Business model innovation design and experimentation in SMEs: drivers and outcomes

Mark de Reuver
Associate Professor
Delft University of Technology
Faculty of Technology, Policy, and Management
Phone: +31 6 28 13 12 51
Email: g.a.dereuver@tudelft.nl

Francisco-Jose Molina-Castillo
Associate Professor
Department of Marketing
University of Murcia
Campus de Espinardo, 30100 Murcia, Spain
Phone: (0034) 868.88.78.26
Email: fjmolina@um.es

Harry Bouwman
Professor
Abo Akademi University, Turku, Finland
Delft University of Technology
Faculty of Technology, Policy, and Management
Email: w.a.g.a.bouwman@tudelft.nl

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Keywords: Business model innovation, Business model innovation design, Business model experimentation, Innovativeness, performance, SMEs

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Abstract

Although business model innovation has been receiving increasing attention in strategic management literature, there are no empirical studies into the effects of business model innovation design and experimentation on firm performance. In this paper, we examine the antecedents and consequences of business model innovation design and experimentation using a representative quota sample of European SMEs. We find that business model innovation design and experimentation with business models have a significant impact on the innovation and performance of SMEs. Among the drivers, strategic orientation, competition intensity and technology turbulence are significant antecedents of business model innovation design and experimentation. Our results provide interesting future guidelines for SMEs.

Keywords: Business model innovation, Business model innovation design, Business model experimentation, Innovativeness, performance, SMEs

Introduction

Business model innovation is becoming a mainstream topic in strategic management (Casadesus-Masanell *et al.*, 2013) and it is considered crucial to implementing high-level strategies (Al-Debei *et al.*, 2010). Several case studies have examined how large companies try to adapt their business model (Afuah *et al.*, 2001; Casadesus-Masanell *et al.*, 2011; Chesbrough *et al.*, 2002; Zook *et al.*, 2011) or how start-up companies take advantage of new business model opportunities (Gruber *et al.*, 2006; Hartmann *et al.*, 2016; Muegge, 2012). Because case studies typically focus on which specific business model designs are associated with feasibility, sustainability or profitability (Afuah *et al.*, 2001; Bouwman *et al.*, 2008), business model experimentation, as a core element of business model innovation, has recently received a great deal of attention (Christensen *et al.*, 2016) (Wirtz *et al.*, 2016). Beyond academia, business model innovation has also received a great deal of attention from policy-makers (e.g. EU, OECD) and practitioners who agree that business model innovation is relevant to established firms that are looking for renewal (Berends *et al.*, 2016), as well as for start-ups that want to establish themselves in the market (Hartmann *et al.*, 2016) .

However, there is an ongoing debate about the effects of business model innovation (Clauss, 2016). Although scholars suggest that business model innovation is a prerequisite for firms to benefit from innovations (Chesbrough, 2010) and improve their performance (Zott *et al.*, 2008), empirical evidence is largely lacking. After a detailed review, Wirtz *et al.* (2016) found evidence that of a similar distribution between conceptual papers (46%) and case study-based research (49%), but there was a clear deficit for multivariate analyses (5%).

To address this gap, our research objective is to empirically assess the antecedents of business model innovation, as well as the effect it has on the performance and innovativeness of firms. We define business model innovation as a change in business logic that is new to the firm and that results in observable changes in the firm's practices towards its customers and partners (Bucherer *et al.*, 2012), and in the way the firm captures, creates or distributes value (Zott *et al.*, 2008).

To address our research question, we used a large-scale quantitative survey among small and medium-sized enterprises (SMEs) in Europe. We focus on SMEs for three reasons. First of all, SMEs typically operate with one business model, while large firms often have a portfolio of multiple business models (Sabatier *et al.*, 2010). As such, business model innovation by SMEs is more likely to result in observable consequences in terms of firm performance. Secondly, established SMEs typically have limited resources at their disposal for innovation, which is known to affect the outcomes (Frankenberger *et al.*, 2013),which means that antecedents are more likely to lead to actual business model innovation compared to larger firms. Thirdly, although SMEs make up the biggest part of the economy in most countries, business model innovation research has so far focused mainly on large businesses and start-ups (Lindgren, 2012). As such, our decision to focus on SMEs provides an empirical contribution to existing literature.

The remainder of this paper is organized as follows. We first review existing empirical cross-sectional literature on business model innovation. Next, we define core concepts and develop hypotheses to be tested, after which we discuss our research

approach and methodology, and the main results of the multivariate analysis. Finally, we discuss the results and limitations of this study, as well as future research guidelines.

Literature review

Business model innovation

A detailed review of existing literature (using Scopus, Web of Science and Google Scholar) reveals considerable conceptual ambiguity regarding what constitutes business model innovation (see Table 1), as has also been pointed out by other authors, like Spieth *et al.* (2016) and Clauss (2016). Some papers are unclear as to which components of a business model need to be changed to talk about business model innovation (Souto, 2015), while others list business model components that do not resemble the components used in BM ontologies like CANVAS (Osterwalder *et al.*, 2005), STOF (Bouwman *et al.*, 2008) or Visor (El Sawy *et al.*, 2012). This conceptual ambiguity likely reflects the lack of clarity in business model literature in general (Aspara *et al.*, 2010; Aziz *et al.*, 2011; Huang *et al.*, 2012) .

