

Managing Complexity in a Multi-Business-Model Organization

Yuliya Snihur
Toulouse University, Toulouse Business School
20, Boulevard Lascrosses
31068 Toulouse, France
Tel.: +33 752 29 01 01
E-mail: y.snihur@tbs-education.fr

Jorge Tarzijan
Pontificia Universidad Catolica de Chile
Vicuña Mackena 4860
Santiago-Chile
Tl.: +56 9684 39082
E-mail: jtarzija@uc.cl

Accepted for publication in *Long Range Planning*

Acknowledgments: We would like to thank Thomas Ritter and Christopher Lettl, two anonymous reviewers, our colleagues Tim Folta, Tomi Laamanen, and Steve Tallman, as well as session attendants during the SMS Conference in St. Gallen. Yuliya Snihur acknowledges the financial support from the « IDEX-nouveaux entrants » scholarship provided by the Université Fédérale Toulouse Midi-Pyrénées.

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Abstract

Many organizations operate multiple business models (BMs) concurrently. Yet, we know little about the challenges of managing a BM portfolio in one organization. In this study, we examine complexity as an important issue facing multi-BM firms. We differentiate complexity *within* a single BM from the complexity of links *between* BMs managed by a focal organization. Linking the BM and corporate strategy literatures, we discuss important dimensions and consequences of complexity in a BM portfolio. The sharing of similar activities and partners and the redeployment of activities and partners across BMs are important dimensions of the complexity of an integrated BM portfolio. We also suggest that BM portfolio complexity should be aligned with organizational design in terms of the centralization or decentralization of the decision-making process, and identify the positive effect of BM portfolio complexity on building imitation barriers.

Keywords: business model portfolio, *within* and *between* complexity, corporate strategy, sharing, redeployment, organizational design, imitation barriers.

Introduction

Corporate strategy has traditionally focused on the main strategic choices faced by multi-business organizations that seek to create competitive and corporate advantages. These strategic choices are the determination of the firm scope (i.e., the selection of specific business units or product domains) and the management of individual domains (Eisenhardt and Piezunka, 2011; Porter, 1987). With the advent of the business model (BM) as a new and different unit of analysis (Casadesus-Masanell and Zhu, 2013; Zott et al., 2011), the role of corporate strategy can

be also conceptualized as focused on the strategic decisions faced by multi-BM organizations. These decisions particularly concern the choice of specific BMs to operate and the management of several BMs within the firm's BM portfolio.

We posit that complexity is an important factor to consider for firms managing a multi-BM portfolio. Complexity is generated by the number of activities and partners in such a portfolio and the number of interdependencies between them (Kauffman, 1993; Simon, 1962). A growing number of interdependencies increases the coordination requirements among activities and partners and the complexity of a system, whereas a higher number of activities and partners also raises the complexity because it increases the likelihood of interactions among them (Larsen et al., 2013). The lack of academic analysis of complexity in a multi-BM setting is surprising, given that complexity has long been part of the research tradition in strategic management (Nickerson and Zenger, 2004; Williamson, 1975). It is important and timely to examine the challenges of managing BM portfolios because firms have been actively adding BMs—such as online retail, discount, or sponsor-based—to improve performance in a variety of industries (Kim and Min, 2015; Sabatier et al., 2010; Santos et al., 2015).

To fill this gap, we analyze the dimensions and consequences of complexity in multi-BM organizations using three relevant theoretical lenses. To define complexity at the BM portfolio level we draw on the theory of complex adaptive systems (Anderson, 1999; Kauffman, 1993; Rivkin, 2000). To analyze the dimensions of complexity we extend the insights from corporate strategy on strategic similarity, sharing, and redeployment (Capron et al., 2001; Helfat and Eisenhardt, 2004; Sakhartov and Folta, 2014) to the BM level. Finally, to theorize about the consequences of complexity we incorporate insights from organizational design theory (Galbraith, 1973; Fjeldstad et al., 2012; Zhou, 2011).

We explain that the relevant complexity type in an autonomous BM portfolio (with no interdependencies between the different BMs of the same organization) is the *within* complexity, inherent in individual BMs of the portfolio, while in an integrated BM portfolio (when there are interdependencies between activities and partners of different BMs) the relevant complexity type is the *between* complexity, stemming from interdependencies between the elements of the different BMs. We argue that sharing of similar activities and partners and redeployment of activities and partners across the BMs in an integrated portfolio limit the increase in *between* complexity in cases of integrated management.

Our analysis of BM portfolio complexity seeks to add to the business model, corporate strategy, and organizational design literatures. We enrich corporate strategy research by comparing and contrasting business unit (BU)-based and BM-based organizations. We also discuss how the level and type of BM portfolio complexity have to be aligned with organizational design and identify the positive effect of BM portfolio complexity on building imitation barriers. The detailed conceptualization of complexity in a multi-BM organization enables us to provide specific guidelines for managers, direct future research, and suggest how to operationalize the proposed constructs.

To begin, we define the BM as an activity system and discuss multi-BM organizations from this perspective. Then, we discuss the implications of using the concept of BM as a new unit of analysis for multi-BM organizations and differentiate it from a more traditional BU-based analysis. Next, we formalize the concept of complexity and disentangle its dimensions in multi-BM organizations. The analysis then turns to the consequences of complexity for the design of organizational structure and the likelihood of imitation by competitors. Finally, we draw attention to the theoretical and managerial implications of considering complexity in multi-BM

organizations and suggest avenues for future research. To illustrate our arguments, we use LAN Airlines as our primary example.

Business models and multi-business-model organizations

The business model as an activity system

We follow the activity system perspective, based on the work of Zott and Amit (2010: 216), who define the BM as “a system of interdependent activities that transcends the focal firm and spans its boundaries. The activity system enables the firm, in concert with its partners, to create value and also to appropriate a share of that value.” This perspective analyzes activities as the building blocks managers (or entrepreneurs) use to design BMs, or particular activity systems. Managers can choose which activities the firm performs, how they are linked, and who performs them (i.e., the firm or its partners). This perspective also echoes Porter’s discussion of the firm as composed of a set of activities (Porter, 1987; Porter and Siggelkow, 2008).

Several authors agree that activities are an important building block of a BM (Casadesus-Masanell and Ricart, 2010; Gambardella and McGahan, 2010; McGrath, 2010) and that the firm can perform different sets of activities alone or together with partners (Amit and Zott, 2001; Chesbrough, 2010; Desyllas and Sako, 2013). We develop our understanding of issues facing companies that manage several distinct activity systems, or BMs, from the activity system perspective.

