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Fostering growth patterns of SMEs through business model innovation. A tailored dynamic business modelling approach

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ABSTRACT

In the contemporary complex and fast-changing markets, there is persistent pressure for Small-and-Medium Enterprises (SMEs) to engage in business model innovation to promptly meet customer expectations and successfully compete for survival. In the last decade, multiple approaches to business model development and innovation have been explored. However, they have been primarily designed for large-sized companies, while SMEs display distinctive organizational attributes. Thus, SMEs require a tailored approach to design, experiment and innovate their business models, in order to frame the specific complexity of their value creation processes. This paper aims to explore how a Dynamic Business Modelling approach complies with inherent SME characteristics and serves as a lean strategy design tool for innovating associated business models. A case-study of a real SME currently involved in innovating its business model illustrates and discusses the empirical evidence emerging from the use of this approach.

1. Introduction and research design

Over the past ten years, business research has experienced a steady growth of both theoretical and empirical contributions related to the Business Model (BM) concept, its evolution, and applications (Massa, Tucci, & Afuah, 2016; Wirtz, Pistoia, Ullrich, & Gottel, 2016; Zott, Amit, & Massa, 2011). Recent reviews of the BM literature pointed to its definitional convergence so that today there is a shared consensus in defining a BM as the "design or architecture of the value creation, delivery, and capture mechanisms" of an organization (Teece, 2010: 172). Following this definition, the interest around BMs has crossed different research fields (e.g., strategic management, entrepreneurship, innovation, corporate sustainability), business and non-business sectors (e.g., circular economy, e-business, transportation, healthcare, higher education), and usage perspectives (e.g., strategy and organizational design, narrative and sense-making, innovation tool, performance and controlling), thus becoming nowadays a new distinct unit of analysis (Foss & Saebi, 2017).

Despite the multitude of contributions offered by the literature, little attention to date has been addressed to explore how the use of BMs fits with inherent organizational attributes of Small-Medium Enterprises (SMEs) and supports the development of desired strategic capabilities aimed to foster their innovation processes and associated growth patterns (Bianchi, 2002, 2016; Coda, 2010; Cucculelli & Bettinelli, 2015). This is quite surprising given the acknowledged role played by SMEs in national economies worldwide. Rather, the literature emphasises that there is no consensus regarding a shared theoretical framework and related construct boundaries for designing and innovating BMs in SMEs (Ricciardi, Zardini, & Rossignoli, 2016; Ritter & Letti, 2018; Spieth, Schneckenberg, & Ricart, 2014; Zott et al., 2011), and this resounds as a call for action for scholars interested in the development of appropriate BM design methods within the SME context. SME value creation processes show different organizational features, strategic requirements and drivers compared to larger organizations on which BM research has so far focused its attention (Alberti, Ferrario, & Pizzurno, 2018; Demil & Lecocq, 2015). Differences can be associated not only to size (e.g., limited workforce, small customer base, constrained resources, market niche orientation), but also to strategy design, organisational setting, and performance management (Berends, Jelinek, Reymen, & Stultiëns, 2014; Cagliano, Blackmon, & Voss, 2001; Halme & Korpela, 2014). For these reasons, SMEs require a tailored methodological approach – i.e., calibrated on those organizational features and inherent attributes characterizing their value creation processes – to develop and innovate their BMs.

Based on these premises, this paper firstly provides an analysis of the literature to investigate the dynamic complexity of SME value creation

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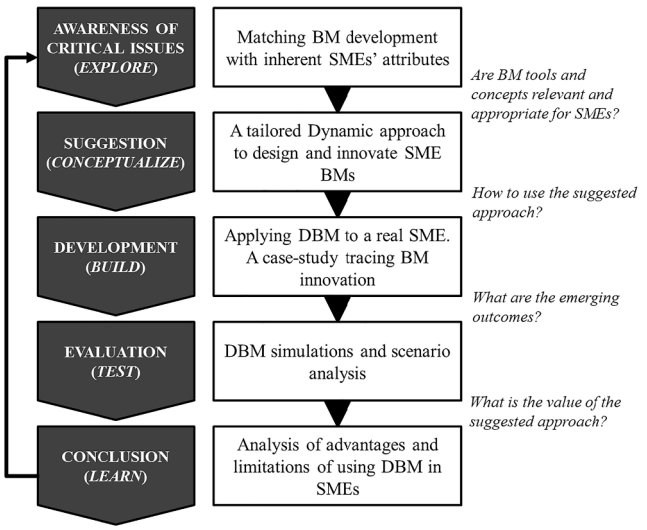

Fig. 1. Research process design adapted from Ries (2011) and Kuechler and Vaishnavi (2008).

processes, as well as the relevance and appropriateness of adopting BMs as lean strategy design tools for framing and managing such a specific complexity. Drawing on the previous research conducted by Bianchi (2002), Ries (2011) and Ghezzi and Cavallo (2018), this paper uses the "lean" attribute to characterize an agile, less-structured and more pragmatic approach in applying business modelling to SMEs compared to larger organisations. Then, the fitting between inherent SME characteristics and BMs offers a fertile ground for introducing and exploring a tailored Dynamic Business Modelling (DBM) approach to develop and innovate SME BMs. Such an approach originates from the combination between a revised Business Model Canvas structure (Osterwalder & Pigneur, 2010) and the System Dynamics (SD) methodology (Forrester, 1961; Sterman, 2000). This methodological support is particularly recommended to model and analyse social systems characterized by dynamic complexity and uncertainty, as well as to experiment with the models to design and simulate strategies for management and change (Bianchi, 2016; Morecroft, 2007; Torres, Kunc, & O'Brien, 2017). The emerging causal feedback structures prioritize and capture the interplays among financial and non-financial factors (i.e., strategic capabilities and intangibles) affecting value generation processes, thus providing a shared understanding of how the BM currently works. In addition, SD simulation models facilitate the introduction of innovation-oriented interventions in the extant business formula, and – by using simulation scenarios – enable SME decision-makers to experiment, test and learn how the business system reacts in terms of performance and value creation (Bianchi, 2002, 2016; Andries, Debackere, & Looy, 2013; Davis, Eisenhardt, & Bingham, 2007; Groesser & Jovy, 2016). Recently, building on the research by Demil and Lecocq (2010) and Zott and Amit (2010), the SD modelling perspective has been suggested for designing BM for sustainability purposes (Abdelkafi & Täuscher, 2016; Täuscher & Abdelkafi, 2018), as well as for developing and experimenting BMs of start-up firms (Cosenz & Noto, 2018; Cosenz, 2017).

Fig. 1 shows the research design used in this paper. It adopts the methodological pathway proposed by Ries (2011) and Kuechler and Vaishnavi (2008) which is already applied to explore strategy design principles in the context of BM tools (e.g., Augenstein & Mädche, 2017).

After this introduction, the paper concentrates on a critical analysis of the literature to investigate the relevance and appropriateness of BM tools and concepts in the SME context. Such an analysis provides the elements forming the methodological background whereon to conceptualize a tailored DBM approach for designing and innovating SME BMs. Subsequently, a real case-study of an SME applying DBM for innovating its current BM is developed and discussed. The case-study method is particularly useful for exploring an area at an early stage of development – such as business modelling applied to SMEs – where little research has been conducted (Eisenhardt & Graebner, 2007). With the intent to evaluate the effectiveness of this approach, emerging simulation scenarios associated with BM innovation are also examined. Eventually, the paper concludes with the analysis of the main insights of using DBM in SMEs, thus fuelling a circular learning process feeding back to further exploration of research findings.

2. Matching business modelling with inherent attributes of SME value generation processes

2.1. Business models and business model innovation

Despite a generalized agreement on conceiving a BM as a "design or architecture of the value creation, delivery, and capture mechanisms" of an organization (Teece, 2010: 172), divergences among scholars arise when attempting to define a BM on a more operational level (Wirtz et al., 2016; Zott et al., 2011). Drawing on a critical review of the literature on BM research recently carried out by Massa et al. (2016), this paper adopts the interpretation of BMs as formal conceptual representations of how an organization works and creates value.

