BUSINESS MODEL EXPERIMENTATION IN SMES: THE APPLICATION OF A DUAL SCALING TECHNIQUE

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Business model experimentation is an essential step for developing new business models. While the benefits of business model experimentation are increasingly studied, it is still poorly understood why companies engage in business model experimentation. This paper examines, starting from environmental turbulence reasoning, which external and internal drivers serve as antecedents for business model experimentation by firms that already have established business models. We do so by making use of a unique, quantitative data set based on a survey study among 929 European SMEs actively engaged in business model innovation. Using Dual Scaling, a procedure to scale categorical inputs that yields the least-squares lower-rank approximation to the elements of our data set, we find that external drivers relating to technological turbulence are the most important antecedents for business model experimentation. External competitive intensity doesn't motivate business model experimentation. Regarding internal drivers, strategic change, related to product innovation, is a significant antecedent, while innovative activities are less outspoken. By examining why companies engage in business model experimentation, the paper contributes to understanding the antecedents of business model innovation.

Keywords: Business model innovation; Business models; SME; Business model experimentation

INTRODUCTION

Evidence is rapidly growing that an innovative business model (To et al., 2020) positively contributes to firm performance (Zott & Amit, 2007; 2008; Kim & Min, 2015; Pucci et al., 2017). Business model innovation has been touted as a prerequisite for firms to benefit from changes inside the firm (Chesbrough, 2010; Molina-Castillo et al., 2012) to achieve strategic renewal (Berends, Smits, Reymen, & Podoynitsyna, 2016) or to encourage teams to innovate (Moser et al., 2019). Only recently, scholars started to unravel the process (Sjödin et al., 2020) through which business model innovation as a process, i.e., business model experimentation, takes place (Foss &

Saebi, 2017). Empirical studies show that actual changes in the business model, defined as the logic to create, deliver and capture value (Teece, 2010), are preceded by prolonged stages of experimentation and trial-and-error (Sosna et al., 2010; Calcavante, 2013; Heikkilä et al., 2018). Thus, "innovation laboratories" could be crucial to expand our knowledge of different alternatives (Osorio et al., 2019). Scholars argue that business model experimentation leads to new ideas on how to create, capture and deliver value (Baden-Fuller & Morgan, 2010), helps to overcome obstructions to change (Chesbrough, 2010), improves business agility by challenging business assumptions and prototyping or piloting change (Doz & Kosonen, 2010), preserves performance (Meroño-Cerdan et al., 2017) by promoting business model consistency (Demil & Lecocq, 2010) and produces superior long-term performance (Andries, Debackere, and Looy, 2013).

We focus on firms with well-established and implemented business models that are engaged in changing their business model (Gamble et al., 2020). These established firms differ from start-ups entering a market and are still designing or searching for their first initial, robust business model (Heikkilä et al., 2018). However, the motivation for firms with established business models to engage in business model experimentation is still poorly understood. A recent literature review by Foss and Saebi (2017) shows that systematic studies on antecedents for business model innovation are lacking in general. Other literature reviews suggest a wide variety of drivers for business model innovation, mentioning both internal and external drivers to the firm (Lambert & Davidson, 2013). External drivers for business model innovation include deploying new advanced technologies and changing market-related conditions (De Reuver et al., 2009; Casadesus-Masanell and Zhu, 2013; Cavalcante, 2013; Mezger, 2014; Bouwman et al., 2018). Internal drivers include strategic awareness and reorientations and internal R&D

and innovation activities (Stanko et al., 2013) that require the firm to adapt and reconfigure its business model (cf., Amit & Zott, 2008; Al-Debei & Avison, 2010; Chesbrough, 2010; Haggège et al., 2017). We consider these drivers to play an active role in motivating business model experimentation.

We contribute to business model literature by focusing on how specific drivers motivate business model experimentation. We define business model experimentation as the *process* of purposefully and methodologically examining alternative business models (Sinfeld et al., 2012; Baden-Fuller & Morgan, 2010). We define business model innovation as a discrete outcome, i.e., the renewed, alternative way in which companies create, capture and distribute value (Teece, 2010). Business model experimentation entails all the activities from discussions on the existing business model, brainstorming, the assessment of consequences for the operation model, business processes, or the information technology infrastructure (Trigo et al., 2011) to the use of business model tools to small scale trials (Verhagen et al., 2021). We distinguish this exploration phase from business model implementation, in which the business model is actually rolled out. So, this paper examines how external and internal drivers serve as antecedents for business model experimentation.

Our secondary aim is to explore whether our results are consistent over different firms with an established business. To do so, we introduce a revolutionary procedure called Dual Scaling. This technic can be described as a singular value decomposition of scaled categorical data. In a nutshell, dual scaling is used to examine hidden structures in categorical data (i.e., size of the firm or response to a yes/no question) by determining weights or scores (for an original source of this method see Nishisato, 1980). So which specific precursors are more or less important when comparing different types of firms (i.e., size, age) and their motivation for model experimentation?

Our second contribution, therefore, relates to different types of firms and their motivation to engage in business model experimentation. Our findings show that specific groups can be detected.

We focus on SMEs as they typically have limited financial, human and knowledge resources at their disposal for business model innovation (Frankenberger, Weiblen, & Gassmann, 2013). On the other hand, SMEs can be more flexible and agile while handling business model changes (Bouwman et al., 2018a). Antecedents might be more likely to lead to actual business model experimentation compared to larger firms, which might stick to more robust business models (Haaker et al., 2017). Large firms might be less resilient. Besides, although SMEs make up the most significant part of the economy in most countries (Gamble et al., 2020), business model research has so far focused mainly on large businesses and start-ups (Lindgren, 2012; Kesting & Günzel-Jensen, 2015, Velu, 2015). As such, our focus on SMEs with established business models and on groups within this population provides an empirical contribution to existing business model literature, especially since we explore how background characteristics, which are the basis of the groups, affect the role of business model experimentation drivers. So the study is based on a large-scale quantitative survey among small and medium-sized enterprises (SMEs), as defined by and located in the European Union.

In summary, our study fills in several significant gaps in the literature: analysis of internal and external drivers of business model experimentation, a sophisticated methodology with dual scaling procedure, focus on a large sample size of SMEs in Europe, and groups within this population.

The remainder of this paper is organised as follows. We first review existing literature on business model experimentation and innovation. Next, we develop

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

LITERATURE REVIEW

In strategic management, the relationship between strategy and business models is at the core of several - mainly conceptual and theoretical - papers (Casadesus-Masanell and Ricart, 2010; Massa et al., 2017; Teece, 2010). Existing literature still exhibits considerable conceptual ambiguity regarding what constitutes business models, business model experimentation, and business model innovation, as other authors have pointed out as well (Foss & Saebi, 2017; Clauss, 2016; Spieth & Schneider, 2016; Zott, Amit, & Massa, 2011). For instance, Priem et al., (2017) provide a long list of concepts used in literature to discuss business model innovation, ranging from business model design, development, generation, alignment, configuration, and so on to business model renewal. In addition to strategic management, business models and business model innovation have also received attention, for instance from Information Systems and Innovation Management (Afuah & Tucci, 2002; Al-Debei and Avison, 2010; Bouwman et al., 2008; Chesbrough, & Rosenbloom, 2002; Molina-Castillo et al., 2012; Osterwalder & Pigneur, 2010; Trigo et al., 2011). The focus in this stream of literature is on the definition of the business model concept, ontologies, taxonomies, business model components, assessment, representation, change methodologies, transformation aspects and tools to support business model experimentation (Pateli and Giaglis, 2004; Foss, & Saebi, 2017; Wirtz, et al., 2016, Bouwman et al., 2020). More recently, the focus has shifted towards business model experimentation as a process, while treating business model innovation as an outcome (Sjödin et al., 2020). Business model innovation is related to changes in business logic that, although new to the firm or

industry (novelty), are not necessarily new to the world (Heikkilä et al., 2018) and have to result in observable changes in the components or architecture of a business model (scope) (Foss, & Saebi, 2017).

Business model experimentation

A group of scholars view business model innovation as a discrete *outcome* (e.g., Amit & Zott, 2008), while others see business model innovation as a *process* triggered or motivated by strategic transformation (Foss & Saebi, 2017; Demil & Lecocq, 2010). For clarity purposes, we label the process view on business model innovation as business model experimentation. A process-oriented view assumes that business models are subject to continuous refinement and modification (Demil & Lecocq, 2010), extension and revision (Cavalcante et al., 2017) to match changing internal and external conditions (Sjödin et al., 2020). Our process-oriented view on business model experimentation is appropriate, given that our research objective focuses on these antecedents of business model experimentation, i.e., the motivation to change the business model.