The business model as a new unit of analysis for corporate strategy

After an important effort to define the BM concept, scholars have begun to study the implications of using the BM as a new unit and level of analysis in different contexts. Studies have looked at the drivers of BM design and innovation (Amit and Zott, 2015; Hienerth et al., 2011; Osiyevskyy and Dewald, 2015; Sanchez and Ricart, 2010; Sosna et al., 2010), competition

and replication of BMs (Casadesus-Masanell and Zhu, 2013; Winter and Szulanski, 2001), and their performance consequences (Brea-Solis et al., 2015; Visnjic et al., 2016; Zott and Amit, 2007). However, relatively few studies have considered the BM as a new and potentially useful unit of analysis for corporate, rather than business, strategy issues (Ahuja and Novelli, 2016; Aversa et al., 2015; Casadesus-Masanell and Tarzijan, 2012). These studies usually observe that incumbent firms in various industries add BMs to improve performance and to compete more effectively with rivals (e.g., Markides and Oyon, 2010; Santos et al., 2015).

A firm's choice to manage multiple BMs can be a response to the inadequacy of existing BMs to exploit new opportunities (Berends et al., 2016; Markides, 2015) or a reaction to competitors introducing new BMs (Ahuja and Novelli, 2016). In such cases, firms incorporate distinct BMs into what we call a BM portfolio, or a set of different BMs operated by the same organization. Several authors study firms that compete simultaneously with multiple BMs: Aversa et al. (2015) discuss how firms involved in Formula One racing operate two BMs concurrently, selling technology to competitors, and developing and trading human resources with competitors; Osiyevskiy and Dewald (2015) describe how some Canadian real estate brokers combine discount real estate brokerage with their traditional BMs; and Kim and Min (2015) comment on several retailers that add an online retailing BM to their BM portfolio. Despite the fact that the addition of a BM to the firm's BM portfolio might have significant performance consequences for the focal firm (Aversa et al., 2015; Kim and Min, 2015), the challenges of managing multiple BMs have not been studied in the detail they deserve. We argue that the complexity of the BM portfolio is an important factor to consider when managing multiple BMs.

The case of LAN Airlines

To illustrate our conceptual analysis (Siggelkow, 2007), we consider the case of LAN Airlines as a primary example (Casadesus-Masanell and Tarzijan, 2012). This company successfully operates three BMs: a full-service passenger BM for international long-haul flights, a no-frills discount passenger BM for domestic operations, and a cargo BM. As part of a pilot study to understand the management of complexity in multi-BM organizations, one of the authors conducted five interviews, lasting 13 hours in total, with LAN's CEO and top managers in charge of LAN's cargo and passenger BMs during the period 2010–15. The executives interviewed provided valuable information that complemented our own field research on LAN's BM portfolio management practices. Given the nature of the pilot study, we use the data exclusively to illustrate the relevance of managing BM portfolio complexity and the particular practices followed in a multi-BM organization¹ (Siggelkow, 2007).

LAN operates the full-service international passenger BM in much the same way as other airlines operate global passenger BMs. It offers frequent flights to major destinations through its own hubs and alliances with other airlines, and it has two classes of service, coach and business. The company has received awards for the high level of service of its international operations on numerous occasions.² The no-frills discount BM for domestic short-haul routes is a lower-cost, lower-overhead model characterized by fewer amenities, Internet ticketing, shorter turnaround times, and a uniform fleet of single-aisle planes from which the kitchens have been removed to increase seating capacity. LAN adopted a no-frills BM for domestic flights to stimulate demand in price-sensitive segments and increase capacity utilization. The cargo BM has an extensive international route network and offers a high level of service. LAN carries about two-thirds of its

¹ Due to data limitations and the objectives of the study, we did not conduct grounded theory development.

² Examples of these awards include Best Business Class in Latin America by *Business Traveler* magazine, Best airline in South America by the official *Airline Guide*, Best Latin American airline by *Global Finance Magazine*, and the best A-340 operator in the world by Airbus.

cargo shipments in specialized freighters and one-third in the belly of passenger airplanes. The company's international cargo operations are based on facilities located at different international airports. Its storage capacity, equipment, and extensive refrigeration units have made LAN the largest Latin American airline with dedicated cargo assets on U.S. soil. Whereas the premium long-haul passenger and cargo BMs drive significant willingness to pay from less price-elastic passenger and corporate clients, the no-frills short-haul BM is based on low prices, aimed at more price-sensitive customers.

The international passenger and cargo BMs present high levels of integration. This has allowed LAN, unusually among passenger carriers, to rely on cargo revenue, which accounts for approximately 35% of its total revenues. The combination of cargo and passengers in the same aircraft decreases the break-even load factor for passengers on each flight, promoting the operation of more routes and more flights per route. Without the international passenger BM, LAN would not be as strong in cargo as it currently is because the bulk of its cargo operates on the same route network as its international passenger BM. Similarly, because of the cargo contribution, passengers can enjoy more routes.

However, LAN cannot benefit from integrating passenger and cargo businesses on domestic routes given the competition from trucks, trains, and boats, and low local demand for the perishables that LAN transports farther abroad. As a result, the no-frills BM is managed autonomously and separately from the international passenger and cargo BMs. The objective of the no-frill BM is to exploit economies of scale by filling planes to the maximum possible extent, while the integrated cargo and long-haul passenger BMs exploit economies of scope.

Despite the advantages, the simultaneous operation of these three BMs creates a number of challenges for LAN's management. How can LAN manage, and possibly reduce, the complexity

of its BM portfolio? With this objective in mind, what dimensions of complexity should be considered? How should an adequate organizational structure (e.g., centralized or decentralized) be designed for its BM portfolio? What are the effects of its BM portfolio complexity on barriers to imitation and the sustainability of its competitive advantage? Before answering these questions, we first examine the differences between multi-BM organizations like LAN and multi-BU organizations like Procter & Gamble.

Multi-business-model and multi-business-unit organizations

The analysis based on multi-BM firms is not always coincident with the analysis based on multi-BU firms. BUs represent individual components of firm organization, differentiated through responsibility for one or several product markets, and often characterized by a unique address (Chandler, 1962; Karim et al., 2016; Martin and Eisenhardt, 2010). For instance, Procter & Gamble is divided into several BUs, such as skin and personal care, fabric care, or baby care, responsible for its various product lines, and often located at different headquarter addresses (P&G annual report, 2015). A profuse body of literature has analyzed the effects of the firm's BU characteristics (e.g., BU needs, competitive strategy, technology, size, investment prospects, maturity, etc.) on the organization of the firm. A relevant part of this literature focuses on the need for alignment between the specific characteristics of the BUs managed by the firm, the role of corporate oversight, and the integrating mechanisms (Campbell et al., 1995; Semadeni and Cannella Jr., 2011).