These representations aim to simplify the entrepreneurial cognition of a business system which, unlike cognitive or linguistic schemas, is made explicit and formalized in graphic, mathematical, or symbolic frameworks. The use of formal conceptual representations is particularly valuable for understanding and framing the complexity of BMs by detecting the critical components for use by entrepreneurs (Johnson, Christensen, & Kagermann, 2008; Osterwalder, Pigneur, & Tucci, 2005). As such, these representations can be used to articulate, challenge, transfer, and recombine the tacit knowledge at the background of implicitly understood cognitive models, heuristics, narratives and other organizationally embedded manifestations of BMs (Chesbrough, 2010; Cosenz & Noto, 2018; Massa et al., 2016). One of the most popular BM representation frameworks is the Business Model Canvas by Osterwalder and Pigneur (2010).

This interpretive perspective aims to formalize conceptual representations of how an organization operates and creates value for its stakeholders (Coda, 2010; Kulins, Leonardy, & Weber, 2016; Zott & Amit, 2010) with the twofold intent of facilitating shared understandings and social interactions between strategy-making participants around the formal conceptualization of a business formula into action and, as a result, promoting the introduction of innovation-oriented interventions in the existing BM (Chesbrough, 2010; Demil & Lecocq, 2010; Nielsen & Lund, 2018).

Introducing innovation-oriented interventions in the current BM – i.e., BM innovation (BMI) – entails a change in the strategic direction of the firm as a reaction to external or internal phenomena (e.g., technological advancements, socio-economic trends, deregulations, or managers' decisions, changes in BM core components) in order to fulfil new, hidden or unmet customer needs (Casadesus-Masanell & Ricart, 2010; Demil & Lecocq, 2010; Osterwalder & Pigneur, 2010) and implement a better way of offering value to all stakeholders (Bini, Dainelli, & Giunta, 2016; Bini, Giunta, & Bellucci, 2018; Magretta, 2002; Teece, 2010). Therefore, BMI is a strategy reformulation process aimed to adopt "designed, novel, non-trivial changes to the key elements of a firm's business model and/or the architecture linking these elements" (Foss & Saebi, 2018: 201). In line with Amit and Zott (2012), Ghezzi and Cavallo (2018: 3) argue that "BMI involves innovation to at least one of the foundational elements of value creation, delivery and capture, and thereby gives a firm the potential to activate overlooked value sources within the company or create new systems that are difficult to imitate". Accordingly, Battistella, De Toni, De Zan, and Pessot (2017: 66) assert that "companies are required to continually develop and strengthen their ability and to modify their business model effectively and in a timely manner when an opportunity or threat arises", thus leading to

greater competitive advantages by virtue of a redesigned BM sufficiently differentiated and hard to replicate for incumbents or new entrants (Teece, 2010). Examples of BMI include selling a new product or service for unmet customer needs, process innovation, more efficient production, implementing new technologies, involving new partners or setting new financial arrangements (Magretta, 2002).

Despite the large variety of contributions provided by the literature, research on BMI and the associated practice alike still suffer from a severe lack of homogeneity, construct clarity and supportive methodological approaches (Ghezzi & Cavallo, 2018; Spieth et al., 2014; Wirtz et al., 2016). Within this variety, large firms received greater attention by scholars (Amit & Zott, 2012; Chesbrough, 2010; Johnson et al., 2008; Schaltegger, Lüdeke-Freund, & Hansen, 2012), while only few research contributions focused on SMEs and start-ups (Bianchi, 2002, 2016; Ghezzi & Cavallo, 2018; Klewitz & Hansen, 2014). Nevertheless, compared to larger organizations, SMEs require major efforts to innovate their BMs as they encounter relatively more barriers – such as limited strategic capabilities and resources, poor networking capacity – to grow and survive (Bianchi, Winch, & Cosenz, 2018; Lindgren, 2012). For this reason, distinctive organizational features and inherent attributes influencing SME value generation processes must be identified and examined for exploring both positive and negative forces driving BMI in this specific context.

2.2. Inherent SME attributes affecting value generation processes

SMEs (EU Commission, 2003: 36) and large-sized organizations show significant differences in terms of value generation processes and underlying strategic architectures (Deschryvere, 2014), thus BMI approaches developed for large firms may not directly apply to SMEs. The mainstream research on SMEs identifies a number of recurring attributes characterizing the specific complexity of their value generation processes and related management mechanisms (Bianchi, 2002; Lussier & Corman, 1995; O'Regan & Ghobadian, 2004; Rosenbusch, Brinckmann, & Bausch, 2011; Terziovski, 2010). Namely, they are:

- personalised management, with little devolution of authority;
- severe resource limitations in terms of management, strategic capabilities, and finance;
- high specialization applied to a narrow range of products/services;
- reliance on a small number of customers;
- niche market orientation;
- flat, flexible organisational structures;
- high innovatory potential;
- reactive to environment changes and legislative reforms;
- informal and unstructured strategy design.

In particular, SMEs mostly compete by focusing on high specializations often related to specific – technical or handcrafted – strategic capabilities of the owner/entrepreneur and close collaborators, who usually do not hold significant managerial skills and resources. Although limited, these capabilities form the core competencies of the organization which, by affecting the critical success factors of the specific market sector (e.g., product quality, design, delivery time, etc.), can provide the firm with competitive advantages over its competitors (Barney, 1991; Prahalad & Hamel, 1990; Pucci, Nosi, & Zanni, 2017). In SME value generation processes, strategic capabilities may concern not only products, markets and customers (Berends et al., 2014), but also price, costs and manufacturing skills (Cagliano et al., 2001). Strategic goals and priorities mostly apply to design quality and production, delivery speed, flexibility and openness to include new customer expectations (Cagliano et al., 2001).

Typically, SMEs focus their specializations on offering a narrow range of products/services, that implies the execution of simpler and less-articulated value creation processes. Therefore, these firms usually adopt flat organizational structures with few managerial layers which enable closer employee interaction and prompt responsiveness to both competitors' actions and changing market conditions. The literature emphasises that inherent SME attributes make them flexible in responding to changes, although they are often lacking in those resources or capabilities to innovate or expand the business nationally or internationally (Commission, 2015; Lee, Park, Yoon, & Park, 2010).

Zott and Amit (2010) remark that size has a moderating effect on reconfiguring BMs and associated value generation processes. In particular, SMEs and large firms innovate differently and, in doing this, face different challenges (Klewitz & Hansen, 2014). In innovation-oriented processes, large companies need to reduce their organizational inertia (Hockerts & Wüstenhagen, 2010), while SMEs are mostly called to increase their cooperative capacity to overcome the paucity of their resources (Aguilar-Fernández & Otegi-Olaso, 2018). On the one side, large firms have more resources to engage in BM innovation projects (e.g., new products) which can then be implemented on a larger scale and made profitable through easier access to new markets (Halme & Korpela, 2014). On the other, as asserted by Uhlaner, Berent-Braun, Jeurissen, and de Wit (2012), SMEs are able to transform their BM faster because managers are closer to operational levels thereby making decisions more dynamically and, in addition, their organizational routines are more flexible in absorbing new strategic directions and innovations (Widya-Hasuti, Mardani, Streimikiene, Sharifara, & Cavallaro, 2018), thus facilitating the enhancement of current or future strategic capabilities (Aguilar-Fernández & Otegi-Olaso, 2018).

Strategy design in SMEs is predominantly an informal and unstructured process, often lead by the entrepreneur's individual experience and gut-feeling. Therein, BMs are implicit, informal, cognitive structures emerging from current thinking patterns or mental models of firm leaders. The possibility to design and formalize them in structured BM frameworks significantly contributes to simplify the entrepreneurial cognition over value generation processes and understand the specific complexity of the business system, thus offering a practical strategy design tool for facilitating the introduction of innovation-oriented interventions (Heikkilä, Bouwman, & Heikkilä, 2018).