Recently, scholars point out experimentation as an essential part of business model innovation, either as a rational or evolutionary approach, based on cognitive or real-life experiments (Martins et al., 2015; Berends et al., 2016). McGrath (2010) argues that continuous testing is required for discovering new business models, as companies cannot fully anticipate new business models in advance. Similarly, Calcavante (2013) argues that business model experimentation is a phase that precedes actual changes in the business model to be materialised. Baden-Fuller and Morgan (2010) argue that experimentation helps to come up with new business model ideas. Osterwalder, Pigneur, and Tucci (2005) suggest that business model experimentation is like playing

with a box of Lego blocks, leading to novel designs `limited only by imagination and the pieces supplied'. Morris et al., (2005) state that business models start from being informal and implicit, upon which they are refined through trial-and-error. Chesbrough (2010) argues business model experimentation helps to overcome barriers to change and resolve confusion in the process of the business model to be innovated. Kummitha (2019) highlights the need for understanding user engagement to design structures. Heikkila et al., (2018) show, based on an extensive number of cases, how business models are iterated following some common, although seldom linear, paths. Business model experimentation is, in their experience, characterised by trial and error, and many fall back and restart loops.

Based on these arguments, business model experimentation can be viewed as an activity in which methodologically alternative business models and business model component configurations are tested (Sinfeld et al., 2012). Baden-Fuller and Morgan (2010) argue that business model experimentation has a purposive character. Their comparison of relevant studies shows that business model experimentation contains both thought experiments and real-life experiments (Martins et al., 2015; Berends et al., 2016). Here, we define business model experimentation as the purposive effort to examine new business models methodologically. Conceptual and empirical work shows business model experimentation entails various activities. We distinguish the process of experimentation as distinct from the implementation of a change in a business model components or of a completely renewed business model, in which management decision on the operational model, business processes, supporting technologies, including Information Technology, need to be made (Trigo et al., 2011). Possible operational decisions affecting organisation, organisational culture and learning, and related to capabilities of the workforce need to be realised and executed. As an exploration

process, business model experimentation leads to a business model, labelled as innovated, renewed or redesigned. Business model experimentation precedes the actual implementation.

Martins et al. (2017), in a conceptual paper, make a distinction between rational positioning related to exogenous shocks, evolutionary learning related to uncertainties due to exogenous learning and cognitive approaches focussed on the managerial understanding of interdependencies of business model components and architecture and modifications of components or architecture to existing business models. Through an extensive case study, Sosna et al. (2010) find that the exploration phase of business model innovation consists of initial designs and trial-and-error improvements, which may last for several years before leading to sustained change in the business model. Calcavante (2013) distinguishes experimentation from learning, defining business model experimentation as researching technical challenges and performing new practices, and business model learning as acquiring new knowledge, discussing new ideas and interacting with and contacting others. Achtenhagen et al. (2013) find, through inductive research, that business model experimentation comprises three activities: retrieving information about the environment, encouraging new ideas, and learning from mistakes (Trigo et al., 2011). Berends et al. (2016) find four phases of business model innovation: conceptualising new ideas, creating new business models, adapting the business model after it is in operation, and experimenting to learn and validate. While some of these empirical findings are congruent, considerable differences emerge as well. For instance, Calcavante (2013) sees experimentation and learning as different activities, while Berends et al. (2016) defines experimentation as learning from experience.

Besides empirical work, other scholars provide more practical perspectives on

how to deal with business model experimentation. For instance, De Reuver et al. (2013) provide an approach based on road mapping, which allows us to plan and revisit plans for changing a business model. Eppler et al. (2011) provide collaborative idea generation tools to support developing new business models. Haaker et al. (2017) suggest a method for gradually improving the fit between a firm's environment and business model (Stanko et al., 2015). Bouwman et al. (2008) indicate that business models should be developed through sequentially conducting quick-scans, high-level designs, evaluation and refinement of business models. Although research on the role of internal and external turbulence in strategic management is common, systematic studies on drivers for business model experimentation and innovation is lacking (Foss & Saebi, 2017). However, in most process-oriented conceptualisations of business model innovation, contextual conditions play an essential role. For instance, Demil and Lecocq (2010) argue companies continuously need to make deliberate business model changes to keep the business model in a dynamic disequilibrium with conditions internal or external to the firm. Schneider & Spieth (2013) stress the need to understand business model experimentation and innovation concerning environmental volatility. In an empirical study, Bucherer et al. (2012) find that external and internal threats and opportunities are triggers for business model experimentation and innovation. In empirical research by Giesen et al. (2007), decision-makers mention internal and external drivers as essential motivations for business model change.

HYPOTHESES DEVELOPMENT

Concerning the antecedents of business model experimentation, we focus, like Cortimiglia et al. (2016), Cheng et al. (2014), Pati et al. (2018) and Velu & Jacob (2014), from a contingency perspective on external and internal drivers. The general idea is that innovation is beneficial when firms are in turbulent environments (Stanko et

al., 2013), i.e., dealing with market and technology turbulence, and firms able to exploit their strategic and innovative capabilities (Martinez-Lopez, 2014). This idea is well established (Calantone et al., 2003). An important starting point is that dynamic changes in the environment need to be mirrored by internal competencies focussed on internal innovation and strategic capabilities (Meroño-Cerdan et al., 2017). One of the few studies on technology turbulence and market turbulence concerning business models shows that changing technologies drive firms to rethink their business model (De Reuver et al., 2009).

Internal drivers

As innovation literature typically posits that business models mediate the link from technology innovation to business performance (Chesbrough 2010; Baden-Fuller & Haeflinger, 2013; Molina-Castillo et al., 2012). The underlying assumption is that novel, emergent technologies or innovative products constitute no value in and on themselves but only when accompanied with a suitable business model (Chesbrough & Rosenbloom, 2002; Cavalcante,2011). Business models can enhance the value of technologies and lead to competitive advantage (Bjorkdahl 2009). Innovative technologies developed or adopted by firms may affect business model components or requires architectural changes (Wirtz et al., 2016)

Bouwman et al. (2008) see technology-driven service and product innovation (Molina-Castillo et al., 2012), or the bundling of products and services, as an impetus to business model experimentation, innovation and implementation. According to their model, new services and products drive and enable new ways of value creation, which subsequently leads to new ways of value delivery and capturing. Hence, innovative offerings, like for instance innovation-driven service- product bundling or unbundling,

might require innovative channels and channel mix, more refined market segmentation, boundary-spanning activities, alternative roles fulfilled by new partners (Meroño-Cerdan et al., 2017), sourcing arrangements and so on, in short, new business models (Clauss, 2016). Empirical studies similarly show that new products or services, as proposed by R&D, innovation (Molin-Castillo et al., 2012) or marketing departments (Segers et al., 2007), trigger a need to engage in new ways to commercialise and adjust a business model accordingly (e.g., Giesen et al., 2007:). Our hypothesis is, therefore, posit that:

H1: The more companies engage in internal innovative activities, the more they will also need to engage in business model experimentation.

The relationship between business models and strategy has long been debated (Hedman & Kalling, 2003; Al Debei & Avison, 2010; Teece, 2017). Although most scholars agree that business model innovation, as process and outcome, and strategy are in some way related, there is less agreement on the exact interrelation (Casadesus-Masanell & Zhu, 2013; Chesbrough, 2010; Hedman & Kalling, 2003).

Most scholars argue that business models are the materialisation of a strategy (Al-Debei & Avison, 2010; Cortimiglia, Ghezzi, & German, 2016). Cucculelli and Bettinelli (2015) argue that business model innovation is, therefore, a function of corporate strategic entrepreneurship. Teece (2017) suggests that strategy guides business model design and innovation. While, for instance, Osterwalder, Pigneur, and Tucci (2005) establish a direct link between concepts of customer intimacy, operational excellence and product leadership proposed by Treacy and Wiersema (1993) and components of Osterwalder's ontology. Another example is Markides and Sosa (2013) study in which market entrance strategy and business models are related. Some scholars

argue that strategy is a plan or a way to position a company vis-à-vis its competitors. At the same time, the business model is the actual or operational state of the business logic. For instance, Dahan et al. (2010) state that a strategy describes a path towards a desired future state, and the business model describes the actual state. Casadesus-Mansel & Ricart (2010) define strategy as the contingent plan in which a business model is to be used, whereas a business model is the company's realised strategy. Consistent with this view that business models are snap-shot materialisations of a strategic plan or strategic positioning, a change in strategy will trigger changes in the value proposition, the product offering, like for instance product, service (un) bundling, product and service with greater added value, or servitisation, i.e. replacing paying subscription fees for services instead of paying for product sales (Bouwman et al., 2008), and as such require changes in the business model to remain coherent. Through this reasoning, a change of strategy directly implies that the company's business model may have to be changed. In that sense, experimentation is an intermediate step towards realising or implementing a new business model that aligns with a firm's new strategy (Hayashi, 2009; McGrath, 2010; Sosna et al., 2010). Hence, we hypothesise that:

H2: The more companies engage in strategic (product) renewal, the more they will also need to engage in business model experimentation.

External drivers

Regarding drivers for business model innovation in the firm's environment, turbulence in the environment can originate from within the industry (e.g., competitors introducing new products) and outside the industry (e.g., emerging technological innovations). Both have an impact on the rate and magnitude of changes (Marino et al., 2015). Especially competition, in contrast to cooperation and competition as these relate

to boundary-spanning activities in business model innovation, appears to be crucial. Johnson et al. (2008) point to competitive pressure or a shifting base of competition as reasons to develop new business models. A study by Pauwels and Weiss (2008) shows how a firm has to change the value-capturing mechanisms of its business model due to a competitor's behaviour. Competition-related changes in the environment are found as one of the two main drivers for business model innovation in the empirical study by De Reuver et al. (2009).