Osterwalder *et al.* (2005) define business model innovation as the result of rearranging business model components. In a similar vein, other authors (Bucherer *et al.*, 2012; Frankenberger *et al.*, 2013) define business model innovation as the deliberate modification of a firm's core elements and business logic, as well as the introduction of new business model components. Björkdahl *et al.* (2013) see business model innovation as the result of new integrated logic of value creation and value

capture, which can include new products or services, as well as changes in the firm's market position and operational logic. Lindgardt *et al.* (2009) focus on value delivery and define a business model innovation as changes in two or more business model components which lead to novel ways of value delivery. Amit *et al.* (2012) suggest that a business model innovation can involve adopting novel activities that define the business model of a firm, establishing new connections between existing activities or changing business actors in the firm's value network. Giesen *et al.* (2007) define a business model innovation through a taxonomy that includes three types of business model innovation: (1) changes in the industry model, i.e. innovation in a firm's value chain, which can be achieved by redefining existing industries, or moving to or creating new industries; (2) changes in the revenue model, i.e. changing the way a firm generates revenues; and (3) changes in the enterprise model, i.e. changing the role and structure of an enterprise in new or existing value chains. As such, it may be clear that there is a variety of definitions as to what constitutes business model innovation.

In terms of how business model innovation can be operationalized, Velu (2015) sees diversification/product launch and external funding as the two main indicators of business model innovation. To refer to business model innovation, other studies use terms like consulting business model, technology business model, software business model, etc., which they use as dummy variables in their analyses (Clausen *et al.*, 2013). Kim *et al.* (2015) boil down business model innovation to the decision whether or not to add online retail activities. Some studies are vague on how they measure concepts (Clauss, 2016; Spieth *et al.*, 2016), use scales with two generic items (Souto, 2015), or use list of business model components as business model innovation indicators without

indication their origin (Huang *et al.*, 2012). Some studies use secondary data to measure business model innovation, for instance indicators from the EU's Communication Innovation Survey (CIS), as a proxy for business model innovation (Barjak *et al.*, 2013), or they use other existing databases (Cucculelli *et al.*, 2015). In short, business model innovation is measured in a variety of ways, while in some cases, the measurements are derived from data that was originally collected for other purposes.

Business model innovation design and experimentation

We conceptualize business model innovation as a strategic activity. The relationship between business models and strategy has long been the subject of debate (Hedman *et al.*, 2003). Most scholars argue that business models should be an implementation of strategy (Al-Debei *et al.*, 2010; Cortimiglia *et al.*, 2016). Similarly, Cucculelli *et al.* (2015) argue that business model innovation should be a function of corporate strategic entrepreneurship.

In addition, we see business model innovation as a learning process, in which discovery through experimentation is more appropriate than conventional analytical approaches (McGrath, 2010) or more cognitive-oriented approaches (Martins *et al.*, 2015). The latter category, which comes close to road-mapping as proposed by De Reuver *et al.* (2009), also includes experimentation and alternative options. Chesbrough (2010) argues that experimentation with business model innovation can help overcome barriers to business model change and clear up confusion. Andries *et al.* (2013) used simulation modelling to show that simultaneous business model experimentation leads

to superior long-term performance, while a more focused approach to business model development is more advantageous in the short term. Case studies suggest that actual changes in a business model are preceded by prolonged phases of experimentation and failure (Sosna *et al.*, 2010).

Existing studies provide no formal definitions of what constitutes business model experimentation. Sinfield *et al.* (2012) define business model experimentation as the ”pursuit of growth through the methodical examination of alternative business models”, while Baden-Fuller *et al.* (2010) argue that business model experimentation has a purposive character. However, their comparison of relevant studies shows that business model experimentation contains both thought experiments (including experiments based on analogical reasoning, Martins *et al.* (2015)) and real-life experiments.

In light of the overview presented above, we define business model experimentation as the purposive effort to try out new business models that contribute to firm strategy, and that include both thought experiments and real-life experiments. Considering the fact that these efforts should be purposive, a prerequisite to business model experimentation is to design the most appropriate business model based on resources within the firm.

Drivers and outcomes of business model innovation

As highlighted by Wirtz *et al.* (2016), very few studies have conducted an empirical analysis of antecedents and consequences. In the few papers we encountered in our literature review (Table 1), there is an almost universal lack of clear hypotheses and conceptual models. Although Clauss (2016) is a valuable paper on developing a scale

for business model innovation that sheds light on the conceptualization of this construct, it does not analyze the drivers or outcomes in detail. Other analyses, on the other hand, use a clear conceptualization of business model innovation and more advanced model testing that goes beyond ordinary econometric analyses like Brettel *et al.* (2012).