While BUs are usually based on a particular product market served in an often well-delineated geographical area, BMs reflect how particular products or services are provided through a specific activity system. In the case of Procter & Gamble, several BUs are operated with one BM; however, a BU can be also operated with more than one BM. LAN operates two

BM in the passenger BU: a discount model for domestic short-haul routes and a full-service model for long-haul routes. These two BMs represent two different logics of value creation and capture even though they belong to the same BU. The recent announcement of the German giant GEA Group, an important worldwide supplier to the food processing industry, similarly demonstrates that a BM is not equivalent to a BU: GEA reorganized from four original BUs (farming technologies, mechanical equipment, process engineering, and refrigeration technologies) into two BMs (equipment and solutions) (GEA, 2014).

Conversely, the same BM can serve different product markets, and the same product market can be served by different BMs. For instance, Easy Group applies the same discount BM to markets such as airlines, car rental, or Internet cafes, while ING uses both discount (through the ING Direct brand) and traditional (through the ING brand) BMs to serve its customers' banking needs. Firms with international operations usually have separate BUs in different countries, but these BUs typically apply the same BM. For instance, retailers like Walmart, Carrefour, and Auchan expand into other countries by exploiting the same traditional retailing BM, but they might do so through separate BUs (Berg and Roberts, 2012). Table 1 illustrates the various possible scenarios described.

 INSERT TABLE 1 ABOUT HERE

As the firm can manage a BU with different BMs or operate different BUs with the same BM, there is no direct correspondence between the BU and the BM unit of analysis. What is more, some companies choose to organize their operations based on BMs rather than BUs (i.e., GEA, the recent reorganization of Google as Alphabet³).

³ As discussed in Google's press release: <https://investor.google.com/releases/2015/0810.html>

The distinction between BMs and BUs implies that the analysis of corporate strategy issues cannot be performed comprehensively while ignoring the BM unit of analysis. Shifting the object of study from the BU to the BM has interesting implications for corporate strategy, particularly it relates to the complexity generated by adding a new BM to the firm's BM portfolio, the design of organizational structure to cope with this complexity, and the effects on the durability of the firm's competitive advantage through the creation of imitation barriers. Before analyzing these issues, we first discuss the types of complexity that arise in a multi-BM organization.

Complexity in a multi-business-model organization

Simon (1962: 468) defines complexity in a system as “a large number of parts that interact in a non-simple way.” A growing number of interdependent parts increases coordination requirements and raises the total number of interfaces within the system (Larsen et al., 2013). Our conceptualization of complexity borrows from Kauffman's (1993) theory of complex adaptive systems, in which the complexity of a system positively depends on the number of interdependencies between the elements within the system (K). The number of elements or agents in a system (N) also affects complexity, because a higher N generally implies a higher K. Following Kauffman's (1993) notation, a BM can be associated with a subsystem in which N is related to the activities and partners in charge of specific activities within the BM, and K relates to the interdependencies among them. Thus, a portfolio of BMs can be analyzed as a system composed of different subsystems with a varying number of activities and partners and varying levels of interdependencies between them.⁴

To simplify the analysis of complexity in a multi-BM organization, we define two types of BM portfolios: *autonomous* and *integrated*. While in an *autonomous* BM portfolio there are no

⁴ A caveat to consider here is that the degree of complexity could be affected by variability and variety more than by the simple number of interdependencies. For instance, it might be harder for a focal firm to cooperate with partners when there are important differences in size or identity (e.g., family firm, non-profit organization).

interdependencies between the sets of activities employed in the different BMs the firm operates (although there are interdependencies within each BM), in an *integrated* BM portfolio there are interdependencies between the activity systems of the different BMs operated by the focal firm.

Authors examining complexity in organizations distinguish complexity within functional departments or components, and complexity across departments or interfaces (e.g., Claussen et al., 2015; Levinthal and Posen, 2007). Extending this literature to the BM level of analysis, we term the complexity contained within a particular BM as *within* complexity and the complexity associated with the interdependencies between the BMs as *between* complexity. In an autonomous BM portfolio, complexity is equivalent to the sum of *within* complexities of individual BMs, whereas in an integrated BM portfolio, complexity also depends on *between* complexity (Ethiraj and Levinthal, 2004).⁵ Given that in practice the BM portfolio operated by the firm is usually neither completely autonomous nor fully integrated, we can observe different levels of *between* complexity, from very low to very high.

Firms can manage multiple BMs either within a single BU or in separate BUs, and different BUs with a single BM. If different BUs, based on distinct product markets or geographies, operate the same BM (e.g., Walmart's discount BM, Brea-Solis et al., 2015), then the issue of *between* complexity at the BM level will be irrelevant.⁶ Managing *between* complexity becomes relevant when the firm operates multiple BMs within one or several BUs. For instance, managing *between* complexity is an important issue for LAN Airlines. Given that the discount BM for domestic passengers and the full-service BM for international flyers are "hosted" in the passenger BU, the analysis of complexity at the BM level is different from the analysis of complexity at the BU level.

⁵ Although we consider *within* complexity, we mainly focus our attention on *between* complexity because of its relevance to any integrated management of a BM portfolio.

⁶ Although complexity might still exist in such a firm due, for instance, to a high number of different products.

Based on the corporate strategy literature, we derive two important dimensions determining BM portfolio complexity: the sharing and the redeployment of activities and partners across BMs within the same organization. It is relevant to analyze these two dimensions because they can be affected by the firm's decision-making: multi-BM firms may choose to share more activities and partners across the BMs and may add BMs with activities and partners that have a higher or lower capacity for redeployment across the BMs. Later, we analyze the consequences of BM portfolio complexity for the firm's organizational structure and the sustainability of its competitive advantage. Our conceptual model is summarized in Figure 1.

 INSERT FIGURE 1 ABOUT HERE

Complexity dimensions in a multi-business-model organization

Sharing of similar activities and partners across BMs

How different BMs are managed within the BM portfolio will be important for the resulting complexity of such a portfolio. A firm that seeks to manage an integrated portfolio of BMs will face a higher number of interdependencies and, thus, increased *between* complexity compared to a firm that manages the same BM portfolio more autonomously. The increase in the *between* complexity of the integrated portfolio will be affected by the similarity⁷ of the activities and partners across the different BMs. More similarity will entail the possibility of sharing common activities and partners across the BMs, decreasing the total number of elements required to manage the portfolio of BMs (Mehrizi and Lashkarbolouki, 2016; Porter, 1987; Siggelkow and Levinthal, 2003). Helfat and Eisenhardt (2004: 1219) refer to the contemporaneous sharing as *intra-temporal* economies of scope.