Several scholars expressly point to the intensity of competition as a driver for business model innovation. Doz & Kosonen (2010) argue that business model innovation is a necessary response to intense competition. Voelpel et al. (2005) argue that business model innovation is a way to deal with intense competition because firms can avoid competing directly on identical business models. In case studies from Casadesus-Mansel and Ricart (2010), competition intensity was the primary reason for companies to change their business model. Hence, we hypothesise that:

H3: The more companies need to respond to external competitive intensity, the more they will also need to engage in business model experimentation.

Besides competition, firms often have to change or adapt their business model in response to emerging technologies and radical innovations (Bohnsack et al., 2014; Bouwman et al., 2018b; Cavalcante, 2013). Chesbrough (2010) notes that technological advancements force organisations to change their business model. In empirical work, technology characteristics (Martinez-Lopez, 2014), like, for instance control over intellectual property rights, affect the choice of business models (Pries & Guild, 2011). Although some more technologies and incremental innovations enable day-to-day operations, these seldom lead to radical business model innovation.

Especially technological turbulence appears to drive business model innovation, as the empirical study by De Reuver et al. (2009) shows. In several case studies, companies change their business model in response to rapid changes in technologies, i.e., drivers that enable new business models, for instance, among other things, social media technologies or web 2.0 technologies (Wirtz, Schilke & Ulrich, 2010), digital transformation (Ritter and Pedersen 2020)(Berman, 2012), platforms (Muzellec et al., 2015), Internet of Things-ecosystems (Leminen et al., 2012), Big Data (Hartmann et al., 2016), or technical innovations in logistics (Chapman et al., 2003), energy (Richter, 2017) or the mobility industry (Tongur, & Engwall, 2014). However, we don't focus on a specific type of technology or technology characteristics (Martinez-Lopez, 2014) per se since we want to generalise towards SMEs in any industry sector (Gamble et al., 2020). Although there are some generic trends, like digital transformation (Ritter and Pedersen 2020) or renewable energy, technology turbulence might be industry-specific, like, for instance, developments in material sciences or biotech. Hence, we hypothesise that:

H4: The more companies are confronted with external technological turbulence, the more they will also need to engage in business model experimentation.

The overall theoretical model is shown in figure 1.

<Insert figure 1 about here>

METHODOLOGY

Data collection

Our population is European SMEs in any industry that conducts business model innovation. Respondents are sampled based on a database acquired from Dun &

Bradstreet. This company regularly collects data on businesses, their executives, industry classification and contact information from Chambers of Commerce and other organisations in multiple countries. In order to achieve a geographical spread over Europe and not to translate the questionnaires in all 25 languages, in each region of Europe, a large and small country with a considerable number of SMEs is selected. For instance, Germany has about three mln. SMEs (Eurostat data, 2012), while Austria has, for instance, 339.000 SMEs. Both represent Central Europe. Poland (about two mln. SMEs), Lithuania (150.000 SMEs) and Slovenia (328.000 SMEs) can be considered to represent the Eastern Europe region. Sweden (736.000 SMEs) and Finland (291.000 SMEs) are more Nordic. The U.K. (about two mln. SMEs), France (three mln. SMEs) and the Netherlands (almost one mln. SMEs) represent the more Western part of Europe. Italy (four mln. SMEs), Spain (three mln) and Portugal 808.000 SMEs) represent the Southern part of Europe.

We strived for almost equal distribution per country. Also, quotas are established for micro-enterprises, small and medium-sized enterprise (33%-33% -33%). No quotas are defined for industry sectors, which would make the sampling procedure even more complicated. Agriculture, public administration, and non-market household activities are excluded, as is common in research on European SMEs. Initially, we strived for a sample of about 300 responses per country. However, collecting data on SMEs actually involved in business model innovation was cumbersome due to response and incidence rates, e.g. identifying SMEs that are actually engaged in business model innovation (see Table 1). Hours spend on collecting data by the research agency were 6706.

<Insert table 1 about here>

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 system. Based on quota sampling, companies were randomly selected, and key respondents (owners or business model innovation managers) approached. The survey included questions about size and industry sector to confirm that the approached companies were indeed part of the intended population. Answering the questions did take 28 minutes on average.

As mentioned, only companies are included that were engaged in changing their business model in the past 24 months, to avoid responses without variation on any of our constructs. To do so, filter questions were applied at the start of each interview (Lee & O'Connor, 2003). Since most SMEs are not aware of the business model concept, a generic question and four specific filter questions were formulated, addressing aspects of a business model in everyday business language (Langerak, Hultink, & Robben, 2004); see Table 2. Each filter question reflects one of the dimensions of business models, i.e., value creation, delivery, and capturing (Teece, 2010). Only if the answer to at least one filter question was positive, the respondent was included in the sample. In total, 37% of the respondents answered positively on the first filter question. In comparison, between 45% and 67% responded positively to the other filter questions and was next included in the sample, yielding 929 valid responses.

<Insert table 2 about here>

Micro firms, up to 10 employees, account for 35% of the sample used. Small firms, between 10 to 50, account for 34% and Medium-sized firms, 50 up to 250 employees, for 31%. Business model innovation is most prominent in the service

industry (18%), manufacturing (15%), wholesale and retail (14%), construction (10%) and hospitality industry (7%), and least explicit in mining, waste management and energy-related industries. About 20% of firms engaged in business model innovation are a start-up, and 55% are family businesses. Of the manager/owner, 82% are males, although females are active in decision-making processes in 75% of the companies. Country specific samples of SMEs, actively engaged in business model experimentation, varies between 64 to 89 responses.

The suitability of respondents to answer the questionnaire was tested, as well as their degree of knowledge regarding the company's activities (Atuahene-Gima, 2005). Specifically, respondents were asked to indicate their degree of knowledge (1 = "very limited knowledge" to 7 = "very substantial knowledge") concerning 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.

Measures

Questionnaire items were adapted from prior scales; see Table 3. Competitive intensity and technology turbulence were measured using broadly accepted scales adapted from Jaworski and Kohli (1993). Innovation activity was measured using a scale from the Community Innovation Survey (CIS), which is the harmonised survey instrument used by all European Union statistical offices. Strategic changes were measured with a four-item scale from Zott and Amit (2008).

<Insert table 3 about here>

For business model experimentation, no pre-existing scales are available. Based on the study by Sosna et al. (2010), we argue that the time and resources that companies

attribute contributes to their business model experimentation. The questionnaire item explained to respondents that business model innovation might take the form of any of the examples mentioned in the filter questions (see Table 2). Next, they were asked about how they deal with business model experimentation in the enterprise. We are not so much focusing on the actions of experimentation per se, but more into whether the practice of examining business models is done in a purposeful and systematic/methodological way. The survey items in Table 3 on business model experimentation focus on this: a purposeful and methodological practice of experimenting with business models would be reflected in the experiments themselves (item 1), the existence of dedicated teams (item 2) and the existence of a budget to support the experiments (item 3).

The measures, as included in the questionnaire, were pre-tested and validated through seven in-depth interviews with SME managers with a focus on clarity, complexity, brevity, and consistency. The questionnaire was also reviewed by eight involved researchers from different European universities. 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 the consistency between translations by native speakers from the research agency. Before the actual data collection took place, the questionnaire was pre-tested again in trial interviews by native speakers from the research agency for every country. During the process, minor changes were made, but the core of the questionnaire remained the same.

Common method variance (CMV) is a frequent problem in survey studies that rely on a single informant for each firm. To assess the potential risk of CMV, several tests were conducted. Firstly, the latent method factor approach was applied (Podsakoff, Mackenzie, Lee, & Podsakoff, 2003), which takes into account the covariance among the measures in each construct and a common construct for all measures. The results indicate that there is no common factor for all our constructs. Secondly, the marker variable technique was used from Lindell and Whitney (2001). Using a series of chi-square difference tests, we found that correlations were consistent among adjusted and unadjusted correlation matrices. Thirdly, the test was used as suggested by Malhotra, Kim, and Patil (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 was not statistically different.

RESULTS

Overall model

To test our hypotheses, we used variance-based structural equation modelling and the software ADANCO 2.0 (Henseler, Ringle, & Sarstedt, 2015). This method uses a composite scale for each of the constructs in our study. Traditional approaches to measure constructs rely on reflective or formative approaches (Jarvis et al., 2003). Recently, the composite approach has emerged as an alternative way to construct scales and to eliminate the weaknesses of existing formative methods. The composite approach is similar to the formative way of building a measurement scale. However, in contrast to formative approaches, the composite approach contains no error term for the constructs, causality between constructs and indicators is not specified, and co-variation between constructs and indicators is not defined (Henseler et al., 2015).

