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Five dimensions of business model innovation: A multi-case exploration of industrial incumbent firm's business model transformations



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ABSTRACT

Studies focus on the process of business model innovation as performed by start-up firms, while incumbent industrial firms' attempts to innovate their business models often fail, being hindered by path-dependency. There is a lack of understanding of what in a business model of such firms is modified to produce an innovation that gives rise to value creation. Based on explorations of twenty-two incumbent industrial firms, five dimensions of a business model are identified that, when modified, may result in business model innovation by incumbents. These dimensions are exchangeable, activity, actor, transaction mechanism, and governance setup. The results show how business model innovation can be systemically characterized in terms of several dimensions that must be modified in concert to produce an innovative business model. The results also show that such business model innovations require novel uses of digital technologies that enable new activities to be incorporated into existing business models.

1. Introduction

The century-old industrial firm Klöckner & Co. is a large producer and independent distributor of steel and metal goods and services. One day, it dared to reinvent its future. Its business model innovation repositioned the firm to capture new value and establish a unique position within its business network. Rather than becoming disintermediated by digital platforms linking steel and metal producers directly with their customers, Klöckner & Co. established two of its own platforms: one for its own services only and another provider-independent platform that links customers with providers. Klockner & Co. not only achieved new revenues, surpassing its industry peers, but also more importantly positioned itself for the future by tackling the challenges related to the industry's overcapacity and high fixed costs in a volatile market (Hasler, Schallmo, Hackl, & Lang, 2020; Kortov & Sack, 2019).

The success rate for business model innovation among industrial incumbent firms is unfortunately very low (Aspara, Lamberg, Laukia, & Tikkanen, 2013; Haftor, Climent, & Lundström, 2021; Naor, Druehl, & Bernardes, 2018; Santos, Spector, & Van der Heyden, 2009). For example, one study shows that two-thirds of incumbent firms that attempt such innovation fail (Markides & Oyon, 2010), whereas another study shows that only 5 % succeed with the innovation of their business model (Nebuloni, Hernandez, & Carter, 2019). Nonetheless, business

model innovation is on the agenda of many executives, who regard it as a key source of firm performance, comparable with product innovation and operational optimization (Sohl, Vroom, & Fitza, 2020; Zott, Amit, & Massa, 2011).

The emerging consensus is that a business model is the "architecture of the value creation, delivery, and capture mechanism" (Teece, 2010: 172). Under such a consensus, the majority of business model innovation research focuses on technology-based start-ups (Bouncken, Kraus, & Martinez-Perez, 2020; Bogers, Hadar, & Bilberg, 2016; Zott & Amit, 2007) and the processes needed for business model innovation (Andreini, Bettinelli, Foss, & Mismetti, 2021). In contrast, research has paid much less attention to the innovation of existing business models of large incumbent industrial firms (Andreini et al., 2021). Unlike startups, incumbents manifest an inertia that creates path dependence, hindering certain innovation decisions and actions (Goumagias, Fernandes, Nucciarelli, & Li, 2022). Inertia creates a stickiness that keeps the various parts of a firm's business model in their existing positions (Zuzul, & Tripsas, 2020). Therefore, attempts to re-design an existing business model by altering one component at a time will most likely fail. This insight is further supported by research suggesting that business model innovation requires a comprehensive, holistic approach that focuses on each of its parts in concert (Zott & Amit, 2010). To change a business model using a holistic approach, it is crucial to know which

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aspects, or parts, of the model must be altered in concert. A key empirical question is therefore the following: Which aspects of a business model are altered when an industrial incumbent firm implements business model innovation to create and capture value? The aforementioned "aspects" of a business model refer to characteristics, parts, or compositions of elements. The objective of this study is to answer this question

By exploring 22 cases of successful business model innovation by incumbent industrial firms, the study reveals five dimensions of business model innovation. In other words, an alteration of the dimensions of a business model produces a new business model. These dimensions are exchangeables, activities, actors, transaction mechanisms, and governance setup. The results build on previous research by extending the number of dimensions and clarifying their content. These five dimensions provide guidance for developing a detailed understanding of what is modified in business model innovation and inform managers' redesign of business models. The results also show that any innovation of an existing business model requires modification of multiple dimensions in concert, which shows the systemic nature of the business model. Moreover, successful business model innovations are facilitated by firms' novel uses of digital technologies. In turn, these novel uses of digital technologies enable the inclusion of new activities in the business model to create and appropriate value. The next section reviews the existing theory on business models and business model innovation. The knowledge gap targeted by this study is thus highlighted. Research methods are then detailed, followed by the results. The paper ends with a discussion of the results and the key conclusions in answer to this research question. Contributions to theory and managerial practices are discussed, as well as the limitations of the study and suggestions for further research.

2. Theory

Given the focus of this study, this section first defines the notion and underlying arguments of a business model. This review highlights the need for firms, both firms in general terms and incumbent industrial firms, to pursue innovation of their business models. This discussion highlights the knowledge gap targeted by the present study.