<Insert table 1 about here>

It can be concluded that studies on business model innovation are few and far between and that they sometimes lack a deeper understanding of what Business Model Innovation implies, what antecedents are and how business model Innovation affects the performance and innovativeness of firms, and it is clear that business model innovation practices can offer both a theoretical and a practical contribution.

Conceptual model and hypotheses

Antecedents of business model innovation design: Internal factors

We argue that business model innovation is a specific type of innovation, where the object of innovation is not a product, technology or process, but a firm's core business logic. Innovation management literature suggests a broad range of (internal and external) antecedents for innovation.

Since business model innovation often accompanies technology or product innovation (Chesbrough, 2010), internal drivers for business model innovation may be similar to those found in innovation in general, including *R&D intensity* (Bock *et al.*, 2012; Garcia-Zamora *et al.*, 2013; Guimaraes, 2011; Liao *et al.*, 2010; Mina *et al.*, 2014;

Yeh-Yun Lin *et al.*, 2007) and marketing innovation, as expressed by *customer orientation* (Huang *et al.*, 2012; Mavondo *et al.*, 2005; Mina *et al.*, 2014; Tang *et al.*, 2013). More generically, we assume that innovation creates a need for business model innovation, which is why we hypothesize that:

H1: Innovation will have a positive effect on business model innovation design

Although most scholars agree that business model innovation and strategy are in some way related, there is less agreement on the exact relationship between the two (Casadesus-Masanell *et al.*, 2013; Chesbrough, 2010; Hedman *et al.*, 2003). For instance, Osterwalder *et al.* (2005) establish a direct link between concepts of customer intimacy, operational excellence and product leadership proposed by Treacy *et al.* (1993) and components of Osterwalder's ontology. And while some scholars see a direct relationship between strategy, business model and the resulting business processes (Al-Debei *et al.*, 2010), others view strategy as the long-term positioning of a company, and argue that business models have to do with execution (Solaimani *et al.*, 2015) .

Leaving aside the exact nature of the relationship between strategy and business, however, it has been confirmed that the two are related (Cortimiglia *et al.*, 2016), and firms that engage more in strategy discussions are more likely to experiment and change their business models, which is why we hypothesize that:

H2: Changes in strategy will have a positive effect on business model innovation design

Antecedents of business model innovation design: External factors

Firms often change their business models in response to changes in their environment (Bohnsack et al., 2012; De Reuver, Bouwman, & MacInnes, 2009; George & Bock, 2011; Giesen et al., 2010; Morris et al., 2005, 2013). Generally speaking, innovation is assumed to be driven by competitive behavior (Johnson et al., 2008). In fact, various studies have confirmed that competitive pressure is relevant to business model innovation (Carayannis *et al.*, 2015; Guimaraes, 2011; Mina *et al.*, 2014; Pauwels *et al.*, 2008; Ritala *et al.*, 2015; Tsai *et al.*, 2013; Velu, 2015), which is why we hypothesize that:

H3: Competitive intensity will have a positive effect on business model innovation design

Technological changes in a firm's environment are often mentioned as drivers and enablers of business model innovation (De Reuver *et al.*, 2009; Pries *et al.*, 2011). SMEs have to assess which technologies can potentially support or threaten their Business Model, which means that rapid changes will lead to experimentation, which brings us to our next hypothesis.

H4: Technological turbulence will have a positive effect on business model innovation design

Business model experimentation

Generally speaking, experimentation is seen as an intermediate step towards realizing a new business model that is in line with a firm's strategy (Hayashi, 2009; McGrath, 2010; Sosna et al., 2010). Several researchers focus on the transition from the old business model towards the new one through the use of tooling like stress-testing and road-mapping (Bouwman et al., 2012; De Reuver, Bouwman, & Haaker, 2013; M. W. Johnson et al., 2008) or business model ontologies (Chesbrough, 2010). Moreover, when translating a business model into operational processes, literature emphasizes the need to understand the 'how' part of the business model, i.e. the operating model (Heikkilä, Tyrväinen, & Heikkilä, 2010; Lindgardt, Reeves, Stalk, & Deimler, 2009; Morris et al., 2013; Ross et al., 2007; Slack, Chambers, Johnston, & Betts, 2012). Some scholars propose a unified business framework that connects business models to the operational level in the form of a business process or architecture (Al-Debei & Avison, 2010; Morris et al., 2005; Osterwalder & Pigneur, 2002; Teece, 2010).