To test the accuracy of the model, the software analyses the discrepancy between the empirical and the model-implied correlation matrix (Dijkstra & Henseler, 2015). The fit of the model is evaluated using the standardised root mean square residual (SRMR) that should not exceed the benchmark value of .08. (Hu & Bentler, 1999). For evaluating reliability, composite approaches use the measure of internal consistency reliability ρA and more traditional measures such as Jöreskog's rho and Cronbach's alpha. Overall results in Table 3 indicate the acceptable model fit and reliability.

Based on recent studies (Henseler et al., 2015; Voorhees, Brady, Calantone, & Ramirez, 2016), the heterotrait-monotrait (HTMT) ratio of discriminant validity is to be preferred over more traditional methods such as the confidence interval by Anderson and Gerbing (1988) confidence interval or Fornell and Larcker (1981) AVE – correlation comparison test. The HTMT test requires calculating an HTMT 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 none of the values exceeds the benchmark value of .85, see Table 4.

<Insert table 4 about here>

To test the hypotheses in our model, we examine the path coefficients from ADANCO 2.0. A path coefficient shows the change in the dependent variable based on a difference in the independent variable while the rest of the constructs remain constant. Bootstrapping is used to obtain confidence intervals of the estimations of path values. The overall adjusted R2 of business model experimentation equals .24. The results in

figure 2 show that all hypotheses were supported except H3, which suggested an impact of competitive intensity on business model experimentation.

<Insert figure 2 about here>

Although this result looks rather straightforward, the results can be more nuanced if we detail our analysis by looking into ways how these overall results might work out differently for different group of SMEs.

Dual Scaling technique

Therefore, we have decided to go deeply into the results with the new approach. The goal is to to seek multidimensional principal coordinates for the non-numerical data we have. As we have already mention, the method used to do so is called Dual Scaling. Based on the matrix of coordinates this method produces groups. As input variables for the Dual Scaling, we use the five specific filter questions, plus size and age of the firms, which leads to 192 possible patterns of responses. The results for the relevant dimensions are displayed in Table 5.

<Insert table 5 about here>

The information contained in Table 5 is plotted on Figure 3 for the first two dimensions (see Nishisato et al., 2021 for a comprehensive description of the different ways to present graphically the results). The first dimension contains 60.3% of the initial information in the input matrix and clearly distinguishes companies that have answered `yes' from those that answered `no' on the selection questions. As can be noticed, the answer to the first selection question (e.g., did you do business model

innovation in the past 24 months?) and the question on value creation play an important role in the dimension. The age of the company is not relevant to the first dimension, but it is in the second one.

<Insert figure 3 about here>

Subsequently, relevant groups within the dimensional space we have found with Dual Scaling. We see three patterns, as displayed in Figure 4. Group 1 (33% of respondents) contains firms that say `yes' to most filter questions and hence are engaged in forms of business model experimentation that address multiple components of the business model. Group 2 (51% of respondents) mainly consists of small firms in the sample, with little differentiation regarding the filter questions. Group 3 (16% of respondents) has mainly `no' for the filter questions and comprises a few of the start-ups and are most likely to focus on a single business model component.

<Insert figure 4 about here>

We also check the homogeneity of the groups across each of the countries in our study. As it can be observed in figure 5, group 1, group 2 and group 3 are evenly distributed among the countries, confirming that each type is present in each of countries.

<Insert figure 5 about here>

Next, we compute the path weights for our structural model for the three groups, see Table 6. Overall, we find that the path weights are similar across the three groups.

<Insert table 6 about here>

DISCUSSION

This study examined the internal and external drivers for business model experimentation by firms that already had established business models. We find that external drivers of technological turbulence are the more important trigger for business model experimentation and not external competitive intensity. Further, strategic changes rather than innovative activities are the most critical internal drivers. This section compares our results to related work and theory on business model experimentation and environmental turbulence.

The European SMEs from this study are engaged in business model experimentation, i.e. business model innovation as a process, and as such, drivers for business model experimentation are core. We find that the motivation to start business model experimentation is mainly motivated by a strategic focus on product/service innovation and by an internal focus on how innovative technologies can be exploited in concert with external technology turbulence. Our research also contributes to a more in-depth insight into the discussion of differences between different groups of SMEs. Some firms are experimenting with multiple components, confirming earlier case study findings of Heikkilä et al. (2018). With less fixed business models, younger and micro firms continue to experiment, as also proposed by Heikkilä et al. (2018). While the last group of SMEs only looks into changing a single business model component.

In contrast to earlier studies, we find that SMEs that experiment with their business model in response to competitive pressures do not attribute more resources and time. Even though SMEs may change their business model in response to competition intensity, they are not likely to spend resources or time on experimentation and trying out their new business model. Most likely, this can be explained by the fact that managerial capacity in SMEs is limited, and time to reflect on activities, business models, and product-markets is limited (Kesting & Günzel-Jensen, 2015). Also, time to

experiment and to free up resources might be constrained. This finding is in contrast with various conceptual (Doz & Kosonen et al., 2010; Voelpel et al., 2005) as well as empirical studies with large firms (Pauwels & Weiss, 2008; De Reuver et al., 2009), and thus suggests that SMEs respond differently to competition intensity than large firms. Our finding is also inconsistent with popular belief, for instance, among policymakers and consultants, that business model experimentation is a way for companies to overcome competition. Generally speaking, one would expect that, when the competition is fierce, companies will look for alternative business models and strategies, as proposed in the Blue Ocean strategy (Chan & Mauborgne, 2005; Kim, 2005), while in practice, most SMEs are only experimenting with a limited number of components of their business model (Gamble et al., 2020).

Moreover, it might be essential to focus on the reason why SMEs experiment with their business model. Business model experimentation motivated by competitive turbulence might be directed towards achieving growth, for instance, in a Red Ocean strategy (Chan & Mauborgne, 2005; Kim, 2005). An alternative explanation might be that the companies focus on profitability (Stanko et al., 2015) and adjust their business model accordingly. These firms focus on single business model components and cost-cutting, operations, and efficiency, as shown in an extensive case study on strategic choices and business model paths (Heikkila et al., 2018, see also Zott & Amit, 2008). However, SMEs might not be able to free up financial and human resources when they struggle to survive.

Consistent with earlier studies, we find that technological turbulence positively impacts resources dedicated to business model experimentation. This finding is in line with existing conceptualisations that business model experimentation results from technological advances (Chesbrough, 2010). As digital transformation, platformization,

changes in cyber-physical systems, energy systems, material sciences, bio-tech and logistic systems are starting to affect SMEs in any industry sector (Ritter and Pedersen 2020), the impact of technological turbulence on business model experimentation may be on the rise. Typically, external technology turbulence will affect internal motivations to innovate products and services, and motivate business model experimentation accordingly.

In line with our hypotheses, our results suggest that internal innovative activities trigger business model experimentation. This finding lends empirical support to existing literature, which is mainly conceptual and case-based, and typically indicates that product and service innovation, enabled by new technologies, should go hand-in-hand with business model experimentaion (Chesbrough 2010; Chesbrough & Rosenbloom 2002), as is also illustrated on the many publications on new technologies and application that trigger new, innovative business models (Meroño-Cerdan et al., 2017). From this, we argue that business model experimentation and product and service innovation go hand-in-hand: when the value proposition changes due to a novel offering, the business model has to be adapted as well. The finding also supports design-oriented views on business models, which prescribe that service and product innovation should be a starting point of exploring new ways of value creation and delivery (Bouwman et al., 2008).

Our results confirm that strategic activity, focusing on product-market renewal, is an essential driver for business model experimentation, which is in line with previous findings (Cortimiglia et al., 2016; Zott & Amit, 2007, 2008). When the strategy changes, SMEs start to invest time and resources into exploring new business models that fit the new strategy (Stanko et al., 2015). An explanation is that new strategies can only be implemented through new business models. In this way, our study contributes to

understanding the interrelation between strategy and business models (Hedman & Kalling, 2003). It supports the idea that business models are valuable to implement strategic changes (Al-Debei & Avison, 2010). The finding also supports the conceptual idea that experimentation is an intermediate step to realise new business models that fit company strategy (McGrath, 2010; Sosna et al., 2010; Stanko et al., 2015).

Possibly, the choice to spend resources and time experimenting with business models is more endogenous than exogenous to the firm. Promotion by the European Community, national governments and advisory agencies, as well as education on business model innovation in management, entrepreneurship and technical courses, might have an independent effect, with as a result, that firms may be inclined to spend more time and resources on business model experimentation regardless of the contextual conditions they face. Such an explanation could be in line with the fact that business model thinking is only recently gaining momentum, thanks to the business model canvas popularisation (Osterwalder & Pigneur, 2010). This proliferation has yet to reach the list of mainstream SMEs.