2.3. Relevance and appropriateness of business modelling in the SME context

Examining the conventional use of BMs for strategy design and innovation purposes, as well as the inherent SME attributes characterizing their value generation processes (Bini et al., 2016), may lead to remarkable insights in terms of relevance and appropriateness of adopting BM tools to support SME growth patterns and their survival. Actually, the literature emphasises the crucial role played by structured strategy design – and management control (Neely, Gregory, & Platts, 1995) – tools in framing the dynamic complexity of organizations and supporting decision-making processes (Casadesus-Masanell & Ricart, 2010; Osterwalder et al., 2005; Zott & Amit, 2010). Although the use of BMs as strategy design tools has been mostly explored and recommended in large firms (Demil & Lecocq, 2015), where structured planning and control systems are already well-established management routines, inherent SME attributes pose greater challenges in terms of market competition and survival, thereby further increasing the need for adopting supportive strategy tools in these firms (Bianchi, 2002, 2016). Relying on limited strategic capabilities, mainly based on technical or handcrafted skills, stresses the urgency of adopting viable countermeasures to keep up with changing market expectations and, hence, prevent business crises leading to failure. For instance, as many real SME cases prove, in the long-term the lack of significant managerial skills – alongside the absence of strategy tools – may imply a weak understanding of the effect of current decisions on future growth and of the strategies to undertake for coping with major internal or external changes (Bianchi & Bivona, 2000; Saebi, Lien, & Foss, 2017). Therefore, entrepreneurs and SME key-actors are called to develop their managerial abilities to detect weak signals of change in order to timely cope with

possible sources of discontinuity leading to business crises. Structural deficiencies of SMEs should not only be primarily related to lack of capital, technical capabilities and qualified professional management. Rather, SME entrepreneurs need to better frame the complex system where they operate, as well as to fuel their strategic learning processes for undertaking prompt and adequate corrective interventions aimed at developing capabilities to innovate their BMs in enhancing their competitiveness (Berends, Smits, Reymen, & Podoynitsyna, 2016). Under these conditions, BMI processes of SMEs can be further facilitated by other relevant attributes characterizing their value generation processes, such as a flat/flexible organisational structure, a high innovatory potential, and flexibility in responding to contextual changes (e.g., external threats and opportunities).

In this context, BM frameworks may provide SME entrepreneurs with a strategy design tool – to be used on a regular basis – aimed to map the different key-elements underlying value creation processes and learn how the business reacts to internal and external changes in terms of performance, innovation and new pathways for creating value (Argyris, 1982). Unlike large companies which can engage in BMI with lower risks in terms of survival, SMEs must pay greater attention in experimenting BMI in the real world in order to prevent the erosion of their limited (financial and non financial) resources. In fact, given the uncertainty and turbulence characterizing today's market sectors (Andries et al., 2013), running BMI in the real world may be too costly or even fatal for SME survival (Lussier & Corman, 1995). Actually, BM frameworks are already widely used in new business ventures since potential investors (e.g., business angels, venture capitalists), start-up competition committees and academic incubators have institutionalized the use of BMs to assess the viability of a business idea and the advantage associated with financing it (Cosenz & Noto, 2018; Cosenz, 2017; Ries, 2011).

However, heavy structured business design tools (e.g., SAP, ERP software) used by large companies may not bring the same advantages to SMEs which may run the risk of losing their flexibility to changes or using them occasionally, thereby undermining their implementation. Rather, the adoption of formal – although *lean* – strategy design tools may prove to be appropriate in fuelling SME entrepreneurs' strategic learning processes (Bianchi, 2002). In particular, a *lean* approach to BM design and innovation in SMEs is likely to combine the advantage of a structured with a flexible, agile and selective perspective (Arbussa, Bikfalvi, & Marquès, 2017; Balocco, Cavallo, Ghezzi, & Berbegal-Mirabent, 2019; Bianchi et al., 2018; Bortolini, Nogueira Cortimiglia, de Moura Ferreira Danilevicz, & Ghezzi, 2018; De Cock, Bruneel, & Bobelyn, 2019; Guo, Tang, Su, & Katz, 2017; Ries, 2011), thus fostering their practice on a regular basis. In this setting, the *lean* attribute is used for characterizing a different approach in applying BM design to SMEs compared to large firms. In fact, such an approach to BM design and innovation may better fit with the distinctive characteristics of SMEs as it is able to make the entrepreneur's tacit BM explicit and to formalize value generation processes in concise representation schemas, thus incorporating their development, evaluation and innovation hypotheses into organisational routines. As argued by Ghezzi and Cavallo (2018), the *lean* philosophy applied to BMI revolves around the "build-measure-learn" loop, where an SME builds an innovation hypothesis and related tests, measures the test results and customer feedbacks, and learns how to change its BM accordingly. As a result, adopting *lean* BM frameworks tailored to inherent SME attributes may contribute to improving their strategic capabilities and decision-making, as well as to supporting innovation-oriented initiatives to enhance their competitiveness.

Focusing on different contexts and research purposes, the literature on BM design suggested several representation frameworks to model the strategic and organizational architecture of a business and the way it works for creating, delivering and capturing value (e.g., Osterwalder & Pigneur, 2010; Afuah, 2004; Johnson et al., 2008). Among these, the Business Model Canvas (BMC) by Osterwalder and Pigneur (2010) displays a *lean* and agile structure which, alongside its widely recognized popularity (Cantino, Alfiero, Cane, & De Bernardi, 2016; Trimi & Berbegal-Mirabent, 2012), may fit well with the inherent SME attributes. With the intent to introduce a standardized method for designing BMs, Osterwalder and Pigneur (2010) developed such a framework to better illustrate the business formula and its value generation structure that also can be easily communicated through a lean, flexible and meaningful design. The BMC consist of nine building blocks corresponding to those critical elements characterizing a BM (i.e., key-partners, key-resources, key-activities, cost structure, value proposition, customer relationships, distribution channels, customer segments, revenue streams) and, thus, it is assumed to be effective for describing many organizations (Osterwalder & Pigneur, 2010).

Despite its popularity, the BMC shows some methodological shortcomings which need to be fixed to obtain a tailored business modelling approach complying with inherent SME attributes. In fact, such a framework essentially lists and organizes the core BM elements into specific sections, thus offering a static perspective of how the firm functions and creates value, that prevents SME entrepreneurs from framing the complexity of today's market sectors and experimenting how the business reacts to contextual changes and innovations (Chesbrough, 2010; Demil & Lecocq, 2010). While large firms with a well-defined BM are mostly called to innovate it through a fine-tuning process oriented to benefit from new market opportunities, SMEs – often lacking appropriate entrepreneurial experience and financial resources – need to develop and innovate their BM under a deeper uncertainty related to the higher entrepreneurial risk they are engaging in. In addition, the BMC offers a qualitative method to BM representation in which the causal relationships among the BM elements (e.g., how strategic capabilities affect key-activities) and their quantification are neglected, thereby limiting both the understanding of how the business works and the possibility to experiment what outcomes could emerge from BMI (Cosenz, 2017). As argued by McGrath (2010: 253), "the dilemma is that, while it is usually quite possible to detect trends and changes, it is difficult to know in advance how best to take advantage of them via business model innovation. Such uncertainty places a huge premium on experimentation". Likewise, Wrigley and Straker (2016: 11) emphasise that "in uncertain, complex and fast-moving environments, both product and process development essential for designing BMs increasingly benefit from a combination of novel insights, rapid experimentation and evolutionary learning." For these reasons, drawing on the strengths offered by the BMC (e.g., lean and concise design, widespread popularity, easy-to-understand structure), SMEs need to take advantage of their intrinsic flexibility and responsiveness to contextual changes through the use of an advanced *lean* BM design approach enabling to introduce and experiment innovation-oriented interventions as a strategic capability for gaining competitive advantages (Andries et al., 2013).

2.4. Introducing system dynamics in SME business modelling

With the intent to overcome BMC shortcomings and develop a *lean* BM design approach complying with inherent SME attributes and innovation-oriented experimentation, a methodological contribution can be provided by System Dynamics (SD) modelling whose combination with a revised BMC structure originates the Dynamic Business Modelling (DBM). SD methodology is an approach for capturing the dynamic aspect of complex business systems (Forrester, 1961; Morecroft, 2007; Sterman, 2000). SD models are tailored to specific managerial phenomena and built by mapping the business system structure in order to generate and convey an understanding of behaviour driving processes, as well as the quantification of the causal interactions so as to produce a set of equations that lay the groundwork for simulating possible system behaviours over time (Bianchi, 2002, 2016; Warren, 2008). In particular, SD models entail a feedback view of a BM, seen as a closed boundary, i.e. encompassing all the main variables associated with the business system under observation (Cosenz & Noto, 2018).