2.1. From firms to business models

The notion of a *business model* became popular among practitioners and then scholars around the turn of the millennium (Massa, Tucci, & Afuah, 2017). This interest was seemingly driven by several interacting forces, namely the adoption of powerful digital technologies, particularly the Internet, the de-regulation of numerous industries, the regulatory harmonization of markets (Climent & Haftor, 2021; Teece, 2010), and the inability of orthodox management and economic theories to account for the unparalleled pace and magnitude of value creation by some technology firms (Amit & Zott, 2001; Massa et al., 2017; Parker, Van Alstyne, & Choudary, 2016). Thus, the business model accounted for a new kind of business reality: the globalized technology-based firm.

Research on the business model has reached a consensus (Wirtz, Pistoia, Ullrich, & Göttel, 2016; Zott et al., 2011) in that a business model is the "architecture of the value creation, delivery, and capture mechanism" (Teece, 2010: 172). This architecture is operated by a system of interrelated activities to exploit market opportunities (Amit & Zott, 2001). A firm can operate one or more business models, which can be altered over time (Casadesus-Masanell, & Tarziján, 2012; Kim, & Min, 2015).

Compared to the orthodox notion of a firm as a source of value creation and appropriation, either as a value chain in an industry (Porter, 1985) or as a bundle of strategic resources (Barney, 1991), the business model offers several key conceptual advancements to explain how value is created and appropriated by a firm. One advancement is the idea that a business model is a firm boundary-spanning activity

system including actors and their activities outside the focal firm to account for value creation and appropriation (Amit & Zott, 2001; Zott et al., 2011). Such actors are typically key stakeholders, including customers, forwarders, partners, suppliers, employees, and owners (Best, Miller, McAdam, & Maalaoui, 2022). From a business model view, value creation and appropriation do not occur only inside the focal firm as they do under the orthodox notion of the firm (Barney, 1991; Porter, 1985). Instead, value creation and appropriation take place within the network of activities and actors that constitute the business model (Zott & Amit, 2010). A second advancement, closely linked to the former, is that value creation and appropriation are not purely centered on the focal firm and its customers. Instead, value creation and appropriation concern all actors involved in the execution of the business model. In this sense, a business model view requires articulation of the value creation and appropriation of each actor that partakes in the business model (Amit & Zott, 2001; Zott & Amit, 2010). A third key advancement is the shift from the idea that value is created only on a firm's supply side to the understanding that value can be created on both the firm's supply and demand sides (Adner, & Levinthal, 2001; Massa et al., 2017; Teece, 2010), which accounts for network externalities or effects (Katz & Shapiro, 1985; Economides, 1996; Amit & Zott, 2001). All these advancements make a firm's business model of crucial importance, namely because of its ability to explain a degree of variation in firm performance (Amit & Zott, 2001; Sohl et al., 2020; Zott & Amit, 2007) and other wellestablished performance driving factors such as product-specific, firmspecific, industry-specific, and country-specific factors (Hawawini, Subramanian, & Verdin, 2003; McGahan & Porter, 2002; Porter, 1985; Rumelt, 1991; Sohl et al., 2020). Nowadays, two firms that provide similar products in the same market and service the same customer segments can adopt two different business models, with one firm performing significantly better than the other (Sohl et al., 2020). One example is given by the two fast-fashion giants H&M and Zara, where the latter outperforms the former (Lanzolla & Markides, 2021).

To achieve superior performance, a firm builds its business model using one or more business model themes. A specific business model configuration is then tuned toward one of four available value creation and appropriation architectures (Amit & Zott, 2001; Zott & Amit, 2008; Kulins, Leonardy, & Weber, 2016; Leppänen, George, & Alexy, 2021; Luo, Cao, Tjahjono, & Adegbile, 2022). These four business model themes are novelty, efficiency, complementarity, and lock-in (Amit & Zott, 2001; Leppänen et al., 2021). Amit and Zott (2001) explain these four themes in their ground-breaking research. The novelty-centered business model theme refers to a new way of conducting business in terms of the activities and actors that constitute the business model, such as when eBay disrupted the auctions market. The efficiency-centered business model theme refers to conducting business in a manner that uses fewer resources than alternative business models in the marketplace, such as in the case of various e-commence businesses that offer otherwise similar products to those provided by brick-and-mortar retailers. The complementarity business model theme refers to bundling various offerings, activities, or resources to generate synergies, such as in the case of Amazon. The lock-in business model theme is about discouraging actors in a given business model (e.g., customers, suppliers, and owners) from migrating to an alternative for reasons of sunk costs, loyalty relations, or network externalities, such as in the case of Facebook. Empirically, firms that pursue a certain business model theme (e.g., efficiency) or a combination of two or three themes (e.g., novelty and lock-in) can outperform competitors (Zott & Amit, 2007; Kulins, Leonardy, & Weber, 2016; Leppänen et al., 2021). A key managerial question therefore arises: Which aspects of a business model are altered when an industrial incumbent firm implements business model innovation to create and capture value? The architecture of an existing business model is transformed into a modified business model architecture, which activates one or more of the four business model themes. This question raises the need to review business model innovation.