The robustness of our findings across different sub-groups of SMEs is an essential contribution for several reasons. Our dual scaling analysis shows that technological turbulence, strategic change, and innovation activities similarly affect SMEs of group 2 (mainly young firms with established business models) and group 3 (experiment few elements of business model innovation). In contrast, technological turbulence is not so relevant for business model experimentation in group 1 (experiment with multiple business model elements). Our dual scaling analysis shows that the findings are also mostly robust for underlying groups of firms that innovate on fewer or more elements of the business model. However, the effect sizes are slightly different. One could argue that larger SMEs have a greater need to experiment with business

models since managers need to exchange, communicate and gather broad support for new business model ideas, which is an acclaimed benefit of business model thinking (Pateli & Giaglis, 2004). However, our findings show that these affordances of business model experimentation in larger SMEs do not amplify the impact of internal and external drivers.

Regarding SME age, the robustness of our model is noteworthy as well. Business model experimentation proponents claim that especially young start-ups need to engage in business model experimentation , and it could be critical to developing team innovation inside the organisation (Moser et al., 2019). For instance, the lean management movement argues that finding a viable and scalable business model is the sole task of any start-up (Blank, 2013). Especially start-ups may thus experience more influential internal drivers to change their business model as their strategy is unfolding and as they are creating new products, technologies, and services. However, our findings show that such different contextual conditions do not amplify the impact of any of our internal and external drivers.

MANAGERIAL IMPLICATIONS

Our results show that technological turbulence, strategic change, and internal innovation activities are significantly related to resources and time spent on business model experimentation in SMEs. As extant literature shows, business model experimentation contributes to the performance and innovativeness of firms (Amit & Zott, 2007; 2008; Stanko et al., 2013), these antecedents are essential to take into account.

Our finding that fierce competition is not a significant driver to spend more resources on business model experimentation provides a vital basis to reflect on managerial practice in SMEs. Not dedicating time and resources to evaluating new

business models creates the risk that business models have implemented that turn out to be non-viable and lacks robustness in the end (cf. Christensen et al., 2016; Haaker et al., 2018). As such, while SME managers may be tempted to change their business models quickly in times of fierce competition, we argue that it might be more effective in the long run to proportionally increase the time and resources spent on business model experimentation. It is also essential for managers to consider if their experimentation with business models is growth or profit-driven. A growth-driven strategy might be more intense and require prolonged experimentation and considering many business model elements, while a profit focus might require less effort and experimentation.

The results are also crucial for advisors to SMEs. Although many industry organisations 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.

Our study shows that a focus on internal innovation activity, strategic change in product and markets, and technological turbulence significantly increases SMEs' resources and time on business model experimentation. Our research is among the first to quantitatively explore the antecedents of business model experimentation, which has primarily been unstudied in existing business model literature (Foss & Saebi, 2017). Our study lends empirical support to the research on why companies engage in business model experimentation, which is to date mostly conceptual and case-based. Our finding that competition intensity does not significantly affect business model experimentation calls for more research for understanding the decisions and trade-offs SMEs make in investing in business model experimentation when facing high competition and time pressures to innovate.

LIMITATIONS AND FUTURE RESEARCH GUIDELINES

We acknowledge that our study could suffer from some limitations. A limitation of this paper is the use of cross-sectional data. We did not examine potential interplay and feedback loops between the internal drivers and business model experimentation. For instance, business model experiments often lead to new insights about strategy, which in turn leads to strategic change. Similarly, business model experiments can make SMEs aware of the need to improve their offerings or supporting technologies, which may, in turn, increase innovation activities. Longitudinal survey research or case study research can examine these feedback loops and complex causalities. Moreover, combining our cross-sectional data with more objective, external data, for instance, census data on performance, would be advisable. However, due to restriction concerning privacy set by the involved university, national and international regulators, federating our data with census data was not allowed.

The effect sizes of our findings are relatively modest. A potential explanation is that our population is relatively broad, and then contextual differences between industries moderate the relations found. It is, therefore, to be expected that effect sizes can be more significant when focusing on specific industries. Although we took the four most prominent internal and external drivers as discussed in existing literature, other factors affect the extent to which SMEs engage in business model experimentation. It would be interesting to explore a more specified set of drivers, for instance, for technology turbulence trends concerning, among other things, digital transformation, energy transition, and new materials might be interesting (Ritter and Pedersen 2020); about competition, platformitization and complement or turbulence might be interesting to explore in more detail. While for instance, internal drivers could be related to the product, organisational innovation and business process redesign, dynamic capabilities,

Innovation teams and culture. Concerning strategy repositioning, strategic retaliation, product market strategy might be explored in more detail.

Similarly, we did not examine the impact of business model experimentation on the performance and innovativeness of firms (Stanko et al., 2013). Hence, our findings do not provide direct support for normative claims on what SMEs should do in a specific contextual situation (Meroño-Cerdan et al., 2017). Still, the empirical knowledge base is increasing that business model innovation does contribute to firm performance (Zott & Amit, 2007; 2008; Foss & Saebi 2017). A future research direction would be to examine the interplay of antecedents and consequences of business model innovation to determine under which particular contextual conditions business model experimentation is most likely to pay off most.

A limitation in the data collection is our reliance on single informants per firm. Although we tried to involve more than one informant, specifically in larger SMEs, in practice doing so was difficult. At the same time, the common method bias tests suggest that single-informant related risks do not affect our findings significantly.

Another limitation of our research is that we primarily focussed on the population of SMEs in Europe engaged in business model innovation, but that due to a lacking sample frame (there is no repository of European SMEs engaged in business model innovation), high costs and intense efforts related to offering the questionnaire in local languages and requirements set by the Euroean Union, our sample offers a first proxy of the population. Our best effort approach to achieve representativeness allows us only to draw a rather holistic and undifferentiated picture of how generic internal and external drivers play a role. While we were able to examine subgroups of the population regarding SME size and age, we could not, due to the sample size, compare countries or industries, or take differences in specific market structures in which SMEs operate, the

specific positions of individuals SME within the market, the complexity of modern markets, or assess the impact and nature of specific modular or architectural technological changes an SME has to deal with, into account. More detailed research on institutional economics as well as cultural differences may be relevant as European SMEs are very heterogeneous and diverse, as are the markets in which they operate. Next to these differences in macro- conomic systems, markets, and industries, research might take, for instance, micro economic elements like, if the SME is a family business or part of a larger entity, or entrepreneur-related characteristics, for instance, education or gender, into account. Future research could examine the moderating effects of these background characteristics of SMEs or focus on a less generic population.

REFERENCES

Achtenhagen, L., Melin, L., & Naldi, L. (2013). Dynamics of business models–strategising, critical capabilities and activities for sustained value creation. Long range planning, 46(6), 427-442.

Al-Debei, M. M., & Avison, D. (2010). Developing a unified framework of the B.M. concept. European Journal of Information Systems, 19(1), 359-376.

Afuah, A., & Tucci, C.L. (2002). Internet Business Models: A Strategic Management approach. New York: Mc-Graw-Hill.

Anderson, J. C., & Gerbing, D. W. (1988). Structural equation modelling in practice: A review and recommended two-step approach. Psychological Bulletin, 103(3), 411-423.

André Cavalcante, S. (2013). Understanding the impact of technology on firms' business models. European Journal of Innovation Management, 16(3), 285-300.

Andries, P., Debackere, K., & Looy, B. (2013). Simultaneous experimentation as a learning strategy: business model development under uncertainty. Strategic Entrepreneurship Journal, 7(4), 288-310.

Aspara, J., Hietanen, J., & Tikkanen, H. (2010). Business model innovation vs replication: financial performance implications of strategic emphases. Journal of Strategic Marketing, 18(1), 39-56.

Atuahene-Gima, K. (2005). Resolving the capability-rigidity paradox in new product innovation. Journal of Marketing, 69(3), 61-83.

Aziz, S. A., & Mahmood, R. (2011). The relationship between business model and performance of manufacturing small and medium enterprises in Malaysia. African Journal of Business Management, 5(22), 8918-8932.

Baden-Fuller, C., & Haefliger, S. (2013). Business models and technological innovation. Long range planning, 46(6), 419-426.

Baden-Fuller, C., & Morgan, M. S. (2010). Business models as models. Long Range Planning, 43(2), 156-171.

Berends, H., Smits, A., Reymen, I. & Podoynitsyna, K. (2016). Learning while (re) configuring: Business model innovation processes in established firms. Strategic Organization 14(3), 181-219.

Berman, S. J. (2012). Digital transformation: opportunities to create new business models. Strategy & Leadership. 16 (2) 16-24

Björkdahl, J. (2009). Technology cross-fertilisation and the business model: The case of integrating ICTs in mechanical engineering products. Research Policy, 38(9), 1468-1477.

Blank, S. (2013). Why the lean start-up changes everything. Harvard Business Review, 91(5), 63-72.

Bohnsack, R., Pinkse, J., & Kolk, A. (2014). Business models for sustainable technologies: Exploring business model evolution in the case of electric vehicles. Research Policy, 43(2), 284-300.

Bouwman, H., de Vos, H., & Haaker, T. (Eds.). (2008). Mobile service innovation and business models. Heidelberg, Germany: Springer Science & Business Media.