⁷ The concept of similarity has been discussed by corporate strategy scholars, who have often measured it in terms of similarity of customers, geographic areas, and competition, and analyzed it as an important aspect of acquisition decisions (Capron et al., 2001; Zeng and Schoenecker, 2015).

To assess similarity at the BM portfolio level we consider the BM as a system composed of several interdependent choices related to activities and partners (Casadesus-Masanell and Ricart, 2010; Zott et al., 2011). Specifically, two key questions are relevant to evaluate the similarity of BMs: (1) How different or similar are the *activities* performed in the BMs? (2) How different or similar are the *partners* involved in the BMs? BMs are more similar if they have a greater number of activities or partners in common.

When a company can share similar activities and partners in an integrated BM portfolio, the number of activities and partners, as well as the interdependencies between them, will go down compared to an integrated BM portfolio with lower similarity. For instance, if a retailer works with different suppliers (low similarity) for its online and store-based BMs, the *between* complexity of an integrated system for logistics and warehousing activities will increase more than when the retailer works with a single supplier (high similarity) used in both BMs. Thus, the *between* complexity of an integrated BM portfolio is likely to increase at a lower rate when activities or partners are more similar, increasing the attractiveness of an integrated management of a BM portfolio. We therefore propose:

Proposition 1: *The increase in between complexity of an integrated BM portfolio will be lower when the activities and partners of the portfolio BMs are more similar and, therefore, can be shared across BMs.*

Sharing of similar activities and partners across BMs: the LAN case

In the case of LAN, the cargo and full-service BMs are similar in terms of activities and partners. Cargo and international passengers can arrive at the same airports or fly with the same pilots. Additionally, LAN can acquire passenger and cargo airplanes from the same manufacturers and negotiate with the same airports for runway slots and gates (Casadesus-Masanell and Tarzijan,

2012). Given these similarities, the two BMs can share more activities and partners.

Sharing reduces the total number of activities and partners required, and the number of interdependencies in an integrated BM portfolio, compared to a situation in which BMs are less similar and sharing is more difficult. For example, LAN's discount BM is not very similar to its cargo BM, because generally cargo and domestic passengers do not arrive at the same airports. Integrated management of LAN's domestic and cargo BMs would involve less sharing and almost certainly more interdependencies and higher complexity. In an interview, Enrique Cuento, CEO of LAN Airlines, described the differences in sharing among LAN's BMs:

“The cargo and the international passenger businesses are managed with greater levels of integration than the domestic passenger business. The cargo and the international passenger models share more of our international destinations and we use the same personnel to transport international passengers and cargo.”

Redeployment of activities and partners across BMs

Corporate strategy research points to another important element affecting the complexity of a BM portfolio: the redeployment of activities and partners across BMs. Activities or partners that can be redeployed are amenable to multiple applications across businesses (Anand and Singh, 1997; Danneels, 2011; Mannor et al., 2016); that is, they are not specific to a particular BM (Williamson, 1975, 1985). Activities or partners that are specific to a certain BM cannot be redeployed without a loss in value, and supporting investments will have a higher value if used in that BM rather than redeployed for any other purpose (McGuinness, 1994).

So, while highly specific activities or partners can be used in fewer BMs, activities or partners that display lower levels of specificity can be useful in more settings (Levinthal and Wu, 2010). For instance, in the context of dynamic capabilities, it has been shown that some processes, such as product development, strategic decision making, and alliancing, are applicable in different contexts, facilitating their continuous reallocation across industries and product categories

(Eisenhart and Martin, 2000). The possibility of reallocating activities and partners across businesses over time leads to what Helfat and Eisenhardt (2004) call *inter-temporal* scope economies. The inter-temporal redeployment of activities and partners is different from their intra-temporal sharing across BMs: redeployment demands the withdrawal of activities and partners from one BM to another, while sharing demands the simultaneous utilization of activities and partners in different BMs.

Two key questions can be asked to assess redeployment across the BMs in a portfolio: (1) What is the potential to redeploy *activities* in different BMs? (2) What is the potential to redeploy *partners* in different BMs? The capacity to redeploy activities and partners, although related to the concept of similarity discussed above, implies more future-oriented considerations about *potential* redeployment over time rather than contemporaneous sharing. This is important because the capacity of some activities, such as managerial attention, can be limited, so that those activities will not be shared contemporaneously once limits have been attained (Levinthal and Wu, 2010). However, they could still be redeployed from one BM to another over time.

The redeployment option is especially useful in cases of high uncertainty (Sakhartov and Folta, 2014). For example, environmental uncertainty, defined as the rate of exogenous change in the environment that affects firm performance, increases the likelihood that the elements or the links among the elements of a system may become obsolete from one day to the next (Poppo and Zenger, 1998; Sorenson, 2003). More interactions between the activities and partners of a BM means that environmental uncertainty affects not only those activities or partners, but also the functioning of the entire BM, increasing the value of flexibility and the ability to quickly respond to changes in the business environment (Bettis and Hitt, 1995; Nadkarni and Narayanan, 2007). The ability to redeploy activities and partners across the firm's BMs speeds up the exit from

underperforming BMs and lowers the costs of experimentation with new BMs that require a subset of the activities and partners of existing BMs (Lieberman et al., 2016). The option to redeploy activities and partners among BMs enables a multi-BM firm to be more flexible than a single-BM firm, whose major alternative is divestment in external markets (Lieberman et al., 2016).

Further, the option to redeploy activities or partners between BMs can reduce the total number of activities or partners required to manage an integrated BM portfolio (Helfat and Eisenhardt, 2004) because activities or partners can be quickly borrowed from any other BM operated by the firm when needed (e.g., when the demand goes up or down unexpectedly). This reduction decreases the number of interdependencies among BMs compared to the interdependencies in the management of an integrated BM portfolio with lower levels of redeployment. Thus, the *between* complexity of an integrated BM portfolio is likely to increase at a lower rate when there is redeployment potential for the activities and partners. We therefore propose:

Proposition 2: *The increase in between complexity of an integrated BM portfolio will be lower when the activities and partners of the portfolio BMs have a higher capacity to be redeployed across BMs.*

Redeployment of activities and partners across the BMs: the LAN case

In the case of LAN, the use of airplanes is an example of an activity that can be redeployed across BMs. LAN buys passenger airplane models, which are normally used to transport passengers. However, the passenger planes can also be redeployed (after some adjustments) as freighter planes in times of peak demand in the cargo BM. This redeployment option enables LAN to create a buffer against uncertainty without unnecessarily increasing the total number of

different airplanes it owns. This means that LAN can buy fewer freighters when managing its cargo and full-service BMs in an integrated manner. Jorge Awad Mehech, former Chairman of LAN's Board, describes the importance of redeploying activities and partners in a BM portfolio:

“A major feature of LAN's model is to be able to respond and adapt to changing economic scenarios. Our integrated model allows us to move airplanes when demand for cargo or passenger changes unexpectedly. This is especially useful in this business because cargo and international passenger demands are not closely correlated.”