2.2. Business model innovation

Changing an existing business model through innovation is pivotal for a firm's success (Anzenbacher, & Wagner, 2020; Cucculelli & Bettinelli, 2015; Foss & Saebi, 2017). Recent research (Foss & Saebi, 2017; Snihur & Zott, 2020) reveals a consensus that business model innovation is "a set of deliberate acts that managers and entrepreneurs perform over time to change the BM [Business Model] components and architecture in a consistent and innovative way" (Andreini et al., 2021). Hence, business model innovation research can be regarded in terms of the process and content of innovation, with such innovation pursued by incumbents and start-ups or new market entrants.

The business model innovation *process* has received considerable attention (Andreini et al., 2021; Visnjic, Jovanovic, & Raisch, 2021). This process accounts for the antecedents, moderators, and outcomes of business model innovation (Foss & Saebi, 2017). The literature identifies several kinds of processes that drive business model innovation, including cognitive processes (Roessler, Velamuri, & Schneckenberg, 2019), strategic processes (Broekhuizen, Bakker, & Postma, 2018), value creation processes (Zott, & Amit, 2007), and knowledge-shaping processes (Malhotra, 2002). These processes interact with each other to generate business model innovation (Andreini et al., 2021).

However, the present study focuses on the content of business model innovation. This study centers on what can be changed in a given business model to produce an innovative business model (Ammar, & Chereau, 2018; Giesen, Berman, Bell, & Blitz, 2007). The literature offers two insights in this regard. The first is a list of the business model components that must be altered to achieve business model innovation. These components include target markets, target customers, value proposition, value chain, technology, and means of value capture (Broekhuizen et al., 2018; Malhotra, 2002). Although this list reflects the complexity of business model innovation, it is somewhat self-evident and hence of limited value. The second insight provided by research on the content of business model innovation is that it is the architecture of the business model that must be altered and not only its components. Business model architecture refers to the components of the business model and their relations across various business model dimensions (Foss & Saebi, 2017). This insight further reveals the complexity of business model innovation in terms of relations between components instead of just the components themselves. The limited research on business model dimensions suggests that a business model may be regarded in terms of its content, structure, and governance. Content refers to activities, structure refers to organizational units, and governance refers to control of organizational units (Saebi, & Foss, 2015; Zott & Amit, 2010). However, there is a lack of research on what must be altered through business model innovation to activate one or more business model themes (Zott et al., 2011). Nearly all business model innovation research focuses only on the novelty theme (Massa et al., 2017). This focus is understandable because novelty is assumed to be intrinsic to business model innovation. However, research shows that the other three business model themes (efficiency, complementarity, and lock-in) can also constitute sources of business model innovation (Zott & Amit, 2007). In fact, recently, the novelty theme in isolation has seldom been a source of business model innovation that leads to superior firm performance (Leppänen et al., 2021). Hence, there is a need for research on the dimensions of business model content that give rise to the activation of business model themes. This study addresses this research gap.

Empirically, much of this content-perspective research on business model innovation reports findings related to the business model innovations of start-ups and new entrants (Konya-Baumbach, Schuhmacher, Kuester, & Kuharev, 2019). Such innovation is often enabled by their novel use of digital technologies (Caputo, Pizzi, Pellegrini, & Dabić, 2021). In contrast, there is limited research on industrial incumbent firms' business model innovation, so this issue is the core focus of this study (Habtay, & Holmén, 2014; Kim, & Min, 2015). Research shows that business model innovation may reposition industrial incumbent firms within a value network to appropriate new sources of value (Hacklin, Björkdahl, & Wallin, 2018; Haftor, & Climent, 2021). However, studies also suggest that many of industrial incumbents' attempted business model innovations fail (Markides, & Oyon, 2010; Naor et al., 2018; Santos et al., 2009) because of complexities caused by path dependence and inertia (Goumagias et al., 2022). The idea is that if an incumbent firm attempts to change one part of its business model, other parts may stick and thereby hinder the innovation of the whole business model (Visnjic et al., 2021). Therefore, a key question tackled by this study is as follows: Which aspects of a business model are altered when an industrial incumbent firm implements business model innovation to create and capture value? Implicitly, answering this question also requires knowledge from the firm renewal literature (Shu, De Clercq, Zhou, & Liu, 2019). The objective of this study is therefore to provide novel answers to this question.

3. Methods

This study pursues an exploratory research approach (Locke, 2011) with an abductive mode of theorizing (Tavory & Timmermans, 2014) to answer the research question. The motivation is the lack of stable theory to account for the phenomenon of the change of content of the business models of incumbent firms. When there is limited theory to account for a phenomenon, it is difficult to deduct reasonable hypotheses (Dubois, & Gadde, 2002). In contrast, an inductive research mode that does not draw on any body of theory ignores relevant theorizations and thereby offers advancement and accumulative knowledge production (Behfar & Okhuysen, 2018). The combination of the inductive and deductive modes of inquiry provides an abductive mode that is both open to inducing new characteristics of a given phenomenon and exploiting existing theorizations that may be relevant during explorations (Tavory & Timmermans, 2014).