Bouwman, H., J. Heikkilä, M. Heikkilä, C. Leopold, & T. Haaker (2018a). Achieving agility by Business Model Stress testing. Electronic Markets. 28,149–162

Bouwman, H., Nikou, S., Molina, F., & M. de Reuver (2018b). The Impact of Digitalization on Business Models. Journal of Digital Policy, Regulation and Governance. 20 (2), 105-124.

Bouwman, H., M. de Reuver, M. Heikkilä & E. Fielt. (2020). Business Model Tooling: Where research and practice meet, Electronic Markets, In press.

Bucherer, E., Eisert, U., & Gassmann, O. (2012). Towards systematic business model innovation: lessons from product innovation management. Creativity and Innovation Management, 21(2), 183-198.

Calantone, R., Garcia, R., & Dröge, C. (2003). The effects of environmental turbulence on new product development strategy planning. Journal of product innovation management, 20(2), 90-103.

Casadesus-Masanell, R., & Ricart, J. E. (2010). From strategy to business models and onto tactics. Long range planning, 43(2), 195-215.

Casadesus-Masanell, R., & Zhu, F. (2013). Business model innovation and competitive imitation: The case of sponsor-based business models. Strategic management journal, 34(4), 464-482.

Cavalcante, S. A. (2013). Understanding the impact of technology on firms' business models. European Journal of Innovation Management. 16 (3) 285-300

Cavalcante, S., Kesting, P., & Ulhøi, J. (2011). Business model dynamics and innovation:(re) establishing the missing linkages. Management decision. 49 (8) 1327-1342

Chan, K., & Mauborgne, R. (2005). Blue ocean strategy. Harvard Business School Press.

Chapman, R. L., Soosay, C., & Kandampully, J. (2003). Innovation in logistic services and the new business model. International journal of physical distribution & logistics management. 33 (7) 630-650

Cheng, C., Shiu, E., & Dawson. J. (2014). Service Business Model and Service Innovativeness. International Journal of Innovation Management, 18(2), 27.

Chesbrough, H. & Rosenbloom, R.S. (2002). The role of the business model in capturing value from innovation: evidence from Xerox Corporation's technology spin-off companies. Industrial and Corporate Change 11(3), 529-555.

Chesbrough, H. (2010). Business model innovation: opportunities and barriers. Long Range Planning, 43(1), 354-363.

Christensen, C. M., Bartman, T., & Van Bever, D. (2016). The hard truth about business model innovation. MIT Sloan Management Review, 58(1), 31.

Clauss, T. (2017). Measuring business model innovation: conceptualisation, scale development, and proof of performance. R&D Management 47(3), 385-403.

Cortimiglia, M. N., Ghezzi, A., & German, A. (2016). Business model innovation and strategy making nexus: evidence from a cross-industry mixed-methods study. R&D Management, 46(3), 414-432.

Cucculelli, M., & Bettinelli, C. (2015). Business models, intangibles and firm performance: evidence on corporate entrepreneurship from Italian manufacturing SMEs. Small Business Economics, 45(1), 329-350.

Dahan, N. M., Doh, J. P., Oetzel, J., & Yaziji, M. (2010). Corporate-NGO collaboration: Co-creating new business models for developing markets. Long range planning, 43(2), 326-342.

De Reuver, M., Bouwman, H., & Haaker, T. (2013). Business model roadmapping: A practical approach to come from an existing to a desired business model. International Journal of Innovation Management, 17(01), 1-13.

De Reuver, M., Bouwman, H., & Maclnnes, I. (2009). Business model dynamics: a case survey. Journal of theoretical and applied electronic commerce research, 4(1), 1-11.

Demil, B., & Lecocq, X. (2010). Business model evolution: in search of dynamic consistency. Long range planning, 43(2), 227-246.

Dijkstra, T. K., & Henseler, J. (2015). Consistent partial least squares path modeling. MIS Quarterly, 39(2), 297-316.

Doz, Y. L., & Kosonen, M. (2010). Embedding strategic agility: A leadership agenda for accelerating business model renewal. Long range planning, 43(2), 370-382.

Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. Journal of Marketing Research, 18(1), 39-50.

Foss, N. J., & Saebi, T. (2017). Fifteen Years of Research on Business Model Innovation: How Far Have We Come, and Where Should We Go? Journal of Management, 43(1), 200-227.

Frankenberger, K., Weiblen, T., & Gassmann, O. (2013). Network configuration, customer centricity, and performance of open business models: A solution provider perspective. Industrial Marketing Management, 42(5), 671-682.

Gamble, Jordan Robert, Eric Clinton, & Vanessa Díaz-Moriana (2020), "Broadening the business model construct: Exploring how family-owned SMEs co-create value with external stakeholders," Journal of Business Research.

Giesen, E., Berman, S. J., Bell, R., & Blitz, A. (2007). Three ways to successfully innovate your business model. Strategy & leadership, 35(6), 27-33.

Haaker, T., Bouwman, H., Janssen, W., & de Reuver, M. (2017). Business model stress testing: A practical approach to test the robustness of a business model. Futures, 89, 14-25.

Haggège, M., Gauthier, C., & Rüling, C. C. (2017). Business model performance: five key drivers. Journal of Business Strategy. 38(2), 6-15.

Hartmann, P., Zaki, M., Feldmann, N., & Neely, A. (2016). Capturing value from big data – a taxonomy of data-driven business models used by start-up firms. International Journal of Operations and Production Management, 36 (10), 1382-1406

Hayashi, A. M. (2009). Do you have a" plan B"?. MIT Sloan Management Review, 51(1), 10.

Hedman, J., & Kalling, T. (2003). The business model concept: theoretical underpinnings and empirical illustrations. European Journal of Information Systems, 12(1), 49-59.

Heikkilä, M., H. Bouwman, & J. Heikkilä (2018). From Strategic Goals to Business Model Innovation Paths: an exploratory study. Journal of Small Business and Enterprise Development. 25 (1) 107-128

Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modelling. Journal of the Academy of Marketing Science. 43(1), 115-135.

Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. Structural Equation Modeling, 6(1), 1-55.

Huang, H.-C., Lai, M.-C., Kao, M.-C., & Chen, Y.-C. (2012). Target Costing, Business Model Innovation, and Firm Performance: An Empirical Analysis of Chinese Firms. Canadian Journal of Administrative Sciences. 29(1), 322-335.

Jarvis, C. B., MacKenzie, S. B., & Podsakoff, P. M. (2003). A critical review of construct indicators and measurement model misspecification in marketing and consumer research. Journal of consumer research, 30(2), 199-218.

Jaworski, B. J., & Kohli, A. K. (1993). Market Orientation: Antecedents and Consequences. Journal of Marketing, 57(3), 53-70.

Johnson, M. W., Christensen, C. M., & Kagermann, H. (2008). Reinventing your business model. Harvard business review, 86(12), 57-68.

Kesting, P., & Günzel-Jensen, F. (2015). SMEs and new ventures need business model sophistication. Business Horizons, 58(3), 285-293.

Kim, W. C. (2005). Blue ocean strategy: from theory to practice. California management review, 47(3), 105-121.

Kim, S. K., & Min, S. (2015). Business model innovation performance: when does adding a new business model benefit an incumbent?. Strategic Entrepreneurship Journal, 9(1), 34-57.

Kummitha, R.K.R. (2019). Design thinking in social organisations: Understanding the role of user engagement. Creativity and Innovation Management, 28(1), 101-112.

Lambert, S. C., & Davidson, R. A. (2013). Applications of the business model in studies of enterprise success, innovation and classification: An analysis of empirical research from 1996 to 2010. European Management Journal, 31(6), 668-681.

Langerak, F., Hultink, E. J., & Robben, H. S. J. (2004). The role of predevelopment activities in the relationship between market orientation and performance. R&D Management, 34(3), 295-309.

Lee, Y., & Colarelli O'Connor, G. (2003). The impact of communication strategy on launching new products: The moderating role of product innovativeness. Journal of Product Innovation Management, 20(1), 4-21.

Leminen, S., Westerlund, M., Rajahonka, M., & Siuruainen, R. (2012). Towards IOT ecosystems and business models. In Internet of things, smart spaces, and next generation networking (pp. 15-26). Springer, Berlin, Heidelberg.

Lindgren, P. (2012). Business Model Innovation Leadership: How Do SME's Strategically Lead Business Model Innovation? International Journal of business and management, 7(14), 53.

Lindell, M. K., & Whitney, D. J. (2001). Accounting for common method variance in cross-sectional research designs. Journal of Applied Psychology, 86(1), 1111-1125.

Malhotra, N., Kim, S., & Patil, A. (2006). Common method variance in I.S. research: A comparison of alternative approaches and a reanalysis of past research. Management Science, 52(12), 1865-1883.

Markides, C., & Sosa, L. (2013). Pioneering and first mover advantages: the importance of business models. Long Range Planning, 46(4), 325-334.

Martins, L. L., Rindova, V. P., & Greenbaum, B. E. (2015). Unlocking the hidden value of concepts: A cognitive approach to business model innovation. Strategic Entrepreneurship Journal, 9(1), 99-117.

Massa, L., Tucci, C. L., & Afuah, A. (2017). A critical assessment of business model research. Academy of Management Annals, 11(1), 73-104.