In general, we expect business model innovation design to have a positive impact on the outcome of business model experimentation, which is why we hypothesize that , experimentation and the allocation of financial and human resources to enable experimentation contribute to the use of business models in a firm's strategizing process:

H5: Business model innovation design will have a positive effect on business model experimentation

Consequences of business model innovation

Business model innovation is expected to help firms improve their capacity to innovate and capitalize on new technological innovation and market approaches (Johnson, Christensen, & Kagermann, 2008). In addition, business model innovation can allow firms to meet underserved market demand through disruptive innovation (Johnson et al., 2008), in the form of new solutions resulting from changes in the business logic, for instance by simplifying operations or creating easier access (Johnson et al., 2008). Through business model innovation, firms can redefine both their value proposition and their core business logic (Barjak et al., 2014; Bouwman et al, 2008; Osterwalder, Pigneur, & Tucci, 2005). As such, business model innovation can enhance a firm's ability to innovate (Clausen *et al.*, 2013). Consequently, the relationship between business model innovation and innovativeness can be hypothesized as follows:

H6: Business model experimentation will have a positive effect on innovativeness

Studies suggest that there is a relationship between business model innovation and the performance of SMEs (Abd Aziz & Mahmood, 2011; Aspara, Hietanen, & Tikkanen, 2010; Cucculelli & Bettinelli, 2015; Hartmann, Oriani, & Bateman, 2013; Huang, Lai, Kao, & Chen, 2012; Kim & Min, 2015; Velu, 2015; Zott & Amit, 2007, 2008), which is why we hypothesize that:

H7: Business model experimentation will have a positive effect on performance

Note that we do not include specific hypotheses (Rosenkopf *et al.*, 2001) regarding the relationship between innovativeness and performance, as this relationship has already been tested extensively in existing literature (Hult *et al.*, 2004; Stanko *et al.*, 2013). Instead, we argue that there is a positive relationship between these two concepts based on existing evidence, without including it as a formal hypothesis. Figure 1 summarizes our research model.

<Insert figure 1 about here>

Research method

Data collection

Our population includes European SMEs in any industry engaging in business model innovation in the past 24 months. Respondents are sampled on the basis of a database acquired from Dun & Bradstreet, a company that regularly collects data on businesses, their executives, industry classification and contact information from Chambers of Commerce and other organizations in multiple countries. In each region of Europe, a large and small country is selected, and quota are established for micro-enterprises, small and medium-sized enterprise (33%-33% -33%). No quota are defined for industry sectors. Agriculture, public administration and non-market household activities are excluded.

The data was collected through telephone interviews by a certified research agency with extensive experience in data collection in multiple countries at the same time. The research agency used native speakers and a Computer Assisted Telephone Inquiry. Based on disproportional quota sampling, companies were randomly selected and key respondents (owners or business model innovation managers) approached. The survey included questions with regard to size and industry sector, to confirm the companies that were approached were indeed part of our intended population.

To include firms that engaged in business model innovation in the past 24 months, we applied filter questions at the start of each interview (Lee & O'Connor, 2003). This was especially relevant because, even though the term is frequently used, it sometimes is misunderstood or used incorrectly. We developed four filter questions (Langerak *et al.*, 2004) designed to ask respondents whether, in the past 24 months, they changed their (1) value propositions and customers, (2) eco-system (key partners, resources and activities), (3) information technology or use of social media and/or big data, and (4) pricing and related financial issues (costs and revenues). The four filter questions also helped ascertain whether or not the respondent was knowledgeable with regard to business model innovation in the firm (Atuahene-Gima, 2005). The filter questions produced a so-called incidence rate, i.e. the proportion of SMEs that actually engaged in business model innovation in the past 24 months. The incidence rate equals 36 %, which means that almost 4 out of 10 SMEs engage in business model innovation, although they may not necessarily use the term business model innovation themselves. A total of 586 valid respondents were included and interviewed using a computer-assisted telephone interview system.

As a further test, we assessed the respondents' suitability (Atuahene-Gima, 2005) to answer the questionnaire and their degree of knowledge (1 = "very limited knowledge" to 7 = "very substantial knowledge") with regard to the product/service offerings, business process and new product/service development. The mean responses were 6.7, 6.6, and 5.9, respectively, indicating adequate knowledge levels.

Measurements

The questionnaire included well-known measures from the earlier studies summarized in Table 2. All items used seven-point Likert scales (from 1 = totally disagree to 7 = totally agree), except innovation activity, which was measured on a three-item scale based on Zott *et al.* (2008), and strategy, which used a four item scale, also based on Zott *et al.* (2008). Competitive intensity and technology turbulence were both assessed using a three-item scale, each from Jaworski *et al.* (1993). Business model innovation design was measured using a three-item scale derived from several qualitative studies on business model innovation (Sosna *et al.*, 2010; Teece, 2010), and business model experimentation using a three-item scale consistent with Osterwalder *et al.* (2005). In line with Subramanian (1996), innovativeness was also operationalized using a three-item scale, while overall firm performance was measured using items suggested by Venkatraman *et al.* (1986). Finally, sales volume was used as a control variable for our study.