Because the present research question involves business model change, the content of the business model *prior* to its change and then its content *after* that change must be identified. The two must then be compared to derive what is being changed. This situation calls for a longitudinal case exploration approach in which a firm's business model before change is distinguished from its business model after change (Eisenhardt & Graeber, 2007; Eisenhardt, Graeber & Sonenhein, 2016).

3.1. Empirical setting

This study investigates 22 industrial incumbent firms. The selection of these firms was theory-motivated to match the characteristics of the studied firms with the theoretical gap targeted by the study and thereby answer the research question. The following criteria governed the selection of the investigated firms. All firms were large, industrial, and well-established incumbents operating in mature sectors. These firms were global corporations, typically comprising multiple strategic business units, where each such unit operated with its product line in diverse markets and used a distinct business model. This study focused on a distinct business unit within a distinct market for each firm. The selected business units had to have conducted business model innovation. The successful completion of business model innovation of the strategic business unit was the dependent variable. To eliminate key confounding factors, the studied firms did not pursue strategic repositioning in terms of their chosen product market strategies, for example by shifting from cost-leadership to differentiation (Porter, 1985), at the same time as their business model innovation. The choice of firms was also influenced by access to data on these firms. The number of investigated firms was motivated by the theoretical saturation of results (Patton, 1990). Data collection took place between 2014 and 2021. Engagement with each firm lasted for two or more years to ensure each firm's business model prior to and after change was understood. Table 2 lists the firms included in the study.

Table 1

Specification of data sources of researched firms before and after business model change.

Sources	Pre-change				Post-change			
	Total representatives	Total interviewees	Length (1	ninutes)	Total representatives	Total interviewees	Length (1	ninutes)
			Mean	S.D.			Mean	S.D.
Firm representatives	95	108	66	18	94	101	58	19
Customer representatives	109	112	47	9	101	108	33	7
Partner representatives	17	26	41	11	22	28	46	13

3.2. Data sources and methods

For each firm, multiple data sources and collection methods were used to gather both qualitative and quantitative data. For each investigated strategic business unit and market, several managers were interviewed at two or more times, namely prior to and after change of the unit's business model. In most instances, the same managers were interviewed before and after change. Additionally, for each firm, three or more customer representatives were interviewed both before and after the business model was changed. Where relevant, partners of each firm were interviewed, particularly in cases where the focal firm's business model relied heavily on a partnership. Data were also collected through internal documents provided by the firms. These documents included business plans, market strategies, product specifications, and sales outcomes. Table 1 summarizes the data sources.

Semi-structured interviews were used. The questions that concerned the focal firm's business model were informed by pre-established measurement instruments (Amit & Zott, 2001; Leppänen, et al., 2021). Several measures were used to ensure data validity and reliability. Informants were given anonymity to encourage the provision of uninhibited information. Initial questions were non-directive. Temporal event tracking was used to capture the unfolding of the business model innovation. Finally, multiple sources within the firm and outside were interviewed to triangulate data. In some instances, follow-up inquiries with specific individuals were performed to resolve data conflicts or gaps.

3.3. Data analysis and theory advancement

Collected data were stored using dedicated research database software (ATLAS.ti). The interviews were audio recorded with participants' consent and transcribed within a day to provide nearly 7,000 pages of text. The analysis started with the construction of case scenarios for each firm. These case scenarios described the business model with its value creation themes prior to the business model change and the business model with its value creation themes after the business model change. Each scenario was initially constructed by one author only and then validated by the other author. Potential ambiguities were resolved using additional data collection. The focus of analysis was the comparison between a given firm's business model prior to and after business model change. Any differences that were identified were coded. Each identified difference was coded a-theoretically to give empirical themes related to the changed business model content. These codes were aggregated into second-order empirical themes to distill the empirical content into conceptual categories of the aspects of business models. This process increased the level of abstraction and potential generalizability. Again, each such coding was conducted by one author and then reviewed by the other author to identify possible ambiguities. These ambiguities were then clarified. Next, these business model content themes were compared back and forth multiple times with the business model theorizations presented earlier in the Theory section (Eisenhardt et al., 2016; Klein & Myers, 1999). Finally, this comparison with theory gave rise to further generalizations, producing the five dimensions of business model innovation described in this paper.

4. Results

Table 2 lists the investigated firms and specifies their respective business model innovation and the business model dimensions used in each such innovation. Fig. 1 illustrates a sample of the data analysis and the process followed to generate the dimensions. The results suggest that any existing business model can be understood in terms of five dimensions. Such an understanding facilitates the re-design and thereby the innovation of a business model. Hence, altering one or more of the dimensions of an existing business model may generate an alternative business model. The five dimensions of business model innovation identified here are: exchangeables, activities, actors, transaction mechanisms, and governance. These five dimensions are detailed later.