After identifying causal feedback loops, the main BM variables are

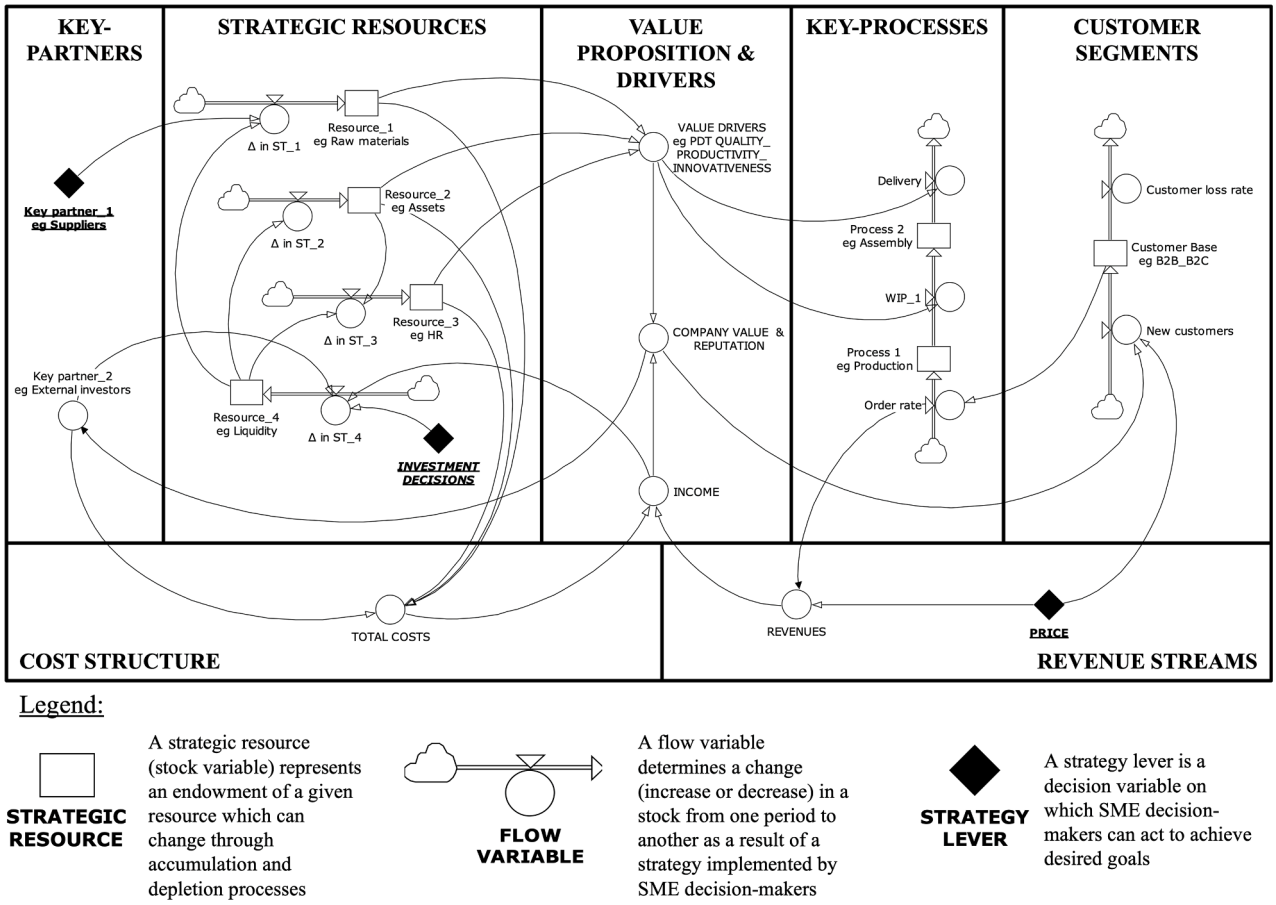

Fig. 2. The DBM framework (adapted from Cosenz & Noto, 2018).

converted into stock-and-flow diagrams by using SD-based simulation software. These diagrams enable decision-makers to simulate the behaviour of the business system over time (Sterman, 2000). An SD simulation model is calibrated by comparing model output with empirical data and, in case of discrepancies or inconsistencies, refining the model and input parameters where adequate data do not exist. Once the simulation model has been developed, calibrated, and tested (Barlas, 1996) whether it realistically behaves, inputs are modified to conduct "what if" analyses of how short- and long-term outcomes would change in response to alternative strategy scenarios (Kunc & O'Brien, 2017; Torres et al., 2017; Cosenz & Noto, 2016). When real BMI experimentation is too costly – as for SMEs – simulation becomes a valuable tool to discover how complex business systems work and where high leverage points may lie (Davis et al., 2007).

Unlike other simulation modelling methods (e.g., Agent-Based modelling), SD embraces a holistic perspective of value generation processes and underlying core BM elements contributing to strategy implementation and its implications. This holistic view focuses on the incorporation of feedback loops, accumulation and depletion processes, time delays, and nonlinear interplays to capture dynamic feedback processes (Sterman, 2000). Several scholars emphasized the necessity to adopt a holistic approach to outline BMs that embodies important understandings of causal links between BM elements (Baden-Fuller & Mangematin, 2013; Casadesus-Masanell & Ricart, 2010). In addition, differently from other simulation methods, building SD models provides the possibility to establish active stakeholders' engagement (e.g., investors, family members, business partners, collaborators). In fact, SD facilitates a shared BM understanding, as well as the incorporation of strategic ideas and innovations from those actors involved in the model building process. Hence, engaging stakeholders can improve both model accuracy and legitimacy, and foster the alignment of key-actors' mental models and group consensus about what actions to undertake (Rouwette, 2011). While the BMC may be regarded as a strategy tool supporting a qualitative analysis of a business formula (Chesbrough, 2010), a simulation-based methodology – such as SD – provides appropriate analytical information and quantifications for strategy development and BMI according to a flexible perspective to both internal and external changes (Bianchi & Bivona, 2000; 2002; Morecroft, 2007; Torres et al., 2017).

3. Tailoring dynamic business modelling to SMEs

Designing and experimenting with DBMs in SMEs aim to envisage dynamic implications of BMI to determine whether they will result in a future that will be better or worse than it would have been without such a BMI (Cosenz, 2017). From a practical viewpoint, SME entrepreneurs can explore these models and simulate alternative BMI scenarios – based, for instance, on launching new products or adding key-partners – and experiment what could happen under a range of different assumptions and across multiple decision choices (Bianchi, 2002; Sterman, 2000). As such, DBMs can be used as lean strategy simulation tools to explore how strategies, decisions, and BMI interact to generate long-term behaviours of key performance variables, as well as to explain why and how outcomes change, and potential unintended consequences.

Fig. 2 shows an illustrative example of DBM. To fit with inherent SME attributes, a revised BMC structure offers a simpler arrangement of value generation processes that comprises seven building blocks corresponding to the core BM elements outlining how an SME operates in achieving its goals. They are: (1) Key-Partners; (2) Strategic Resources, (3) Value

Proposition and Drivers, (4) Key-Processes, (5) Customer Segments, (6) Cost Structure, and (7) Revenue Streams. Unlike the conventional BMC, the DBM structure also incorporates a resource-based view of SME value generation processes (Peteraf, 1993), thus fostering an understanding of how strategic resources and key-partners affect value drivers (included in the value proposition section) which, in turn, influence key-processes and associated results, such as new customer acquisition (Bianchi, 2016; Kunc & Morecroft, 2009; Kunc & O'Brien, 2017). In DBMs, the use of SD modelling highlights the main causal relationships between the BM elements respectively identified in the building blocks providing the readers with a holistic perspective on business strategy and operation. These causal relationships form closed feedback loops which determine the business system behaviour over time.