The measures were pre-tested and validated through several in-depth interviews with SME managers. Before collecting data, the questionnaire was read out loud to

make sure the various questions were clear. The questionnaire was developed in English and then translated into eleven languages (Dutch, French, Finnish, German, Italian, Lithuanian, Polish, Portuguese, Slovenian, Spanish and Swedish). The German questionnaire was also used in Austria. To detect and resolve problems and cultural issues, a back-translation process was used to ensure that the translation did not introduce any bias. Moreover, a final check was conducted on the translations and on the consistency between translation by native speakers from the research agency. Prior to the data collection, the questionnaire was pre-tested by native speakers from the research agency for every country.

Measurement model

We ran a confirmatory factor analysis (CFA) using LISREL 8.8 to confirm and validate our scales. The results (see Table 2) indicate a very good fit of the measurement model of the total sample (χ^2 (202) = 491.70 RMSEA = .05 CFI = .98 NFI=.97 IFI = .98, N = 586). The factor loadings of each of the indicators in their respective scales were significant ($p < 0.001$), which proves evidence of convergent validity. As is commonly done for multi-item reflective scales (Bagozzi *et al.*, 1988), we test composite reliability and average variance extracted (AVE) for each of the constructs. The results of these indicators exceed the benchmarks suggested in literature.

<Insert table 2 about here>

Traditional analysis of discriminant validity, as suggested by Anderson *et al.* (1988) & Fornell *et al.* (1981), composes) a 95% confidence interval of the correlation between constructs, b) Comparison of AVE with square correlations between constructs. However, based on recent studies (Henseler *et al.*, 2015; Voorhees *et al.*, 2016), there is also a need to include the heterotrait-monotrait (HTMT) ratio of discriminant validity with a .85 cut-off point. The HTMT test requires calculating a ratio of the average correlations between constructs to the geometric mean of the average correlations of items within the same constructs. Our results showed evidence of discriminant validity, as shown in Table 3.

<Insert table 3 about here>

Common method variance (CMV) is a frequent problem in this type of studies, as using a single informant for each firm can introduce bias. However, using more than one informant is rather complicated, especially in studies involving SMEs. To assess the potential risk of CMV, we conducted several test. Firstly, we applied the latent method factor approach (Podsakoff *et al.*, 2003), which takes the covariance into account among the measures in each construct and in a common construct for all measures. The results indicate that there is no common factor for all our constructs. Secondly, we used the Lindell *et al.* (2001) marker variable technique. Using a series of chi-square difference tests, we found that correlations were consistent among adjusted and unadjusted correlation matrices. Thirdly, we used the test suggest by Malhotra *et al.* (2006), where the original correlation matrix is used to estimate a structural model.

Again, the chi-square difference test confirmed that the adjusted and unadjusted model were not statistically different.

Results

We ran the structural model for the entire sample (586 respondents) using Lisrel 8.8. The results (see Figure 2) show a very good model fit ($\chi^2(216) = 669.87$ CFI = 0.97 NFI=.95 IFI=.97 RMSEA = 0.06). All hypotheses were supported, with the exception of H1, which suggested a positive impact of innovation activity on resources dedicated to business model experimentation.

<Insert figure 2 about here>

To increase our understanding of the proposed relationships as well as the final impact on innovativeness and performance, we examined the indirect and overall effects of the main antecedents (see Table 4 for a detailed summary).

<Insert table 4 about here>

Discussion

Because existing empirical literature is limited in terms of volume and focus, our results provides some interesting insights. First of all, the internal and external drivers for

business model innovation experimentation work out differently than suggested in literature. Our results confirm that strategic activity is an important driver (Zott *et al.*, 2007, Zott *et al.*, 2008 and Cortimiglia *et al.*, 2016). SMEs most likely still have potential to grow and their operational processes are still in the management's span of control, so strategic reorientations may affect the business models of these types of companies the most. However, our results suggest that innovative activities do not trigger business model experimentation, which is inconsistent with existing literature. Most SMEs do not have an R&D department or sophisticated customer management systems.

The model shows that technology and competitive turbulence are important drivers. Unlike earlier studies, we find that increased competition has a negative impact in terms of the resources that are dedicated to business model experimentation. Competitive pressure may make it necessary to focus on operations and efficiency, at the expense of business model experimentation. Although, generally speaking, one would expect that, when competition is fierce, companies would look for alternatives, as proposed in the Blue Ocean strategy (Chan *et al.*, 2005), SMEs tend to be more focused on their day-to-day operations. Possibly, SMEs are unable to free the necessary resources when they have to struggle for survival.

Consistent with earlier studies, we find that technological turbulence has a positive impact on resources dedicated to business model experimentation. However, the size of the effect is relatively modest, which leads us to conclude that technology is not a strong driver for SME behavior.

Although the relationship between business model innovation design and business model experimentation is evident, there is a lot we still do not know about

business model patterns, paths, the use of tools and the relationship between paths and components to be changed, or how exactly business model experimentation affects business model components.

As far as the impact on innovativeness and performance is concerned, the results confirm our hypotheses, in that business model experimentation significantly improves both the innovativeness and the performance of firms. We also find that innovativeness partially mediates the impact of business model experimentation on performance.