4.1. The five business model dimensions

The first business model dimension refers to the exchangeables of a business model. An exchangeable is something (tangible or intangible) generated by an activity to give an output for another activity. The primary exchangeables are products (goods and services) either procured from suppliers in the factor market or provided to customers in the product market. Given that the notion of a business model involves value creation for all actors involved (Amit & Zott, 2001; Brandenburger & Stuart, 1996), the notion of exchangeables also covers examples such as the worktime provided by employees and the compensation they receive, as well as the investors that fund a firm in exchange for a stake in firm ownership. The typical modification of exchangeables concerns the offered product. An example is when machines and services are bundled together, sometimes along with novel digital technologies, thereby enabling the creation of a smart product market system (Chowdhury, Haftor, & Pashkevich, 2018). Other kinds of modified exchangeables include a lower or higher workload in terms of volume of work hours, as well as increased financial capital to operate a new business model with greater capital intensity. Research supports this conception of exchangeable transformation in terms of the notion of bundling, unbundling, and re-bundling (Kopczewski, Sobolewski, & Miernik, 2018). An illustration is given by the unbundling of books into chapters and records into songs. Changing the exchangeables of a business model can activate one or more business model themes. For example, the complementarity business model theme can be activated by a new bundle that is not offered by competitors.

The second dimension relates to the *activities* in a business model. These activities refer to a set of interrelated actions that together give rise to a distinct and coherent activity in a business model. Examples of such activities are procurement, product development, manufacturing, sales, service, and recruitment. An existing business model is by definition made up of a set of interrelated activities (Amit & Zott, 2001; Zott & Amit, 2010). Therefore, the investigated firms implemented business model innovation by changing their business model activities. Examples of how they did so include adding new activities, excluding existing activities, and changing the order of current activities. The investigated firms typically added activities to establish forward or backward integration in their industrial value chain. Examples include retaining ownership of a machine provided to a customer on lease and then adding the activity of operating the machine for the customer. The literature л

Specification of firms implementing business model innovation: firm, year established, strategic business unit (SBU) under study, market under study, offering provided, product-market-strategy (PMS), market share, year of business model change, business model changes (from and to), business model theme changes (from and to), and business model dimensions.

Firm	Year	SBU	Market	Offering	PMS	Market	BM	BM change		BM theme change		BM dimensions
	established					share	change year	from	to	from	to	altered
ABB	1883	Power generators	Denmark	Generators for wind turbines	Diff.	Market leader	2017	Sales of generators with transfer of ownership, service, repair, and spare parts	Sales of power generating capability: selection of suitable generator, installation, monitoring, maintenance, and upgrade	Complementarity, Efficiency	Novelty, Efficiency	Exchangeables, Actors, Transaction mechanisms, Governance setup
Alfa Laval	1883	Pumps	USA	Pumps for industrial use	Diff.	Top two	2015	Sales of pump devices with transfer of ownership	Sales of pumping capability with uptime guarantee; no transfer of pump ownership	Complementarity, Efficiency	Novelty, Efficiency	Exchangeables, Actors, Transaction Mechanisms, Governance setup
Autoliv	1953	Steering wheel for personal cars	USA	Steering wheels	Diff.	Market leader	2016	Sales of steering wheels	Sales of connected steering wheels that transfer usage data to car manufacturer and provider	Efficiency, Complementarity	Novelty, complementarity	Exchangeables, Transaction mechanisms, Activities
Assa Abloy	1994; merger of Assa 81,881 with Abloy (1907)	Door opening solutions	Canada	Door opening systems	Diff.	Market leader	2017	Sales of door opening systems with transfer of ownership	Provision of door opening capability (selection, installation, training, online monitoring, and upgrade)		Novelty, Efficiency	Exchangeables, Actors, Transaction Mechanisms, Governance setup
Kalmar(part of Cargotec)	1959	Forklift trucks	Sweden	Heavy forklift trucks	Diff.	Market leader	2015	Sales of machines, services and spare part	Provision of lift capacity on site (including machine and operator) and payment per day	Complementarity, Efficiency	Novelty, Efficiency	Exchangeables, Transaction mechanisms, Actors, Governance setup
Electrolux	1919	Industrial kitchen	Poland	Ovens, refrigerators, freezers, etc.	Cost leader	Top 3	2016	Sales of kitchen machines and spare parts to dealers, who sell to customers and provide services	Sales of equipment, services, and spare parts directly to customers	Complementarity, Efficiency	Novelty, Efficiency	Actors, Governance setup
Epiroc(spin-off from Atlas Copco)	1883 (spin of 2018)	Mining drills	Switzerland	Rock drilling tools	Diff.	Market leader	2019	Sales of drilling tools with transfer of ownership	Sales of drilling capability with selection, installation, trading, upgrade	Complementarity, Efficiency	Novelty, Efficiency	
Husqvarna	1689	Lawn mowers	Germany	Electric lawn mowers	Diff	Тор 3	2018	Sales of lawn mowers and spare parts to dealers	Sales of lawn mowers, installation, training, spare parts, and services to end consumers	Complementarity, Efficiency	Novelty, Efficiency	Actors, Governance setup
Ljungby Maskin	1983	Loaders	Nordics	Wheel loaders	Diff. Niche	<20 %	2016	Sales of standardized wheel loaders, services, and spare parts	Leasing of customized wheel loaders, including maintenance service	Complementarity, Efficiency	Novelty, Efficiency	Exchangeables, Transaction mechanisms, Governance setup
Munters	1938	Humidity	France	Dehumidifiers	Diff. Niche	Leader	2015	Sales dehumidifier devices, spare parts, and repair	Hosting of a digital platform that focuses on customers' needs to	Complementarity, Efficiency	Novelty, Complementarity, Efficiency	Actors, Activities, Governance setup