Differently from previous applications of SD modelling to BM design focused on turning business ideas into new start-up firms (Cosenz & Noto, 2018), this approach is here used not only to explore the specific complexity of SMEs which display distinctive organizational attributes and requirements within a well-defined and operating BM, but also to provide an additional methodological support for the innovation of their BMs.

As a result, the DBM framework structure is tailored, gauged and remodelled according to the specific strategic and organizational characteristics of the SME under observation. While the building blocks included in the DBM interface are pre-set sections thereby serving as a basis on which to conduct comparative analyses on BMs, the SD model outlined inside this interface is tuned according to the specific organizational and strategic attributes of the SME. The DBM elements are modelled in terms of SD variables. Namely, strategic resources and process developmental stages are identified as stock variables whose value changes by virtue of flows corresponding to the results generated over time. Strategy levers define the different decisions the entrepreneur may make to change the business strategy and innovate its BM (e.g., introducing new key-partners, setting a different product price, modifying budget allocation). Apart from setting a different quantification, model variables can be easily added or removed, thus facilitating BMI processes.

In this illustrative example depicted in Fig. 2, both price and order rate positively influence revenues which, alongside the costs associated with strategic resources acquisition (i.e., raw materials, assets and human resources) and external funding (e.g., cost of borrowing), determine the income. In the medium-long term, income affects the SME net present value and its reputation which generate an effect on key-partners (e.g., suppliers, investors). In this example, strategic alliances with key-partners may imply a change in the strategic resources (e.g., funding from investors, favourable payment terms in raw material supply) whose exploitation influences value drivers, such as product quality, productivity, innovativeness. In turn, value drivers produce an effect on the business processes (e.g., production, delivery), as well as on the company's reputation and value (e.g., customer satisfaction), which eventually affect the acquisition of new customers. In this DBM framework, three main strategy levers have been identified: price (which positively influences revenues and negatively customer acquisition), key-partners (resulting, for instance, in an agreement for increasing the time to pay back debts), investment decisions (i.e., budget allocation choices). Each variable included in the DBM structure can be simulated in order to test the corresponding behaviour over a given time interval.

The next section illustrates and discusses how to apply the DBM approach to a real SME currently involved in a BMI process.

4. Applying dynamic business modelling to Giglio.com case-study

4.1. Case-study research method

As discussed in the previous sections, SMEs peculiarities require a tailored approach to design and validate their BMI. Although the BMC demonstrated to fit well with larger organisations, its static and rigid structure requires some refinements to be effective in smaller firms. To this purpose, we claim that a leaner strategy design tool for BMI in SMEs is needed (Bianchi et al., 2018). Particularly, by matching the BMC logic with SD simulation-based models, the DBM approach can capture such a specific complexity and enable SME entrepreneurs to explore alternative BMI scenarios. To verify such a proposition, we adopt a case-study research approach. A case-study strategy is particularly suitable to address theory-building research and to demonstrate that the existing research does not properly address the investigated propositions (Eisenhardt & Graebner, 2007).

By combining interviews with corporate actors and data collection, the case-study research technique (Ryan, Scapens, & Theobold, 2002; Yin, 2009) is likely to limit potential bias and enrich the analysis, offering useful insights on how to frame BMI elements within a systemic structure (Furnari, 2015).

Giglio.com case-study was selected among a panel of SMEs currently engaged in a BMI process. The entrepreneur revealed a particular interest in using the DBM approach to validate the business plan, as well as to manage the introduced BMI.

The research strategy consists of four steps.

Initially, the literature review on BMs in an SME context offered the basis to draw the DBM framework. Then, Giglio.com case-study was selected and investigated. Two main data sources were used. Company website[1] and specialised newspapers articles provided a firm preliminary data collection, which was tested and furtherly enriched through five semi-structured interviews with Giglio.com entrepreneur and three executives operating in the marketing, finance and customer orders, and shipping areas. Such face-to-face interviews allowed us to acquire additional information about the reasons behind the decision to involve Giglio.com in a BMI process and the most important issues faced by the company in this transition phase.

Findings of the literature review and information gathered allowed us to build a DBM framework representing the relationships among key-variables in the different seven building blocks. The development and test of such a framework with the active participation of company actors were particularly useful to make Giglio.com value creation processes explicit and to gain a deep understanding of the cause-and-effect relationships affecting its business performance.

In the final step, the SD simulation model was used to explore alternative BMI scenarios. As the value of simulation findings relies on the validity of the simulation model (Harrison, Lin, Carroll, & Carley, 2007), before running it in simulation sessions, with the direct engagement of company actors, SD model structure and behaviour validity tests (Barlas, 1996; Forrester & Senge, 1980) were performed.

Building a formal model is often technically demanding and susceptible to different kind of variables formulation errors. As the purpose of the SD model built is to analyse "a real system (Giglio.com) in order to improve some undesirable performance patterns", to make sure the simulation is adequate to its purpose, Barlas (1996) suggests to initially verifying the validity of the model structure. Then, once the above tests are passed, validation focuses on the accuracy of the model behaviour's reproduction of real patterns. Behavioural tests are important to demonstrate the fit between simulation results and observed behaviours. In such a way, the model can offer a plausible explanation of those underlying processes producing such behaviours (Harrison et al., 2007).

Structure and behaviour validity tests contributed to correct model formulation deficiencies which would prevent the SD model to replicate Giglio.com business planning results [2].

In the following section, after a brief description of the case-study, Giglio.com DBM is presented. Finally, two alternative BMI scenarios are illustrated, and the results discussed.

[1] A copy of Giglio.com business plan can be download from https://www.giglio.com/investors/mini-bond/ [last accessed on 2019 Feb 19th].

[2] Appendix A reports the results of structure and behaviour validity tests.

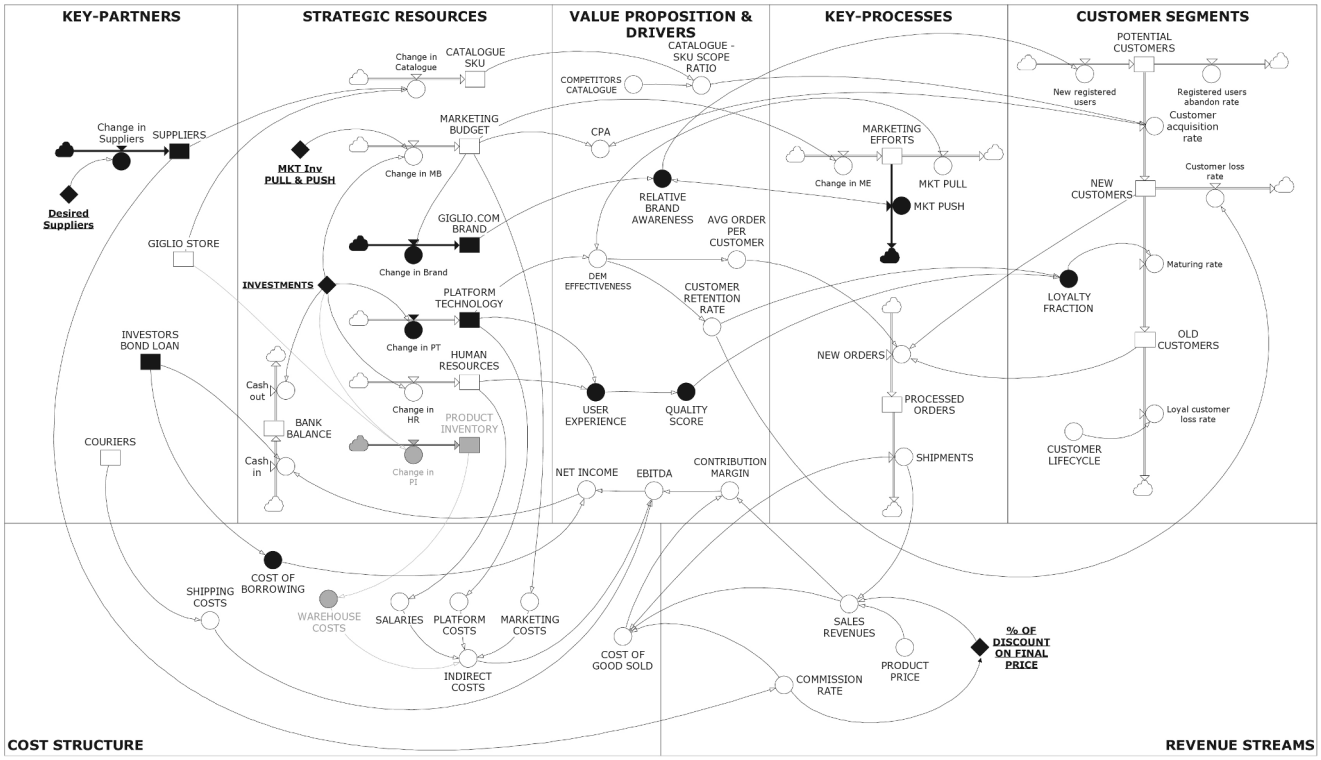

Fig. 3. The Giglio.com DBM framework.

