (Tesch & Brillinger, 2017; Tesch, Brillinger, & Bilgeri, 2017).

The framework can also be used to identify and evaluate risk and uncertainty factors in existing BMs. If a company identifies demand risk and uncertainty factors in its existing BM, it could think of adapting its design. One example of such an adaption is Zara, which differs from the fashion companies described above. Because of high vertical integration, production sites in southern Europe, and fast transportation modes, this fashion company is able to quickly react to changing customer needs and, thus, reduces the risk of not meeting customer demand (Gassmann et al., 2014; Girotra & Netessine, 2011, 2014b). Another example is the computer manufacturer Dell with its make-to-order BM. Because of this type of BM, the risk of high inventory costs as well as the risk of customer insolvency and payment default is managed sufficiently (Gassmann et al., 2014; Girotra & Netessine, 2011, 2014b).

Adapting the design of a BM to overcome certain risk and uncertainty factors can lead to new ones. For example, with Dell, one potential BM is to produce computers in advance, keep them in stock, and sell them via a retailer. This makes it possible for customers to buy a ready-made computer in store. While this model entails investment risk and uncertainty factors because of high inventory and capital tie-up, these factors can be managed by its make-to-order BM. However, customer demand can be a potential risk and uncertainty factor in this type of BM because it leaves out the immediate availability of the products. Managers’ awareness and knowledge of the BM risks and uncertainty factors outlined in our framework can help counterbalance management heuristics and manage BM risks.

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