Managing complexity and its consequences

Design of organizational structure

Anecdotal evidence shows that whereas some multi-BM companies delegate the administration of their businesses to a decentralized management (e.g., ACCOR with its Mercure, Novotel, Ibis, and Formule 1 businesses; Inditex with its ZARA, Massimo Dutti, and Bershka businesses) (Santos et al., 2015), others prefer centralized decision-making (e.g., LAN Airlines with its cargo and long-haul passenger BMs). We propose that the complexity type of a firm's BM portfolio has to be aligned with the design of organizational structure in terms of the centralization or decentralization of the decision-making process.

BM portfolios with a high level of *between* complexity require stronger involvement from the corporate office, in which coordination between BMs is a paramount task. The design of the organizational structure should be biased toward a more decentralized management when the complexity of the BM portfolio involves mostly *within* complexity of the individual BMs.

Decentralized management of a BM portfolio highlights the adaptation, learning, and knowledge advantages of managers of individual BMs (Acemoglu et al., 2007; Birkinshaw et al., 2002; McElheran, 2014). Individuals typically hold hard-to-transfer information about a specific BM and the related tasks they are more familiar with. However, decentralization can enhance efficiency in the decision-making process when a higher level of local adaptation is required,

because more informed and knowledgeable agents understand better the problems at stake (Gibbons et al., 2013; Jensen and Meckling, 1995). The need for rapid adaptation to local changes reduces the efficiency of solving problems by first communicating all of the relevant knowledge to a centralized planner because this slows down the speed of response actions (Hayek, 1945). In an autonomous BM portfolio, where *within* complexity is relatively more important, the firm's headquarters do not play a very active role in coordination between individual BMs and decentralized BM managers are in charge of the interdependencies that occur *within* each BM.

As the *between* complexity of the BM portfolio becomes relatively more important, there is a greater need for coordination of decisions concerning the different BMs, requiring a more centralized decision-making process for the functions involving BM interdependencies. Prior literature indicates that centralization can facilitate coordination between interdependent activities (Alonso et al., 2015; Nickerson and Zenger, 2004; Zhou, 2013) and that the design of organizational structure can play an important role in promoting coordination among the different BMs, for instance through cross-divisional knowledge exchange (Foss and Saebi, 2015). Related to this, Siggelkow and Rivkin (2006) present an agent-based simulation model and suggest that increased exploration by local managers in a decentralized structure might not be effective when coordination is needed. A firm with a centralized organizational structure tends to perform a more coordinated search for new opportunities, invests in understanding the critical interdependencies and bottlenecks, looks to exploit opportunities for complexity reduction, incentivizes managers to seek, participate, and operationalize these opportunities, and directs operations by imposing rules, dispute resolution schemes, and communication channels.

The centralization or decentralization of the decision-making process is also relevant when firms make changes to their existing BMs. When changes imply a refinement of an existing BM and do not affect any other of the firm's BMs, most activities related to these changes can be decentralized. When changes are more extensive and affect other BMs operated by the firm, corporate management has to be involved, especially to deal with internal pressures for resource management and capital reallocations (Mehrizi and Lashkarbolouki, 2016).

In sum, a high level of *between* complexity in a BM portfolio requires more alignment and coordination between agents, increasing the importance of centralization, whereas a high level of *within* complexity requires knowledge specialization and rapid adaptation to local changes to handle the complexity of the individual BMs, increasing the incentives to decentralize. We therefore propose:

Proposition 3a: *The incentives to design a centralized structure to manage a BM portfolio increase with the between complexity of the portfolio.*

Proposition 3b: *The incentives to design a decentralized structure to manage a BM portfolio increase with the within complexity of the portfolio.*

The management of a BM portfolio is usually neither completely autonomous nor completely integrated. Some elements of the BMs are usually autonomously managed at the individual BM level, whereas others are integrated across BMs. This is consistent with findings that show that when adopting new BMs, firms separate some activities from the existing BM, while keeping other activities integrated across BMs (Markides, 2015).

An example is the case of BMs that share back-office activities and independent front-end value propositions, which usually involve different partners with distinct activities (Casadesus-Masanell et al., 2015; Gulati and Garino, 2000: 107). For instance, LAN's accounting manages

payments to all LAN businesses, whereas the front-end value proposition is different in each of the three BMs. In these situations (which are quite common), decentralizing the full operation of individual BMs may not be efficient because conflict would arise and some coordination is needed for interdependent activities. It is not advisable to fully centralize the operations of BM portfolios when there are important levels of *within* and *between* complexity because specialization and local knowledge are required to manage effectively the idiosyncrasies and local adaptation needs of individual BMs.

More mixed organizational designs are required when there are high levels of *within* and *between* complexity, which is often the case with integrated BM portfolios. Based on our previous analysis, we can divide the different elements of a BM portfolio into two groups: elements that are interdependent across different BMs and elements that are idiosyncratic to each BM and do not depend on other BMs. Coordination is needed for the interacting elements, and decentralization of the decision-making process is required for the non-interacting elements. In this setting, the firm can group the interacting elements in one or more modular sub-systems (Martin and Eisenhardt, 2010; Sanchez and Mahoney, 1996), and group the non-interacting elements in a different modular sub-system, leading to what we term modular centralization for integrated BM portfolios. More mixed designs are also required when there are low levels of *within* and *between* complexity. In these cases, a limited coordination of the (few) interdependent partners and activities is needed and thus, the firm should choose modular decentralization.

Such grouping can also help the development and sharing of knowledge and resources across several BMs in the firm's portfolio; organizational design scholars (Fjeldstad et al., 2012; Miles et al., 2010; Snow et al., 2011) term these *commons*. Such knowledge commons can contribute

significantly to the firm's performance advantage due to an improved understanding of the shared or redeployed activities and partners among its BMs. For instance, LAN's experience managing different airport partners, shared between its passenger and cargo BMs, enables it to make better decisions about how best to cooperate with different airports. The development of knowledge commons that is useful across different BMs in a portfolio is an additional incentive for modular centralization of interacting activities and partners in the portfolio. From this we derive our next proposition:

Proposition 3c: *The incentives to design modular centralization for the interacting elements and to delegate the non-interacting elements to individual BM managers increase with the within and between complexity in the BM portfolio.*

Table 2 sketches the organizational structure that should be considered for different types of complexity in a BM portfolio.