Managerial implications

Our results show that business model experimentation has a positive impact on the innovativeness and performance of SMEs. Based on our results, owners and managers of SMEs need to be made aware of the relevance of business models in general and of the need for business model innovation to improve their performance in particular. There is a real need to experiment with business model innovation and to promote business model experimentation practices.

The results are also important for advisors to SMEs. Although many industry organizations and advisors are aware of the relevance of business model innovation, in practice, SME owners often find it hard to distinguish strategy thinking from business model innovation. Because strategic activities are driving business model activities, the difference between the two should be clearly explained.

It is important for SMEs to take the positive impact of business model experimentation on innovativeness and performance into account, even when they face fierce competitive pressure. Fierce competition may often cause SMEs to divert resources away from business model experimentation, when in fact it can actually help them deal with the competition that they face.

Limitations and future research directions

In this paper, we did not take into account internal factors that can be deterrents to innovation, like organizational structure and routines (Braganza *et al.*, 2009), organizational culture or leadership (Chesbrough, 2010), lack of resources (Frankenberger *et al.*, 2013), or lack of internal competencies (Demil & Lecocq, 2010; Hult et al., 2004; Morris et al., 2013). Studies show that organizational inertia (Huang *et al.*, 2012; Meeus *et al.*, 2000; Raymond *et al.*, 2010) has a negative impact on business model innovation. Follow-up research should explore how the internal factors listed above moderate or mediate the impact of the antecedents on business model experimentation.

Understanding the impact of business model innovation requires insight into business model experimentation and the effect it has on innovativeness and performance. Our research was limited because we used cross-sectional data. However, in parallel, we examined a large number of cases on how European SMEs innovate their business models to broaden our insight. Furthermore, detailed insight into business model innovation experimentation and practices, the tools that are used in the various phases of innovation and the way business model components are affected, as

well as possible patterns that can be detected would make this research more valuable. At the moment, we are engaged in a large number of cases studies designed to generate these insights, allowing us to use a mixed method approach to identify questions and items to be included in future questionnaires.

Another limitation of our study is that we used perception scales to measure performance. In future research, we would like to combine existing data with data regarding the performance of the companies involved in this research, as available in Statistical Offices, based on unique identifiers. However, due to restrictions imposed by the European Union, we are not allowed to merge these datasets, which means we can only combine the with data provided in the interviews.

There are also limitations with regard to the data we acquired and the fact that we relied on single informants. Although we tried to involve more than one informant, specifically in mid-sized firms, in practice that proved to be quite difficult. On the other hand, we were able to determine that did find that the risks associated with common method variance did not play a significant role in this study.

Furthermore, we are aware that the current sample size can be increased, to allow us to conduct more detailed analyses at country or industry level and to use combinations and reach conclusions on much more detailed level, which is significant in light of the fact that SMEs in the Europe Union, although in many perspectives comparable, are very diverse, for example in terms of national culture, languages, economic system, industry sector and educational level of entrepreneurs.