McGrath, R. G. (2010). Business models: A discovery driven approach. Long range planning, 43(2), 247-261.

Martinez-Lopez, Francisco J. (2014). Handbook of Strategic e-Business Management. Springer. ISBN: 978-3-642-39747-9.

Meroño-Cerdán, Angel L., Carolina López-Nicolás, and Francisco J. Molina-Castillo (2017). Risk aversion, innovation and performance in family firms, Economics of Innovation and New Technology, 27 (2), 189-203.

Mezger, F. (2014). Toward a capability-based conceptualisation of business model innovation: insights from an explorative study. R&D Management, 44(5), 429-449.

Molina-Castillo, Francisco-Jose, Lopez-Nicolas, Carolina and Soto-Acosta, Pedro. (2012). Interaction effects of media and message on perceived complexity, risk and trust of innovative products. European Management Journal, 30(6), 577-587.

Morris, M., Schindehutte, M., & Allen, J. (2005). The entrepreneur's business model: toward a unified perspective. Journal of business research, 58(6), 726-735.

Moser, K.S., Dawson, J.F. & West, M.A. (2019). Antecedents of team innovation in health care teams. Creativity and Innovation Management 28(1), 72-81.

Muzellec, L., Ronteau, S., & Lambkin, M. (2015). Two-sided Internet platforms: A business model lifecycle perspective. Industrial Marketing Management, 45, 139-150.

Nishisato, S. (1980). Analysis of Categorical Data: Dual Scaling and Its Applications. University of Toronto Press, Toronto.

Nishisato, S., Beh, E.J., Lombardo, R. Clavel, J. (2021). Modern Quatification Theory: Joint Graphical Display, Biplots and Alternatives. Springer Singapore.

Osorio, F., Dupont, L., Camargo, M., Palominos, P., Peña, J.I. & Alfaro, M. (2019). Design and management of innovation laboratories: Toward a performance assessment tool. Creativity and Innovation Management 28(1), 82-100.

Osterwalder, A., & Pigneur, Y. (2010). Business model generation: a handbook for visionaries, game changers, and challengers. John Wiley & Sons.

Osterwalder, A., Pigneur, Y., & Tucci, C. L. (2005). Clarifying business models: origins, present, and future of the concept. Communications of the Association for Information Systems, 16(1), 1-25.

Pateli, A. G., & Giaglis, G. M. (2004). A research framework for analysing eBusiness models. European journal of information systems, 13(4), 302-314.

Pati, R. K., Nandakumar, M. K., Ghobadian, A., Ireland, R. D., & O'Regan, N. (2018). Business model design–performance relationship under external and internal contingencies: Evidence from SMEs in an emerging economy. Long Range Planning, 51(5), 750-769.

Pauwels, K., & Weiss, A. (2008). Moving from free to fee: How online firms market to change their business model successfully. Journal of Marketing, 72(3), 14-31.

Podsakoff, P. M., Mackenzie, S. B., Lee, J., & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. Journal of Applied Psychology, 20(5), 879-903.

Priem, R. L., Wenzel, M., & Koch, J. (2018). Demand-side strategy and business models: Putting value creation for consumers center stage. Long range planning, 51(1), 22-31.

Pries, F., & Guild, P. (2011). Commercialising inventions resulting from university research: Analysing the impact of technology characteristics on subsequent business models. Technovation, 31(4), 151-160.

Pucci, T., Nosi, C., & Zanni, L. (2017). Firm capabilities, business model design and performance of SMEs. Journal of Small Business and Enterprise Development, 24 (2), 222-247.

Richter, M. (2013). Business model innovation for sustainable energy: German utilities and renewable energy. Energy Policy, 62, 1226-1237.

Ritter, Thomas & Carsten Lund Pedersen (2020). Digitisation capability and the digitalisation of business models in business-to-business firms: Past, present, and future. Industrial Marketing Management, 86, 180-90.

Schneider, S., & Spieth, P. (2013). Business model innovation: Towards an integrated future research agenda. International Journal of Innovation Management, 17(01), 1-13.

Segers, J., den Hertog, P., & Bouwman, H. (2007). The organisation of innovation in service firms: evidence from four Dutch service firms. Information Management: Setting the Scene. Perspectives on Information Management, 1, 237-249.

Sjödin, David, Vinit Parida, Marin Jovanovic, and Ivanka Visnjic (2020). Value Creation and Value Capture Alignment in Business Model Innovation: A Process View on Outcome-Based Business Models. Journal of Product Innovation Management, 37 (2), 158-83.

Sinfield, J. V., Calder, E., McConnell, B., & Colson, S. (2012). How to identify new business models. MIT Sloan Management Review, 53(2), 80-85.

Sosna, M., Trevinyo-Rodriguez, R. N., & Velamuri, S. R. (2010). Business Model Innovation through Trial-and-Error Learning. The Naturhouse Case. Long Range Planning, 43(1), 383-407.

Spieth, P., & Schneider, S. (2016). Business model innovativeness: designing a formative measure for business model innovation. Journal of Business Economics, 86(6), 671-696.

Stanko, Michael A., Molina-Castillo, Francisco-Jose and Harmancioglu, Nukhet. (2015). It Won't Fit! For Innovative Products, Sometimes That's for the Best. Journal of Product Innovation Management, 32(1), 122-137.

Stanko, Michael A., Bohlmann, Jonathan D. and Molina-Castillo, Francisco-Jose. (2013). Demand-side inertia factors and their benefits for innovativeness. Journal of the Academy of Marketing Science, 41(6), 649-668.

Tongur, S., & Engwall, M. (2014). The business model dilemma of technology shifts. Technovation, 34(9), 525-535.

Teece, D. J. (2010). Business models, business strategy and innovation. Long Range Planning, 43(1), 172-194.

Teece, D. J. (2018). Business models and dynamic capabilities. Long Range Planning, 51(1), 40-49.

To, Chester K. M., K. P. Chau, & Chi Wai Kan (2020). The logic of innovative value proposition: A schema for characterising and predicting business model evolution. Journal of Business Research, 112, 502-20.

Treacy, M., & Wiersema, F. (1993). Customer Intimacy and Other Value Disciplines. Harvard Business Review, 1(1), 1-20.

Trigo, A., Varajao, J., Barroso, J., Soto-Acosta, P., Molina-Castillo, F. J. and Gonzalvez-Gallego, N. (2011), Enterprise Information Systems Adoption in Iberian Large Companies: Motivations and Trends. Managing Adaptability, Intervention, and People in Enterprise Information Systems, 1(1) pp. 204-228.

Velu, C., & Jacob. A. (2014). Business Model innovation and owner-managers: the moderating role of competition. R&D Management, 46(3), 451-463.

Velu, C. (2015). Business model innovation and third-party alliance on the survival of new firms. Technovation, 35, 1-11.

Verhagen, M., M. de Reuver, & H. Bouwman (2021). Implementing Business Models into Operations: Impact of Business Model Implementation on Performance. IEEE Transactions on Engineering Management

Voelpel, S., Leibold, M., Tekie, E., & Von Krogh, G. (2005). Escaping the red queen effect in competitive strategy: Sense-testing business models. European Management Journal, 23(1), 37-49.

Voorhees, C. M., Brady, M. K., Calantone, R., & Ramirez, E. (2016). Discriminant validity testing in marketing: an analysis, causes for concern, and proposed remedies. Journal of the Academy of Marketing Science, 44(1), 119-134.

Wirtz, B. W., Schilke, O., & Ullrich, S. (2010). Strategic development of business models: implications of the Web 2.0 for creating value on the internet. Long range planning, 43(2), 272-290.

Wirtz, B. W., Pistoia, A., Ullrich, S., & Göttel, V. (2016). Business models: Origin, development and future research perspectives. Long Range Planning, 49(1), 36-54.

Zott, C., & Amit, R. (2007). Business Model Design and the Performance of Entrepreneurial Firms. Organization Science, 18(2), 181-199.

Zott, C., & Amit, R. (2008). The Fit between Product Market Strategy and Business Model: Implications for Firm Performance. Strategic Management Journal, 29(1), 1-26.

Zott, C., Amit, R., & Massa, L. (2011). The Business Model: Recent Developments and Future Research. Journal of Management, 37(4), 1019-10.