 INSERT TABLE 2 ABOUT HERE

Design of organizational structure: the LAN case

We use the LAN case to illustrate some concepts in Table 2. Its three BMs (full-service passenger BM, cargo BM, and no-frills discount BM) face rather high levels of *within* complexity, given that each BM includes a number of activities and partners that interact in non-trivial ways. For instance, for each BM, the airline has to negotiate with airports, pilots, and aircraft manufacturers, offer distinct sales channels, maintain commercial offices worldwide, manage a non-standardized fleet, etc.

LAN manages the discount domestic passenger BM with a high level of decentralization due to the low number of interdependencies (low *between* complexity, but high *within* complexity) with the other two BMs (international passenger and cargo BMs). The narrow-body aircraft used

on the short-haul routes are not large enough to carry sufficient cargo. There is also a rather low level of interdependencies between the discount domestic BM and the long-haul international passenger BM. The fleet, yield management systems, and most of the personnel are generally managed independently between the BMs. As long as the discount domestic BM is separate from the other two BMs, the complexity of the discount BM depends on the interdependencies between activities and partners *within* that BM, and therefore a more decentralized organizational structure is warranted. However, a few centralized coordination mechanisms are still in place: for instance, the loyalty program offered to all LAN passengers is managed through a limited centralized structure.

LAN manages the international long-haul and cargo BMs with a number of centralization initiatives due to the high number of interdependencies (high *between* and high *within* complexity) between these two BMs. LAN's international cargo operations are based on facilities located at different international airports, where it also manages services for international passenger operations. The cargo and the international passenger BMs share such activities as managing the aircraft fleets and yield management systems, among others, and interact with the same partners (airport operators).

Let us take the example of the yield management system used to optimize the revenue generation stemming from a specific flight. To plan for the cargo and the international passenger businesses, LAN must coordinate dynamically a sophisticated passenger-cargo yield management system. This system enables the company to raise and lower passenger ticket prices adjusting to demand for passengers and cargo. However, other elements are not shared between the different BMs. For instance, the cargo BM also involves maintaining a fleet of freighters that do not transport passengers and need to be assigned to different routes, whereas the passenger

BM includes activities such as the loyalty program and a network of alliances not open to cargo customers.

Given that the cargo and the long-haul passenger BMs belong to different BUs, possible conflicts must be managed carefully. These conflicts arise, for instance, because more cargo usually implies fewer passengers in the same aircraft, and vice versa. If decisions were dependent only on the individual BM managers, the cargo manager would try to fill the plane with cargo, and the long-haul passenger manager would try to maximize the number of passengers. If decisions were completely centralized, the manager would not have a detailed understanding of market changes in each of these activities. Alvaro Carril, Vice-President of marketing and sales of LAN cargo, commented on this tension:

“The cargo business is tremendously dynamic and decisions must be made continuously. A major issue is how to assign cargo and passengers to an aircraft when there are important demand shifts, because each activity manager seeks to provide a great service to customers.”

Although internally developed software indicates how to best fill the plane in different circumstances, coordination by a centralized officer is needed because non-anticipated conflicts often arise. The LAN example illustrates how a relevant portion of complexity of the integrated long-haul passenger and cargo BMs depends on interdependencies between activities (e.g., yield management) and partners (e.g., cargo and long-haul passengers). Another portion of the complexity of these two BMs depends on the elements of each BM that do not interact, which should be managed with more decentralization.

In sum, with a low number of interdependencies between the BMs (i.e., low *between* complexity), a decentralized structure is warranted for an autonomous BM portfolio (modular decentralization in case of low *within* complexity, see Table 2). In the case of high *between* complexity, functions involving interdependencies between the BMs have to be centrally

coordinated to optimize their management, whereas functions without interdependencies can still be managed in a decentralized manner.

Imitation barriers

Autonomous management of a BM portfolio resembles a modular organization in which each module can be associated with an individual BM. Modularity has been defined as “a special form of design which intentionally creates a high degree of independence or ‘loose coupling’ between component designs” (Sanchez and Mahoney, 1996: 65). Highly independent BMs display high levels of modularity, in which *within* complexity is relevant. Conversely, highly interdependent BMs display low levels of modularity, in which *between* complexity is relevant.

Following the modularity literature, modular architectures tend to reduce complexity because of the smaller size of the design problem and fewer interdependencies among the elements (Pil and Cohen, 2006). Modular designs seem better suited to provide flexibility (Sanchez and Mahoney, 1996) and are often more robust to changes in their environment compared to tightly coupled systems (Levinthal, 1997). However, highly modular designs also facilitate imitation, undermining the sustained market performance of a firm (Pil and Cohen, 2006). A BM portfolio is more difficult to imitate if its BMs interact closely with each other (i.e., if there is high *between* complexity) because the imitator has to replicate not only the individual BMs, but also the interactions between them.

Thus, the level and type of BM portfolio complexity affect not only the appropriate design of organizational structure, but also barriers to imitation. BMs characterized by many interdependencies between components will take more time and effort to decipher, understand, and imitate due to the negative effects of complexity on imitation (Rivkin, 2000). More information is required to describe (and to understand) the design and functioning of a complex

BM portfolio, and, because this information is usually harder to obtain, it is more likely to be incomplete (Sorenson et al., 2006). Even if the would-be imitator understands most of the elements involved in the separate BMs (i.e., the activities and partners involved), the interactions between the BMs will make the imitation of a BM portfolio harder. As such, interactions between BMs in a BM portfolio can create a barrier to imitation (Lenox et al., 2010; Rivkin, 2000).

The creation of barriers to imitation is important because imitation is the most common “market entry strategy” (Markides, 2015). Imitative entry has been estimated to be close to 90% of all entries, whereas only about 10% of market entries can be considered innovative (Geroski, 1991). This leads us to propose:

***Proposition 4:** A high level of between complexity in the BM portfolio increases barriers to imitation and so contributes to the sustainability of the firm’s competitive advantage.*

Imitation barriers: the LAN case

We have described how LAN largely manages the discount domestic BM independently from its long-haul passenger and cargo BMs, meaning that the short-haul BM follows a more modular organization. At the same time, the international full-service and cargo BMs are managed with high levels of interdependency (high *between* complexity) and cannot be seen as two separate modules. One of the implications of sharing and interdependency between the activities of these two BMs is a reduction in the break-even load factor to serve routes in which cargo and passengers are transported in the same aircraft. This lower break-even point leads to an increase in the number of profitable routes and the number of flights per route, generating higher willingness to pay for both passenger and cargo customers who value the possibility of flying to more destinations more often (Casadesus-Masanell and Tarzijan, 2012). The increase in the

willingness to pay generates a competitive advantage for LAN that is difficult for other airlines to imitate because imitation would require jointly managing the intricacies of a BM portfolio similar to LAN's. Imitation of the more modular (less interdependent) domestic short-haul BM is more straightforward.