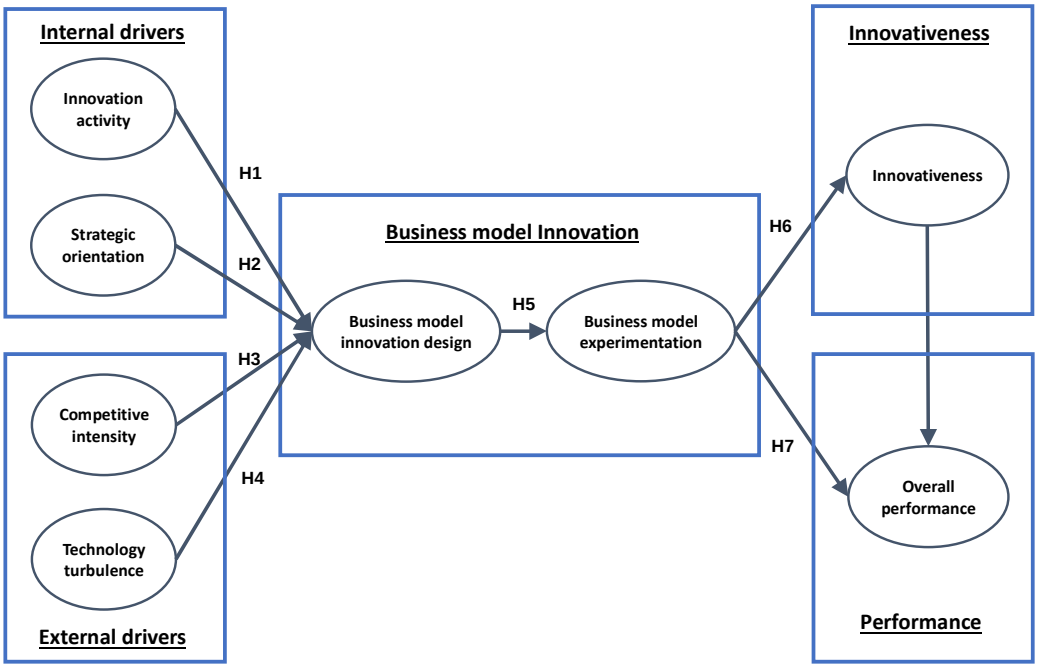
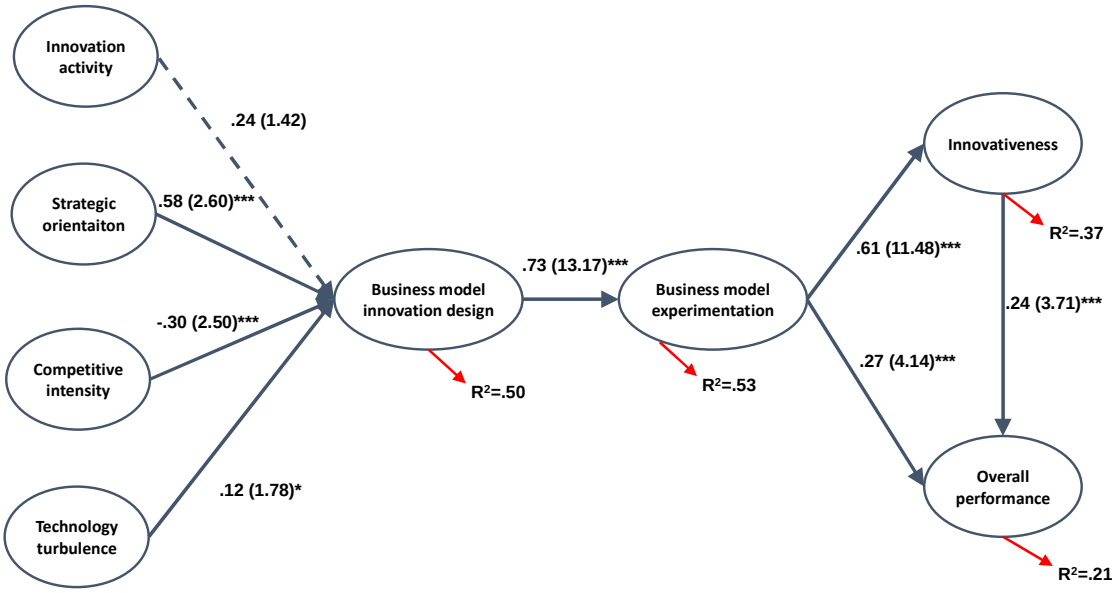


Figure 1: Research model



$\chi^2(216) = 669.87$ RMSEA = .06 CFI = 0.97 NFI=.95 IFI = 0.97

Standardized coefficients shown (critical ratio in parentheses)

Significance levels: ***p < 0.01 **p < 0.05 *p < 0.1

Figure 2: Structural equation modelling results: overall model

Table 1: Review of empirical papers on Business Model Innovation

Reference	Key concepts included	Research subjects	Sample	Analysis
Aspara, et al. (2010)	business model innovation, strategic marketing, replication of business model (components) and financial performance	Finnish large and small firms (unclear how defined in terms of size and turn over, median split is used)	545	
Aziz & Mahmood (2011)	business model, performance related to business model components, like takeholders, competencies, value creation and value capturing	Malaysian SMEs	202	RA
Barjak et al (2014)	business model innovation based on CIS, descriptive analysis	European SMEs (secondary data analyses)	No info	
Brettel et al. (2012)	business model efficiency and novelty design, relationspecific investments, performance	German, Austrian and Swiss SMEs	234	CFA, RA
Clausen, & Rasmussen (2012)	Specific type of business model, number of BMs, technology domain, and innovativeness	Norwegian start-up companies	82	RA
Clauss (2016)	Business Model Innovation scale development Two studies	Small (<50) and midsized (50> <500) German companies, as well as large (>500)	126 232	
Cheng, et al. (2014)	(service) business model, business model efficiency and novelty design , service innovativeness; market turbulence and competitive intensity	Large Taiwanese firms (> 304; < 8.300)	211	CFA, RA
Cortimiglia, et al. (2015)	Business Model Innovation, strategy process, CANVAS, business model design and improvement (when and how BMI in Strategy Making process)	Small but mainly large Italian firms : majority of sample is 100+	138	
Cucculelli, M. & C. Bettinelli (2015).	Levels of business model innovation/adaptation, corporate entrepreneurship, investment in intangibles, performance	Italian clothing SMEs, size between 10 and 500	376	RA
Euro. Com. (2014)	Business Model Innovation per EU country	European SMEs < 250 employees	CIS data	
Hartmann, et al.. (2013)	"Performance effect", "business model innovation", "empirical analysis"	Large Australian Firms in Financial industry	64	RA
Huang, et al. (2012)	Target costing system, business model innovation, performance	Large Firms and SMEs in China's electronics and information industry	189	RA
Kim, & Min (2015)	Original and Imitative BM Innovation, sales revenues	Large incumbent publicly traded store based retailers in the US	131	RA
Souto (2015)	business model innovation, performance	SMEs and large firms in Hospitality Industry in Spain.	124	SEM
Velu (2015)	business model, survival of firm and the role of partnering with 3rd parties with complementary assets	Start-up in the US electronic trading platform firms in the bond market	129	RA
Zott, & Amit (2007)	Novelty centered and efficiency centered business model design, resource munificence, performance	Early phase entrepreneurial firms in Europe and the US	190	RA
Zott, & Amit (2008)	Product market strategy, (novelty and efficiency centered) business model, and performance	Large Firms and SMEs	161	RA