FIGURES

Figure 1. Theoretical model

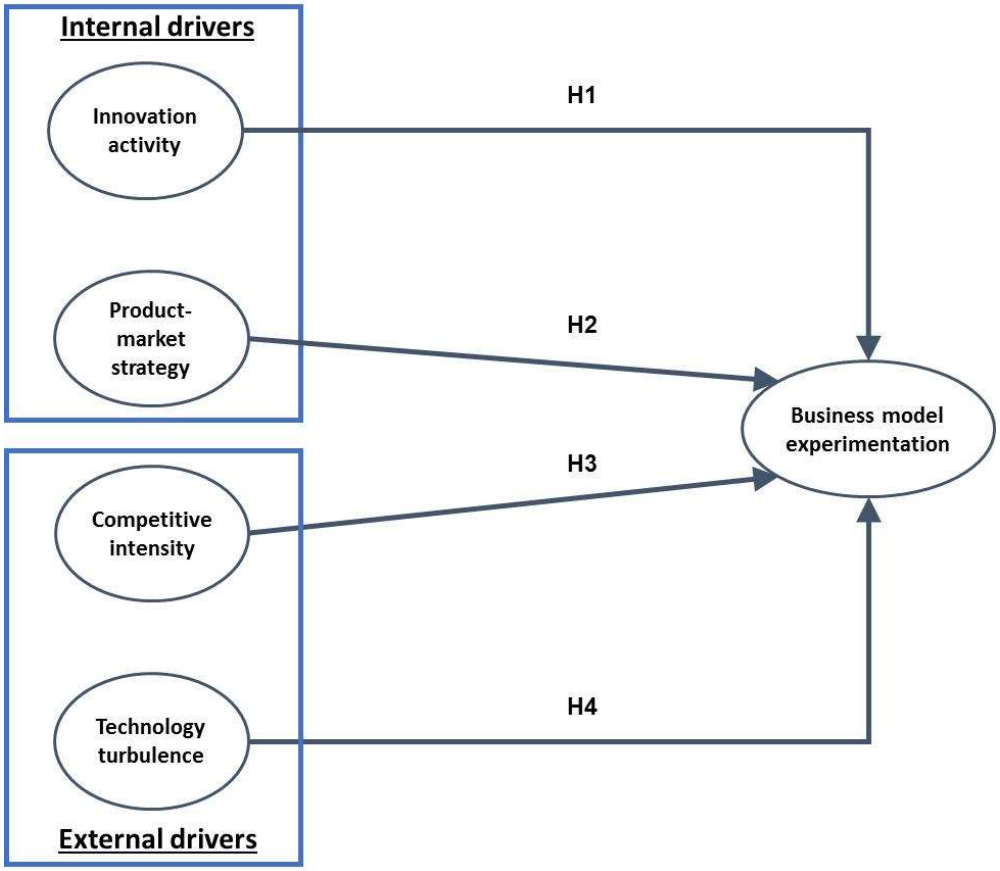
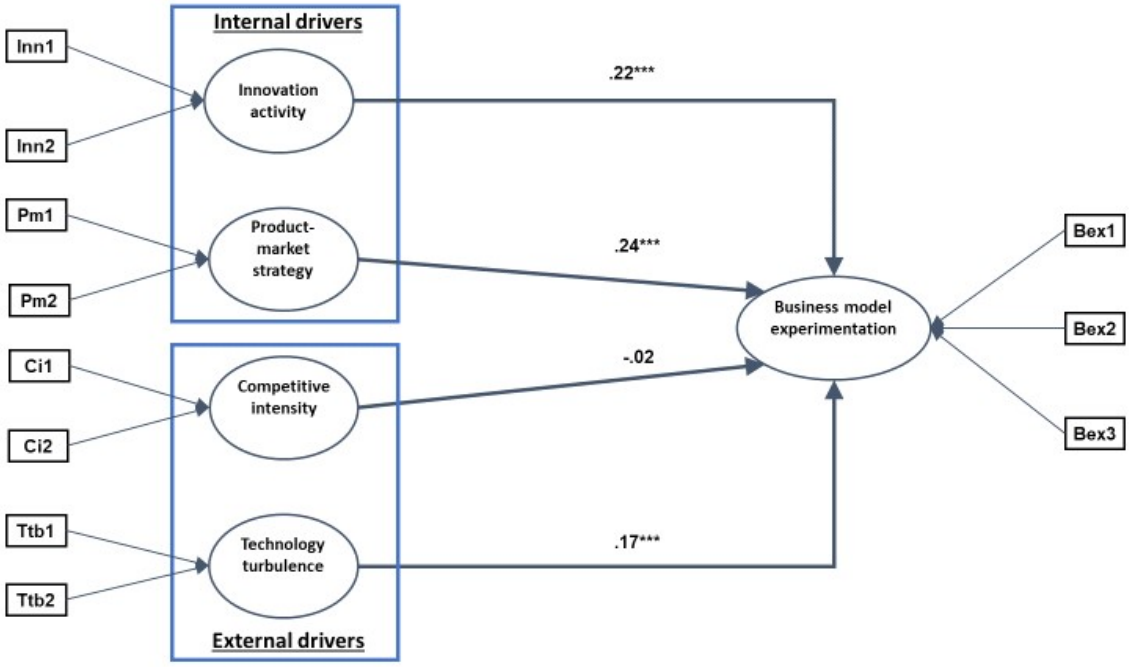
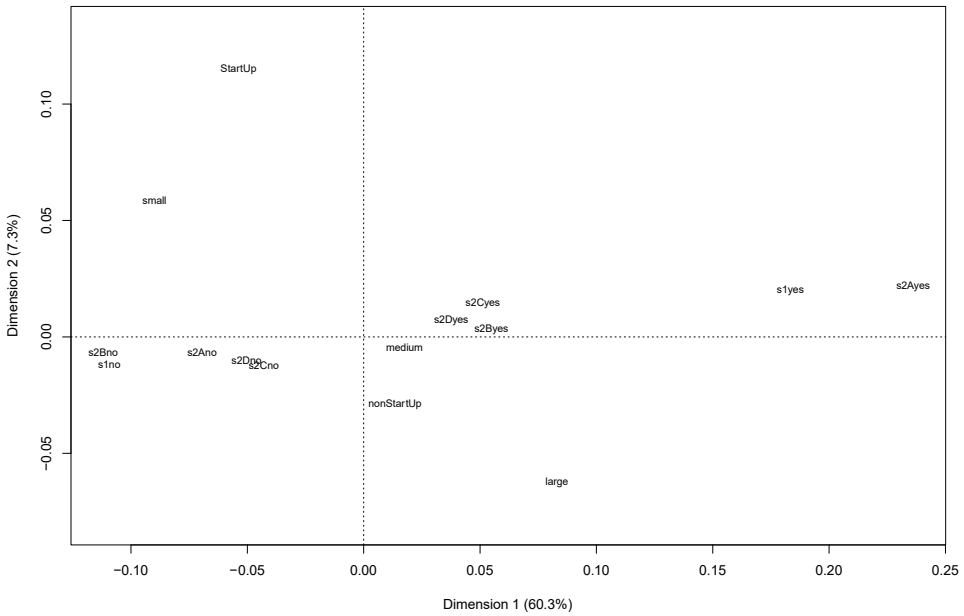


Figure 2. Path model result



*** p<.001

Figure 3: Dual scaling results



Note: The number in the figure refers to the labels as presented in table 5

Figure 4: Group analysis results (percentage within group)

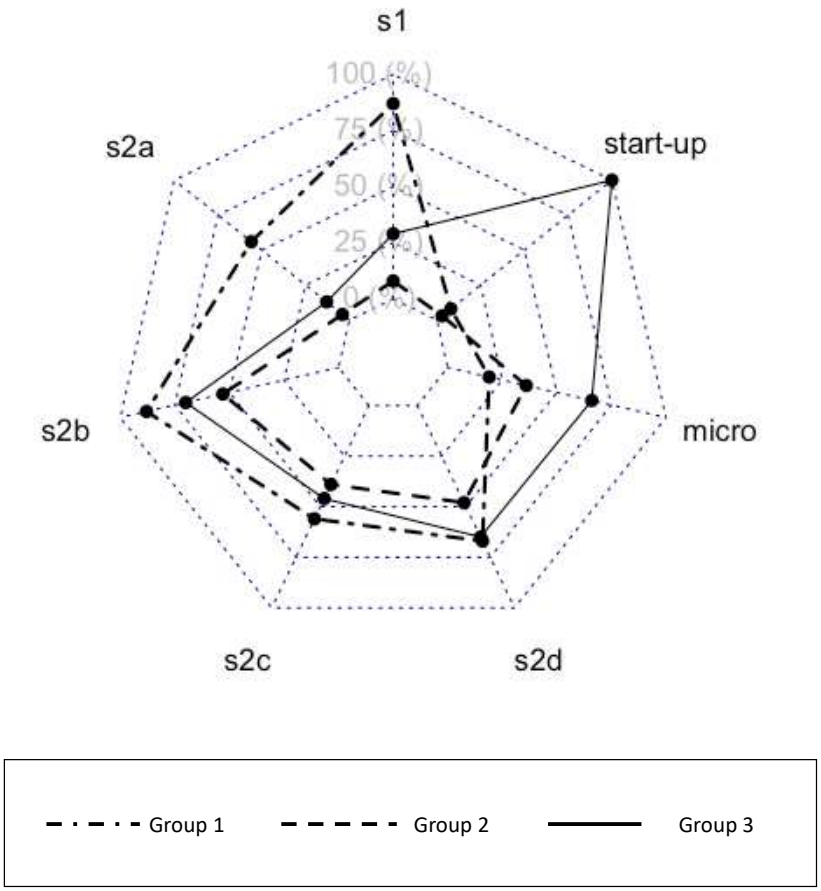


Figure 5. Group analysis by country