LAN's management was well aware of the advantages represented by such organizational design. Enrique Cueto, LAN's CEO, commented:

"A major advantage of our model is that by combining passengers and cargo we can differentiate ourselves from our competitors and hopefully get a more lasting competitive advantage."

Discussion

Although we know through anecdotal evidence that several organizations operate multiple BMs simultaneously, less is known about the challenges of managing BM portfolios. We seek to stimulate the development of theory connecting the BM, corporate strategy, and organizational design literatures by proposing novel ways of thinking about *traditional* strategy concepts through a BM lens. In the following section we discuss the theoretical and managerial implications of our work.

Theoretical implications

First, we contribute to the literature on business models. Our work is one of the first papers (see also Ahuja and Novelli, 2016; Aspara et al., 2013; Aversa et al., 2015) to examine the implications of firms competing with multiple BMs, rather than with multiple BUs. Although previous research has shown the positive consequences for firm performance of competing with multiple BMs (e.g., Aversa et al., 2015), we go deeper by examining an important underlying feature of a BM portfolio: its complexity. The conceptualization of complexity has been absent from the BM literature, which mentions complexity as a possible BM characteristic (Berends et

al., 2016; Bohnsack, et al., 2014; Casadesus-Masanell and Ricart, 2010; Desyllas and Sako, 2013) without offering advice about how to evaluate complexity or what its dimensions or consequences might be. We explain the concept of BM portfolio complexity, formalize it in a parsimonious manner based on Kauffman's (1993) NK notation, and explain its links with corporate strategy and organizational design.

Second, we contribute to the corporate strategy literature, which has mostly focused on the BU level of analysis rather than on the impact of operating several BMs (see, for instance, the review by Wirtz et al., 2016). We argue for the need to include the BM lens as a useful tool in the corporate strategy toolbox. This is important because the increase in imitation barriers due to the effects of *between* complexity might be one of the explanations for recent findings about high performance in multi-BM organizations (Aversa et al., 2015; Casadesus-Masanell and Tarzijan, 2012; Kim and Min, 2015). We also show how important corporate strategy concepts such as strategic similarity (Capron et al., 2001) and redeployment (Helfat and Eisenhardt, 2004) can be extended to the study of complexity at the BM level of analysis.

Third, echoing calls for studies that scrutinize the design of appropriate organizational structure (Fjeldstad et al., 2012; Snow et al., 2011), we add depth to the literature on organizational design by providing specific guidelines for multi-BM organizations. We suggest that companies managing a more integrated BM portfolio centralize decision-making for interdependent activities and partners across the BMs and decentralize the activities and partners for which there are no interdependencies. This view extends discussion about a more complex role for the design of the organizational structure than originally envisioned in corporate strategy research. The organizational design literature has so far discussed issues like geographical location (Laamanen et al., 2012) or BU organization for multinational corporations (Dellestrand

and Kappen, 2012; Nell and Ambos, 2013). The addition of BM introduces an important new locus of attention. BMs can be considered as a complementary unit of analysis when designing organizational structure, especially in cases of high *between* complexity.

Managerial implications

The theoretical insights in this paper have several managerial implications. First, when deciding whether to add a new BM to their portfolio, managers should consider the possibility of sharing similar activities and partners across BMs (Proposition 1) and the options for redeployment of activities and partners across the BM portfolio (Proposition 2). It follows from our propositions that integrated management of a BM portfolio is more appropriate when the activities and partners its BMs contain are similar or when low specificity provides the option to redeploy activities and partners between BMs. From the complexity perspective, dissimilar BMs and BMs without redeployment options (i.e., activities and partners are specific to particular BMs and cannot be used easily in other BMs) should be managed more autonomously. The balance between separation and integration within a BM portfolio can be achieved only if managers think creatively about which specific activities and partners to separate, which to redeploy, and which to share between the different BMs.

Second, with a more autonomous BM portfolio, managers should seek to design an organizational structure with greater decentralization (Proposition 3). Organizational structure is likely to be more complex when the BM portfolio contains important interacting and non-interacting elements (high *between* and *within* complexity). Organizational designers need to consider centralization (coordination of functions) for the elements or sub-systems involving interdependencies and decentralization of functions for non-interacting elements or sub-systems. In such cases it is also important to build knowledge commons to understand better and learn

from sharing and redeployment of activities and partners between BMs.

Overall, given that improvements in information technologies and in the quality of communications are likely to further facilitate the integrated management of an increased number of BMs inside the firm, managers need to pay close attention to the level and types of complexity in their BM portfolio. Our theory development suggests that the firm's competitive advantage might be easier to sustain if it originates from interdependencies between the elements of more than one of its BMs (Proposition 4).

Operationalization and future research

Research is necessary to understand better if and how firms manage complexity and adapt their organizational design to the increased variety of BMs available for integration into a firm's BM portfolio. However, conducting such research, especially empirically, implies several challenges; there is scant theoretical guidance about the relevant determinants, processes, and consequences of BM portfolio complexity management, as well as the operationalization difficulties involved. In empirical research (e.g., Dess and Beard, 1984; Sharfman and Dean, 1991), complexity has been evaluated as a characteristic of the environment. At the organizational level, it has often been proxied by organizational size, number of departments (Damanpour, 1996), or interdependencies between divisions (Zhou, 2013). Our work provides additional precision, anchored in BM and complexity theories, by suggesting that BM portfolio complexity can be measured using two key elements: activities and partners engaged in a firm's BM(s), and their attributes (total number N and interdependencies K).

To test our propositions, a survey in which respondents evaluate the interdependencies between activities and partners of the same BM, and interdependencies between activities and partners of the different BMs managed by the focal firm, could help assess the *within* and

between complexity of a BM portfolio.⁸ Alternatively, activity maps (e.g., Siggelkow, 2001) could be used to assess the intensity of interdependencies in the firm's BM portfolio. Such a study would need to collect data about the number of activities and partners involved in different BMs, identify the interdependencies, and measure complexity along with different organizational designs firms might implement—for instance, through a large-sample survey complemented by archival data. In sum, operationalizing complexity with valid and reliable instruments would help test the propositions developed here, as well as advance the BM literature more generally.