CFA = Confirmatory Factor Analysis; RA = Regression Analysis; SEM = Structural Equation Modelling

Table 2 Measurement model: constructs, items, loadings and reliability estimates

Construct, items	**SCR**	**Standardized λ**
Innovation activity *(Zott et al., 2008)*		
The following internal factors motivated a change in your business model during the last 12 months		
New product development, innovation and R&D activity		.54
Innovation and/or R&D activities	.74	.68
Advertising products and services in a new way		.67
Strategic orientation *(Zott et al., 2008)*		
The following internal factors motivated a change in your business model during the last 12 months		
Offering products/services at low prices		.50
Minimize costs	.70	.50
Scale up your business		.58
Focus your product offering		.73
Competitive intensity *(Jaworski et al., 1993)*		
The following external factors motivated a change in your business model during the last 12 months		
Price competition		.61
Competitors starting to offer similar products/services	.78	.71
Competitor's reactions to your initiatives		.68
Technology turbulence *(Jaworski et al., 1993)*		
The following external factors motivated a change in your business model during the last 12 months		
Rapid changing technology	.90	.84
Rapid increasing technological development		.68
Business model innovation design (Osterwalder *et al.*, 2005)		
In your enterprise, business models are…		
Used to gain competitive advantages		.64
Designed in response to market circumstances	.81	.60
Derived from enterprise's strategy		.50
Business model experimentation *(Sosna et al., 2010; Teece, 2010)*		
How did you deal with business model innovation during the last 12 months		
Experimented with the (implementation of) their business model		.58
Had a specific team to manage business model changes	.79	.50
Allocated budgets for business model experimentation		.50
Innovativeness *(Subramanian, 1996)*		
In our enterprise,		
We aim to create multiple innovations annually		.66
We introduce innovations that are completely new to the market	.80	.63
Creating more than one innovation at the same time is common practice		.55
Overall performance *(Venkatraman et al., 1986)*		
In our enterprise, we are very satisfied with		
The sales growth	.81	.77
The profit growth		.78

$\chi^2(202) = 491.70$ RMSEA = .05 CFI = .98 NFI=.97 IFI = .98 SCR = Scale compose reliability

Table 3 Correlation matrix with AVE (n=586) and HTMT discriminant test

	Mean	SD	AVE	1	2	3	4	5	6	7
1 Innovation activity	3.97	1.67	.50							
2 Strategic orientation	4.16	1.42	.50	.57***						
3 Competitive intensity	3.88	1.64	.54	.38***	.55***					
4 Technology turbulence	3.85	1.92	.80	.55***	.48***	.42***				
5 BM experimentation	3.25	1.80	.54	.46***	.42***	.19***	.39***			
6 BMI design	4.92	1.65	.60	.41***	.34***	.23***	.33***	.51***		
7 Innovativeness	3.88	1.68	.56	.59***	.42***	.27***	.40***	.43***	.43***	
8 Performance	4.17	1.50	.70	.27***	.23***	.11***	.19***	.28***	.31***	.33***

AVE = average variance extracted, SD = standard deviation.

Significance levels: *** p < 0.01 ** p < 0.05 * p < 0.10

HTMT	**1**	**2**	**3**	**4**	**5**	**6**	**7**
1 Innovation activity							
2 Strategic orientation	.37						
3 Competitive intensity	.26	.70					
4 Technology turbulence	.68	.65	.50				
5 BM experimentation	.61	.63	.24	.47			
6 BMI design	.53	.52	.28	.38	.64		
7 Innovativeness	.77	.61	.33	.47	.55	.53	
8 Performance	.35	.35	.14	.39	.35	.38	.40

Table 4 Total effects

	Innovativeness	**Performance**
	Total effect	**Total effect**
Strategic orientation	.26 (2.54)***	.18 (2.48)***
Competitive intensity	-.13(2.45)***	-.09(2.40)***
Technology turbulence	.05(1.76)*	.04(1.74)*
Business model innovation design	.61(11.48)***	.41(8.22)***
Standardized coefficients shown (critical ratio in parentheses) Significance levels: ***p < 0.01 **p < 0.05 *p < 0.1		

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