4.2. *Giglio.com case-study*

Giglio is a fourth-generation small family business operating in the fashion retail trade in Sicily. Founded around the '30s, the company started as a small textile shop. In the '70s, the family decided to redesign the BM opening multiple fashion stores in the centre of Palermo. Such an innovation turned soon into a successful decision. Investments in branding and exclusive retailer agreements with prestigious international fashion designers, such as Giorgio Armani, Cristian Dior and Pierre Cardin, allowed Giglio to build a competitive advantage difficult to contrast by competitors. The growing sales led to a reinforcing phenomenon facilitating the company to enlarge the product portfolio, adding new international fashion designers with exclusive selling licensing. In 2007, Giglio introduced a new change in the BM. Due to the diffusion of the internet, Giglio started a new company – named Giglio.com – to sell its products online. This strategy was twofold. First, it increased company sales revenues and let the personnel to gradually develop organisational routines to deal with internet sales. Second, it expanded the Giglio.com brand internationally. In 2017, Giglio.com decided to take advantage of both the branding position in the fashion market and the knowledge acquired in the sales of fashion products via internet. For this reason, further innovation in its BM was introduced. Giglio.com started a marketplace, in which fashion stores could act as suppliers offering their products without any direct investment in the platform. In such a way, suppliers, by connecting with the marketplace, could enlarge unsold products sales recognising a reasonable commission to Giglio.com. If on the one side, the growing number of suppliers enlarges the marketplace catalogue, which in turn is likely to attract more potential customers and, eventually, to boost sales, on the other side, it does not require Giglio.com to heavily invest in building-up a corresponding product inventory. However, to sustain such an initiative, additional investments in three areas were required. Such as marketing (to attract an increasing number of potential customers to Giglio.com), personnel (to manage the relationships with customers as well as new suppliers) and technology (to promptly update products availability and to improve the marketplace user experience). Because of the financial needs highlighted from the business plan (see the previous footnote), the company issued a Eur 5 million bond.

The data collection and information acquired during the interviews with Giglio.com actors allowed us to build a DBM framework, which was then reviewed and modified accordingly. The process of gathering data and information related to company's resources, capabilities and associated interplays, followed the *Resource Mapping* stages suggested by Kunc and O'Brien (2017). Namely, during the meetings with Giglio.com actors, the adoption of such an approach preliminarily included three interconnected phases: (i) identifying resources and capabilities of the firm; (ii) assessing the strength and importance of the resources and capabilities; (iii) mapping resources and capabilities. Then, according to the *Resource Mapping* process, the emerging model structure has been validated by: (iv) developing strategic options; (v) integrating the insights from scenarios; (vi) rehearsing future performance paths; (vii) presenting the results from rehearsing strategies (Bianchi, 2016; Barnabè, Giorgino, & Kunc, 2019; Kunc & O'Brien, 2017).

The resulting DBM framework is presented in the next section.

4.3. *Giglio.com DBM framework*

On the light of the above case-study analysis, the DBM approach was applied to Giglio.com. Fig. 3 highlights the strategy levers on which Giglio.com entrepreneur may act. These are price discount and investments in different company areas. Investments are fuelled by internal financial resources, as well as a bond loan subscribed by investors. Other key-partners are Giglio store and suppliers affecting the company strategic resources, such as catalogue SKU, platform technology, human resources, marketing and branding. Following the underlying RBV perspective, these resources are likely to influence the value drivers (e.g., catalogue SKU scope ratio, relative brand awareness, cost per acquisition, avg order per customer, customer retention rate, and quality score) which, in turn, generate an effect on both key-processes and customer acquisition mechanisms. Among the key-processes, it is worth

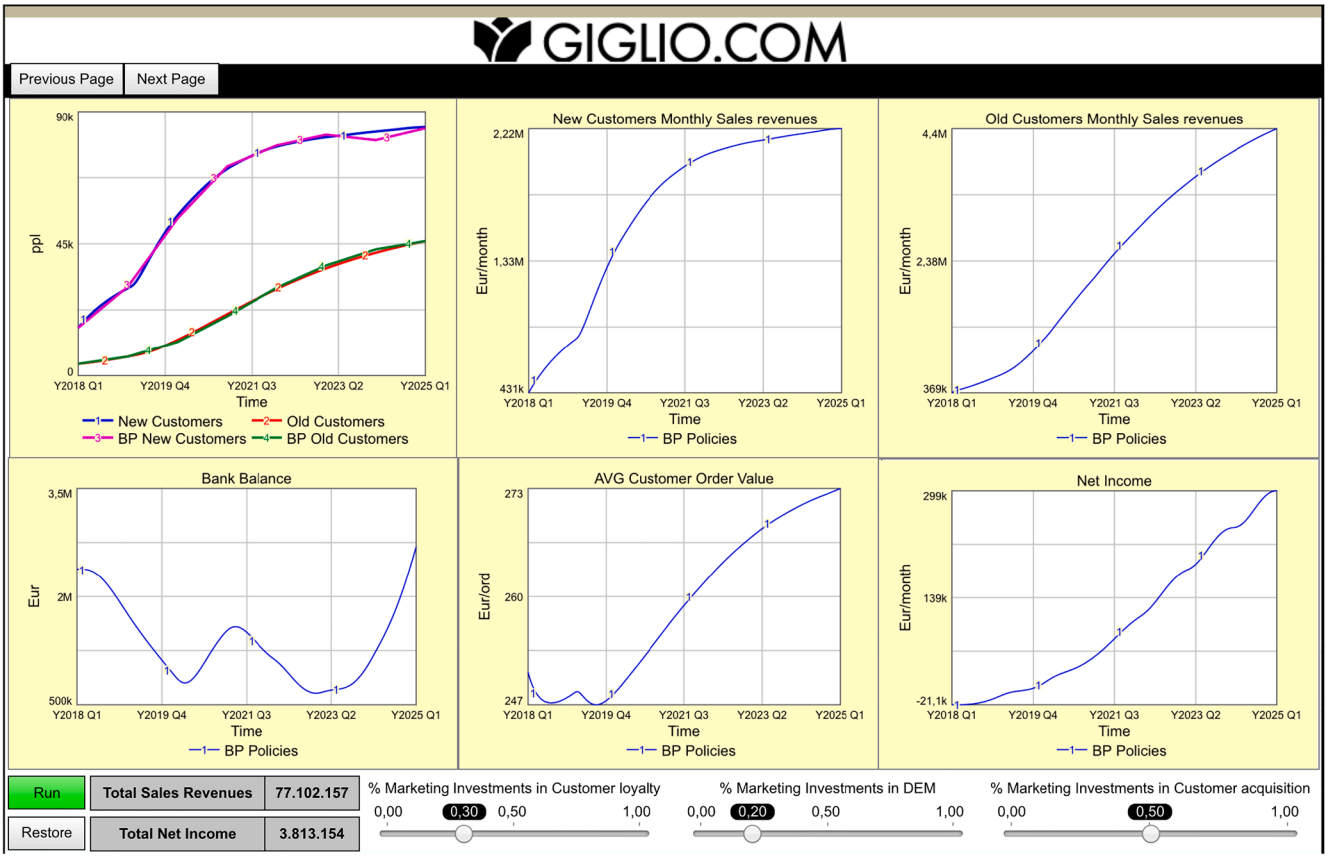

Fig. 4. Giglio.com business plan simulated results.

remarking the role played by the marketing efforts (i.e., push and pull strategies) which impact on both brand awareness and DEM effectiveness. These value drivers also affect the customer base which can be modeled as an aging chain. After registering on the platform, potential customers become new customers as a result of the branding initiatives. Then, loyalty-based activities drive the conversion of new into old customers (i.e., customers active for more than a year). Giglio.com customers place new orders generating sales revenues over time.