Overall, our work suggests that complexity is a relevant issue to consider when assessing how to manage a BM portfolio within an organization. We also argue that the design of an organizational structure has to be consistent with the level and type of BM portfolio complexity, potentially impacting barriers to imitation. Much remains to be done in examining the determinants and consequences of complexity in organizations, particularly analyzing the implications for organizational design and resource management. At this stage, we have more questions than answers. For instance, can firms develop dynamic capabilities to manage complexity by operating more integrated BM portfolios? Would such capabilities facilitate firm survival, especially in environments characterized by high uncertainty? How would the issues faced by multi-BM organizations operating in multiple countries impact the discussion about complexity? What role should corporate headquarters play? How might the role and relevant competences of a BM portfolio manager differ from those of a BU-level executive? We hope others will follow our lead and help deepen our understanding of BM portfolio complexity and how it should be managed in multi-BM organizations.

⁸ A setting with several available BMs should be selected—for instance, in the retail or airline industries, where online retail or discount BMs have become popular alternatives to traditional BMs.

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Figure 1. Managing complexity in multi-business-model organizations—key propositions

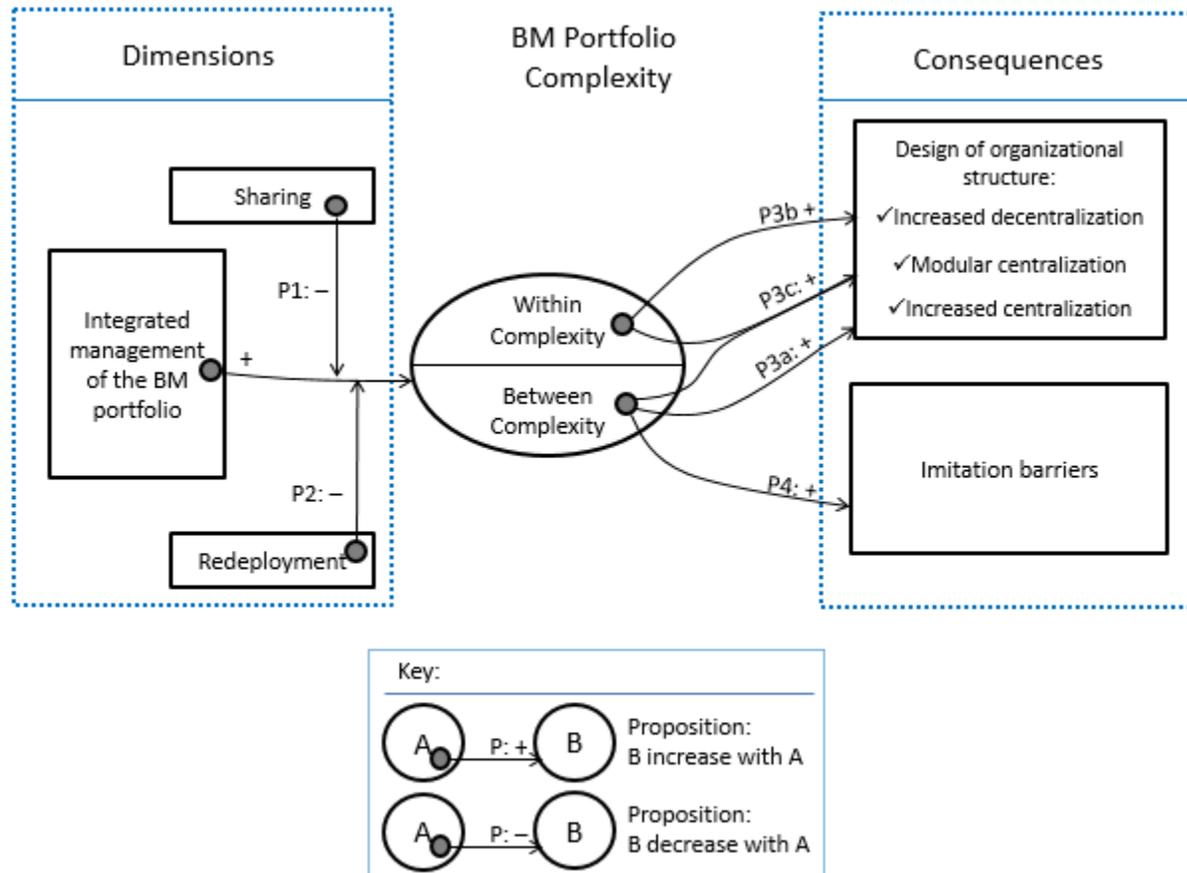


Table 1. Different scenarios of BU- and BM-based organizations

Business Unit (BU)	Multiple (different product markets or geographies served)	<p>Single-BM, multiple-BU organization</p> <p><u>Example:</u> BUs organized by country or by product market, exploiting the same BM: P&G manages its skin, fabric, and baby care BUs with the same BM. Luxury firm Hermès manages its leather goods, clothing, perfumes, and watches BUs with the same BM. Easy Group applies the same discount BM in different product markets (airlines, car rentals, etc.).</p> <p><u>Relevant BM complexity:</u> <i>within</i> complexity</p>	<p>Multiple-BM, multiple-BU organization</p> <p><u>Example:</u> BUs and BMs can overlap or not: LAN is present in two product markets (passenger and cargo BUs) with three BMs (discount BM for domestic short-haul flights, full-service BM for long-haul flights, and a cargo BM). ING exploits two BMs (discount and traditional) in different BUs by country. Netflix manages DVD rental and streaming BMs in the US, with different BUs supervising its international operations.</p> <p><u>Relevant BM complexity:</u> <i>between</i> and <i>within</i> complexity</p>
	Single	<p>Single-BM, single-BU organization</p> <p><u>Example:</u> a firm exploiting one BM in one BU, often the case of small and medium enterprises.</p> <p><u>Relevant BM complexity:</u> <i>within</i> complexity</p>	<p>Multiple-BM, single-BU organization</p> <p><u>Example:</u> Firms can be organized using only the BM logic: GEA exploits two BMs (equipment and solutions) in the same product market.</p> <p><u>Relevant BM complexity:</u> <i>between</i> and <i>within</i> complexity</p>
		Single	Multiple
		Business Model (BM)	

Table 2. Suggested organizational structure for varying types and levels of complexity in a BM portfolio

		<i>Between Complexity</i>	
		Low (Autonomous BM portfolio)	High (Integrated BM portfolio)
<i>Within Complexity</i>	High	Decentralization encouraging empowerment of BM managers.	Modular centralization. Limited delegation of non-interdependent activities to individual BM managers.
	Low	Modular decentralization. Limited coordination of the (few) interdependent activities.	Centralization encouraging coordination between BM managers.