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Tab	le 2	(continued)
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Firm	Year	SBU	Market	Offering	PMS	Market	BM	BM change		BM theme change		BM dimensions
	established					share	change year	from	to	from	to	altered
									handle humidity, with many providers of related products and services			
Rottne Industri	1955	Forest machines	Sweden	Harvesters and forwarders	Niche	<20 %	2017	Sales of forest machines, spare parts, and services	Leasing of machines, including operator training and maintenance service	Complementarity, Efficiency	Novelty, Efficiency	Exchangeables, Transaction mechanisms, Governance setup
SAAB	1937	Aircraft	Czech Republic	Aircraft	Niche, low cost	Top 2 in its niche	2020	Sales of airplane, services, spare parts, and transfer of ownership	Leasing of airplane, installation, training, and maintenance	Complementarity, Efficiency	Novelty, Efficiency	Exchangeables, Actors, Transaction mechanisms, Governance setup
Sandviken	1862	Mining & rock excavation	Canada	Drill rigs, bolters, loaders, and trucks	Diff.	Market leader	2016	Sales of drilling equipment with transfer of ownership	Leasing of drilling and excavation capability, including customization, installation, maintenance, training, and upgrade	Complementarity, Efficiency	Novelty, Efficiency	Exchangeables, Actors, Transaction mechanisms, Governance setup
Scania	1883	Industrial engines	USA	Industrial engines	Diff, Niche	Top 10	2017	Sales of engines, services, and spare parts with transfer of ownership	Sales of engine capability with guarantee of 9,000 h uptime	Complementarity, Efficiency	Novelty, Efficiency	Exchangeables, Actors, Transaction mechanisms, Governance setup
SKF	1907	Bearings for aircraft	USA	Bearing systems	Diff.	Market leader	2020	Sales of bearing systems, services, and spare parts	Sales of connected bearing systems and transfer of usage data to user and manufacturer	Efficiency, Complementarity	Novelty, complementarity	Exchangeables, Transaction mechanisms, Activities
Södra Skogsägarna	1938	Forest owners' relations	Sweden	Services for the management of forests for owners	Niche Diff.	Market leader	2016	Provision of felling forests on requirement and procuring raw trees	Provision of services for management of ownership of forests during growth, planning for felling, executing felling, accounting, and financial services via a digital interface	Efficiency	Novelty, Complementarity, Efficiency	Exchangeables, Activities, Transaction mechanisms, Governance setup
Tetra Pak	1951	Packaging	China	Carton package solutions	Diff.	Market leader	2015	Sales of packaging solutions, services, and spare parts with transfer of ownership	Leasing of packaging capability, including section, operation, and upgrading	Complementarity, Efficiency	Novelty, Efficiency	Exchangeables, Actors, Transaction mechanisms, Governance setup
Trelleborg	1905	Industrial wheel systems	Sweden	Tires, wheels for agriculture machine	Diff.	Top 3	2017	Sales of wheels and tires with transfer	Sales of wheel systems that are connected, transfer of usage data to user and manufacturer	Efficiency, Complementarity	Novelty, complementarity	Exchangeables, Transaction mechanisms, Activities
Volvo Construction Equipment (part of	1950	Crawler excavators	UK	Crawler excavators	Diff.	Market leader	2017	Sales of machine with transfer of ownership to buyer, with	Renting with payment per hour of use	Complementarity, Lock-in	Novelty, efficiency	Exchangeables, Transaction mechanisms, Governance setup ontinued on next page)

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Firm	Year	SBU	Market	Offering	PMS	Market	BM	BM change		BM theme change		BM dimensions
	established					share	change year	from	to	from	to	altered
Volvo Group)								services and spare parts				
Volvo Buses	1930	City bus	Sweden	Electric bus	Diff.	Market	2020	In-house	Procurement of	Efficiency	Novelty,	Exchangeables,
(part of Volvo						leader		manufacturing of bus engine, chassis,	electric engines and batteries and in-house		Complementarity	Actors
Group)								and an venue with assembly	assemuty			
Volvo cars	1915	Passenger	Sweden	Passenger car		Market	2020	Sales of cars and	Renting of cars to end	Complementarity,	Novelty, Efficiency	Actors,
		car				leader		spare parts to	users through online	Efficiency		Governance setup
								dealers who sell	mediated services			
								cars and services to				
								and citetomere				

Fable 2 (continued)

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also reports the disentanglement of business models in terms of activities (Benlian et al., 2019). An example is IKEA, the Swedish furniture giant, which re-locates the activity of furniture assembly from its own operations to its customers, who receive their furniture in unassembled form. Activities are central for any business model because they are executed by actors with certain capabilities and costs. A change of activities thus directly affects the capabilities and costs of a business model. The data show that including a new activity in a focal firm's business model enables access to new sources of value creation and capture within an industrial value chain. Consequently, one or more business model themes may be activated.