The framework also highlights the new elements resulting from BMI as black-coloured variables, as well as those pertaining to the old BM as light grey-coloured variables. These latter particularly refer to the product inventory and associated costs.

4.4. Alternative BMI scenarios

This section depicts the simulation results taken from the SD based-model developed with the direct engagement of company actors. The SD model was used to assess the viability of alternative growth strategies. Two scenarios results are here commented. The first scenario replicates the policies implemented by Giglio.com in drawing-up the business plan. The second simulation portrays the effects of an aggressive new customer acquisition strategy.

In addition to those investments in qualified human resources, new technologies and suppliers, to build-up a large customer base the company adopts a combined push-and-pull marketing strategy. Marketing activities are conceived by Giglio.com entrepreneur as a key element for the success of the company. In the high-end fashion retail industry, the price discount is perceived by customers as a less important driver compared to online clothing outlets. For this reason, such marketing investments are carefully planned. In particular, they are split as follows:

– 50% in Customer acquisition;
– 30% in Customer loyalty;
– 20% in Direct Email Marketing (DEM).

The first policy aims to stimulate potential customers to register on the company website and to become new customers. Customer loyalty efforts are oriented to convert a high number of new customers (1-year-old) in old customers (those that repurchase company products after a one-year period). Besides, Giglio.com invests in DEM with the purpose to boost the average customer order value.

Fig. 4 displays an SD model control panel in which both simulation results and strategy levers are reported. The top left-hand-side graph shows the accuracy of the SD model to replicate both new and old customers variables reported in Giglio.com business plan.

By implementing the above marketing mix decisions, both new and old customers record a growing behaviour. As a result of the investments in DEM, also the average customer order rate shows an improvement over time. Financial results are also positive. Although the bank balance fluctuates, such an oscillation is due to the acquisition and refund of the bond issued by the company. However, bank balance remains above a satisfactory value. At the end of the simulation, sales revenues and net income record Eur 77 million and Eur 3,8 million respectively.

With the purpose to explore alternative growth scenarios and to question company actors' mental model assumptions, the results derived from an aggressive new customer acquisition strategy are here discussed.

Notably, the marketing mix is redefined as follows:

– 80% in Customer acquisition;
– 10% in Customer loyalty;
– 10% in Direct Email Marketing (DEM).

To better gauge the effects generated by such a strategy, the above

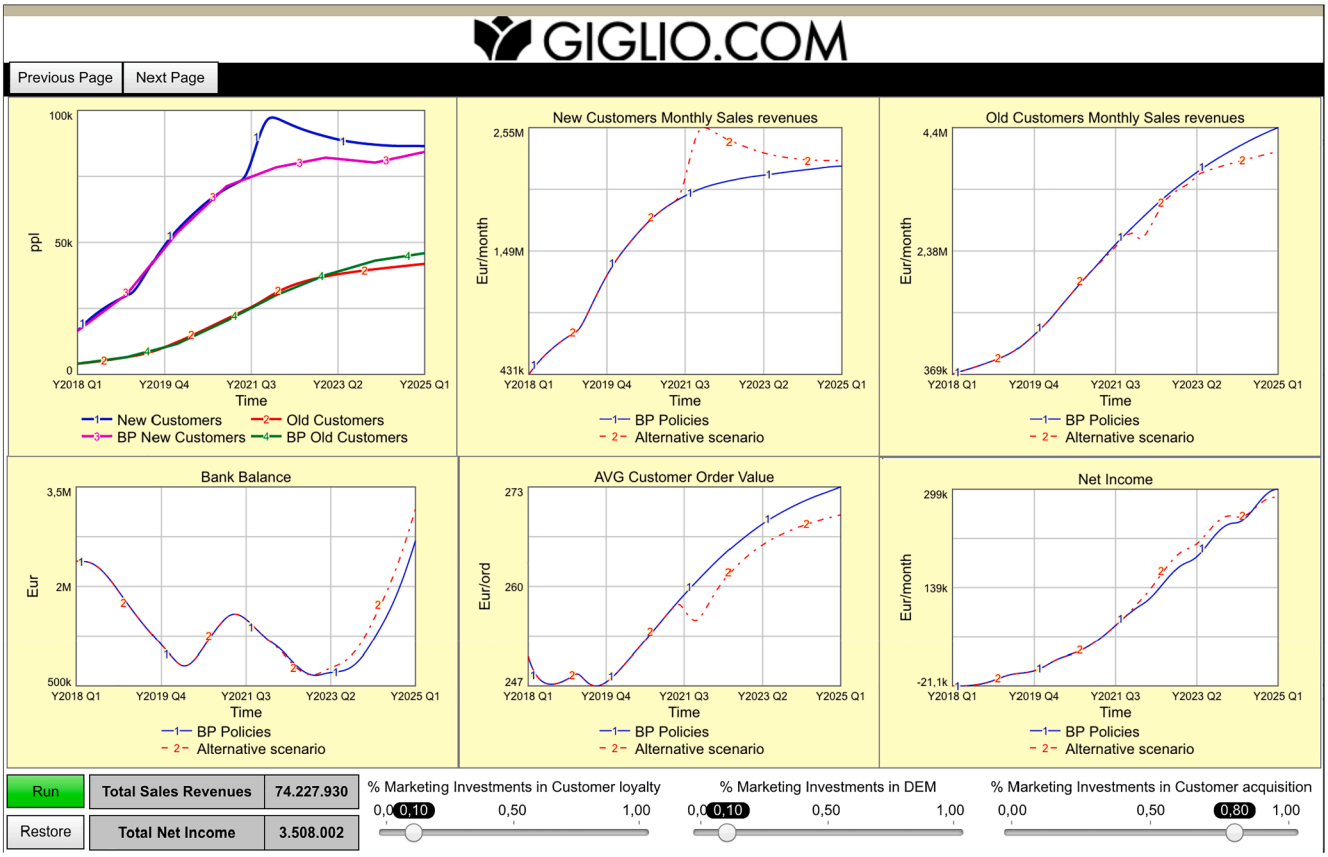

Fig. 5. Aggressive new customer acquisition strategy (line – 2 - Alternative Scenario).

decisions are implemented at the end of the third simulation year.

Fig. 5 compares the company's results depicted in the business plan and those generated by the aggressive new customer acquisition strategy. The high investments in customer acquisition boost both new customers and new customer monthly sales revenues. Due to the decrease in customer loyalty initiatives, old customers and related sales record a slight decline. Such a deterioration also affects customer order value, as a consequence of the low investments in DEM.

This scenario also highlights some counterintuitive behaviours. Although bank balance and net income show higher results in the last two/three years, both sales revenues and net income at the end of the simulation register a worse performance (sales revenues are less than Eur 3 million in the alternative scenario). This can be explained as an outcome of the decline in the average customer order value, which is not compensated through the increase in new customers. The average customer order value strongly relies on the contribution offered by the old customers who already recorded a purchase experience and tended to order more than new customers. The above remarks may lead company actors to reject such a scenario. However, it offers additional insights alike. The aggressive new customer acquisition strategy successfully built up the strategic resource "new customers". In the next years, such growth in new customers may allow the company to enlarge the stock of "old customers", thereby leading to a boost in sales revenues. In other words, if in the financial perspective, this scenario may appear less profitable than the business plan policies implemented by the company, looking at the, often intangible, sources of company competitive advantage (i.e., the endowment of strategic resources), it may turn to be successful.

5. Concluding remarks

This paper introduced and explored the use of DBM as a lean strategy design tool for developing and innovating SME BMs. Unlike large-sized firms, SMEs show different organizational characteristics which require a tailored methodological approach to effectively support both decision-making and BMI processes. Building on an extensive review of the literature, the research has firstly examined the theoretical prerequisites, guiding principles and process-related criteria to develop and innovate BMs, as well as the inherent attributes of SMEs characterizing their value generation processes. Such an analysis contributed to highlighting the relevance and appropriateness of business modelling in the SME context by investigating how these inherent attributes comply with BM design and associated innovation mechanisms. Drawing on this analysis, the paper proposed the adoption of DBM as a lean methodological approach blending a revised BMC structure with SD modelling in order to take advantage of a BM design perspective tailored to the inherent SME characteristics.

Accordingly, this approach has been applied to Giglio.com – an SME currently engaged in a BMI process – whose resulting DBM framework permitted not only to trace the BMI pathway, but also to build a scenario analysis for strategy evaluation, thus testing the effectiveness of this approach in the SME context. In particular, in line with the proposed research process design (Fig. 1), empirical findings taught us that DBM provides a lean methodological framework where financial and non-financial factors (i.e., strategic capabilities) coexist forming a system of causal interdependencies. In addition, we learned that mapping the key factors underlying SME value creation processes into a system of causal interdependencies enables to better understand how the current BM works, as well as to introduce innovation-oriented interventions and – through the use of simulation scenarios – experiment and test the emerging outcomes in terms of performance and value creation.

Based on the insights emerged from the DBM application and related simulations, future research will focus on specific components and subsystems of BMs in order to investigate the peculiar complexity

characterizing value creation, value capture and delivery mechanisms, respectively. Future research may also explore the additional methodological support for complementing the resources and capabilities depicted in the DBM structure provided by a combined approach of Integrated Reporting (IR) and Dynamic Resource-Based View (DRBV), as characterized by Barnabè et al. (2019). Eventually, with the intent to develop more applied knowledge on the DBM, this approach will be applied to other SMEs, thus collecting a database of case-studies from multiple industries and market sectors exploring in a systematic way its effectiveness in supporting BM design and innovation.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A

Based on the SD model validation literature (Barlas, 1996; Forrester & Senge, 1980), structural and behavioural tests were performed to improve and correct the model. The model passed all applied tests and results are discussed here below.

Starting from model structure validation, *structure confirmation* test was conducted to compare the form of the model equations with the relationships that exist in the real system or derived from generalised knowledge available in the literature. Thus, main model variables, such as new and old customers, sales revenues, customer orders, bank balance variables formulation, were reviewed accordantly. Then, the *parameter confirmation* test aimed at evaluating the accuracy of constant variables. To validate such variables, they were compared against the knowledge of the real system. Therefore, variables values, such as unit costs, product unit price, personnel salary cost and marketing investments were matched with available company data. *Dimensional consistency* test was also performed during the model building process. This was possible, as the software in use (Stella Architect) offers a built-in feature checking automatically variables units of measure consistency with equations formulation.

In addition, behaviour patterns tests were also run. *Extreme-condition* test was performed to make sure model variables portray plausible

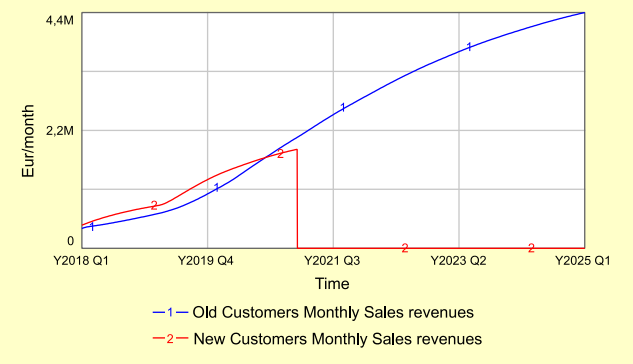

Fig. A1. New Customer monthly sales revenues decay as a consequence of the extreme-condition test.

Table A1
Discrepancy percentage between SD model and Giglio BP variables values (values are in thousands of Eur).

Variable name	A BP values	B Model values	C Discrepancy value (A-B)	D Discrepancy % (A/C)
Cumulated Sales Revenues	342.006	341.962	−44	−0,01%
Cumulated New Customers Sales Revenues	141.233	141.518	285	0,20%
Cumulated Old Customers Sales Revenues	200.773	200.444	−329	−0,16%
New Customers	84.298	84.667	369	0,44%
Old Customers	45.922	45.879	−43	−0,09%
Cumulated Contribution Margin	78.404	78.493	89	0,11%
Cumulated Total Direct costs	19.553	20.242	689	3,52%
Cumulated Total Indirect costs	39.914	39.702	−212	−0,53%
Cumulated EBITDA	18.936	18.548	−388	−2,05%
Cumulated Financial costs	1.046	1.050	4	0,38%
Cumulated Net Income	12.471	12.238	−233	−1,87%

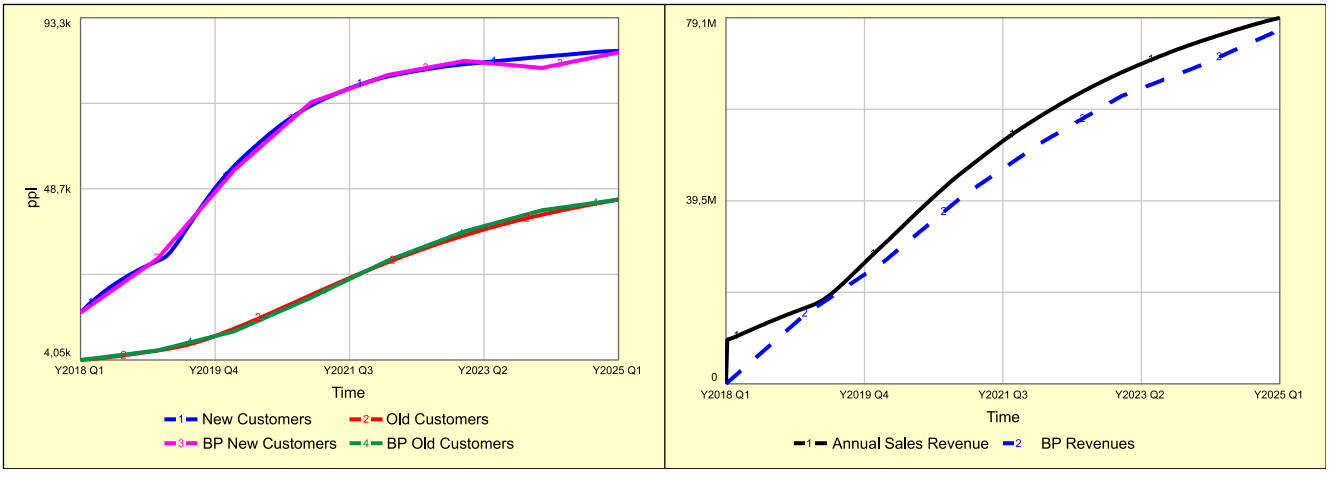

Fig. A2. Comparison of SD model and Giglio BP variables values.

behaviours under a similar condition in real life. Fig. A1 shows a reasonable decay in "new customers monthly sales revenues" as a consequence of the zero-value set to "New Customer order value" at time year 3. As expected, old customers monthly sales revenues are not affected by the change in new customers order value.

Finally, the model was used to test its accuracy to replicate the observed behaviours (*pattern predictions*). On this concern, it is asserted (Barlas, 1996, p. 194) that in case of transient behaviours (i.e., s-shapes growth or boom-and-bust pattern), such as the case under investigation, it is impossible to apply any standard statistical measure. Therefore, "the best approach is to compare graphical/visual measures of the most typical behavior-pattern characteristics". With this in mind, key-model variables behaviours were selected and compared with company data. As reported in Fig. A2, the model shows a high level of accuracy comparing new and old customers, and annual sales revenues variables reported in Giglio.com business plan (BP). As it is possible to detect from Table A1, model and Giglio BP variables values over a 7-year simulation period show a discrepancy percentage not higher than 3,52% (less than the 5% often identified as a "significant level").

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