The third dimension refers to the actors of a business model. These actors are individual persons, organizations, and machines. Such actors have capabilities to execute certain actions that give rise to one or more business model activities. Actors' experience, knowledge, skills, relations, tools, and other resources enable them to perform certain specialized actions of an activity and thereby condition the content and quality of that activity. Examples of actors with specialized capabilities include researchers and developers of new machines and sales representatives with market knowledge and experience, along with unique personal relations with customers. Crucially, organizations and individuals, who may or may not be part of an organization, have cognitive capabilities, affective preferences, and self-interests that shape their intentions, decisions, and actions. In the investigated firms, machine actors were included for the execution of tasks and actions within an activity. An example of these machine actors is an intelligent robot used in the manufacturing of a vehicle. Further examples of alterations through actors in business models include introducing novel capabilities by recruiting knowledgeable or skilled staff members who were not part of the business model. A specific illustration is including staff with data analytics competencies while acquiring digital technologies operated by those staff to conduct data analysis, as exemplified by a situation where a heavy truck is analyzed to detect malfunctioning. The literature highlights actor changes as a source of business model innovation (Laasch, 2019). It illustrates actor changes through actor alteration by the U.S. firm Airbnb, which operates an online lodgings marketplace (Zach, Nicolau, & Sharma, 2020). Airbnb enables large scale use of private apartments and houses for temporary stays, replacing traditional hotel-owning actors. Thus, the conventional actor that owns and runs hotel facilities is replaced with owners of apartments and houses. As explained earlier, actors are central because they provide capabilities that enable value creation and incur costs within business models.

The fourth dimension relates to the transaction mechanisms used within a business model. These mechanisms refer to the way a transaction is conducted, which "occurs when a good or service is transferred across a technologically separable interface" (Williamson, 1975:104). Transaction mechanisms link activities with their respective actors and can constitute a source of innovation for a business model when they contribute to activating a business model theme. The development and adoption of novel digital technology solutions has enabled the transformation of various existing transactions, both inside and between organizations. One illustration is given by e-commerce and e-procurement solutions and recent uses of Internet of Things (IoT) solutions (Metallo, Agrifoglio, Schiavone, & Mueller, 2018). A specific example is when industrial firms use IoT solutions to monitor a machine's condition and use on a continuous basis when operated by customers and transfer data for analysis and pattern detection. Such data transfer is not possible without this kind of technology, which therefore constitutes a source of value creation with the potential to activate the novelty and efficiency business model themes. Research documents situations where several firms are linked by specific transaction mechanisms to form unique complementarities between exchangeables to activate the lock-in business model theme (Jacobides, Cennamo, & Gawer, 2018).

The fifth dimension is governance setup, which refers to the governance of a business model. It relates to the control of the execution of business model activities by actors (Amit & Zott, 2001). More



Fig. 1. Sample of data structure and analysis to generalize from empirical themes (left hand), to conceptual categories (middle), to aggregated dimensions (right hand).

specifically, it accounts for the conventional command and control setups, the various institutional (legal, cultural, and industrial) norms, contracts, and trust between actors, actors' interests, incentives, and rewards, and the relations (alignment and lack thereof) between actors' interests. All these factors regulate actors' behavior (Asgari, & Asgari, 2021). One common change in governance setup among the investigated firms is the change of legal ownership of a product. Conventional transfer of ownership of a machine from provider to customer is replaced by providers' retention of ownership of a machine and leasing or renting to customers. In such situations, new governance setups are required, operationalized through novel contracts and the use of digital technology for continuous monitoring of machine use. Research confirms this new approach (Steinbach, Holcomb, Holmes, Devers, & Cannella, 2017). One example is algorithmic governance of firm-external actors that partake in a business model. A specific application is used by

taxi firms to rate drivers and riders and implement dynamic demanddriven pricing (Garud, Kumaraswamy, Roberts, & Xu, 2020).

4.2. Multi-dimensional alterations of business models

Although the five dimensions of business model innovation identified in this study have been detailed one by one, for analytical reasons, all firms included in the study altered several dimensions simultaneously in their business model innovation. Hence, the empirical cases suggest that altering one dimension at a time is insufficient for business model innovation. For example, Volvo Construction Equipment, which manufacturers crawler excavators among other machinery, transformed its business model from the orthodox manufacture and sale of such machines to renting machines to customers with an hourly fee for actual machine use. In terms of the five dimensions, this business model

transformation added the novel activity of continuous monitoring of machine operations and conditions enabled by IoT devices embedded in the excavators, making such machines a novel actor of the business model instead of a passive exchangeable. A key exchangeable of this business model was therefore also modified because customers received the capability to use the machine whenever they needed it rather than the ownership of that machine. In this change, the manufacturer received a fee depending on usage time and a large set of data on the actual usage of its machines and their condition. The data were used for various ends, such as the calculation of the usage fee and hence value appropriation, as well as machine maintenance and repair and the design of new machines. For this new provider-customer relationship, a new transaction mechanism was implemented based on IoT usage. This mechanism enabled the transfer of usage data from the machine at the customer's site to the machine provider. This entire structure was regulated by an updated governance setup stipulating the ownership, usage, payments, and other aspects of the provider-customer relationship. Hence, there seems to be *complementarity* between the business model dimensions, whereby a fit between these dimensions is needed to create a new business model from an existing business model.

5. Discussion and conclusions

The notion of a business model has emerged as a valuable way of understanding a firm's ability to create and appropriate value as opposed to the orthodox notions of competition through products and operations (Amit & Zott, 2001, 2010). Studies show that firms with similar offerings but different business models perform differently (Lanzolla, & Markides, 2021). Hence, the business model explains part of performance variation (Sohl et al., 2020). Because competing only through products and operations has become increasingly difficult and because changes in the business environment decrease product differentiation (Donthu, & Gustafsson, 2020), business model innovation is on the agenda of many executives (Bock, Opsahl, George, & Gann, 2012). Novel technology-based start-ups use innovative business models to disrupt established industries and create value at an unprecedented pace and magnitude (Parker et al., 2016). Meanwhile, established industrial incumbent firms, which experience inertia and path dependence (Goumagias et al., 2022), often fail in their attempts at business model innovation (Zuzul, & Tripsas, 2020). The incremental innovation approach typically used by such firms means that one part of an existing business model is modified at a time. However, this approach is hindered by the stickiness of other parts of the business model (Favoretto, de Sousa Mendes, Godinho Filho, de Oliveira, & Ganga, 2021), suggesting that these other parts must also be targeted in the innovation process. Hence, the following question arises: Which aspects of a business model are altered when an industrial incumbent firm implements business model innovation to create and capture value?

5.1. Contributions to knowledge advancement

This study offers several contributions to theory development through exploratory analysis of successful business model innovation by 22 industrial firms. The first key contribution is that a business model can be understood in terms of five dimensions: exchangeables, activities, actors, transaction mechanisms, and governance setup. By altering these dimensions in their existing business models, the studied incumbent firms successfully established new business models that enabled the activation of certain business model themes. This primary contribution of the study is important because the limited existing research suggests that a business model can be understood in terms of only three dimensions, namely content, structure, and governance (Saebi, & Foss, 2015; Zott & Amit, 2010). The five dimensions proposed in this study overlap with the three dimensions from the literature and thereby make progress in terms of knowledge development. The present study shows that business model transaction mechanisms and the governance setup should be considered distinct from the actors and activities of a business model. The firms included in this study show that combining these two categories does not correctly reflect what firms actually modify in their business model innovation. For example, not distinguishing between the governance setup and the actors that perform activities overlooks the fact that the same actor can be governed in different ways. For instance, the same actor may be subject to different incentives and legal contracts. Similarly, the existing research combines the activities of a business model and the way they are linked with each other, whereas the model provided in the present study distinguishes between activities and transaction mechanisms. This distinction is important because two or more activities can be linked with different transaction mechanisms that constitute different sources of value creation.

The second key contribution is the insight that the investigated firms all altered several dimensions of their business model simultaneously rather than modifying one dimension at a time. This finding suggests that business model innovation is systemic, such that the whole is more important than the sum of its parts. This idea echoes the notion of complementarity, where the value of dimension A becomes higher in the presence of dimension B. Although research suggests that business models should be examined from a holistic approach, it does not specify which business model aspects must be considered to activate one or more business model themes for value creation and appropriation (Zott & Amit, 2010). The present study fills this gap by detailing the five business model dimensions and their interactions. The results of this study challenge the assumption that changing one aspect of a business model is enough for business model innovation and that a holistic change will generate business model innovation. Instead, business model innovation must be aimed at the activation of one or more business model themes.

A third insight is that all studied firms adopted digital technology in their business model innovation. Moreover, the use of such technology can be understood in terms of the five dimensions of business model innovation identified here (Frank, Mendes, Ayala, & Ghezzi, 2019; Guo, Guo, & Ma, 2022). Firms update their *exchangeables* by embedding digital technology into their offerings. Firms use technology to automate *activities*, replace human *actors* with machine actors, and use machines to transfer information between activities, thus creating *transaction mechanisms*. All such uses of digital technology enable modifications in the business model *governance setup*.

A fourth insight is that several of the studied firms implemented their business model innovation by expanding their activity system for the vertical integration of activities previously conducted by customers and thereby appropriated additional value. For example, a firm that originally provided forklifts for industrial use started retaining ownership of those machines, instead providing the capability of lifting whenever needed by offering the forklift, driver, and services on lease. In sum, the investigated business model innovations combined the five business model dimensions in an attempt to find new sources of value creation typically enabled by the use of digital technology.

5.2. Managerial implications

This study's results offer guidance to managers of incumbent firms seeking business model innovation. First, managers should conceive of their firm's business model in terms of the five dimensions detailed in this paper, namely exchangeables, activities, actors, transaction mechanisms, and governance setup. Crucially, actors should not be limited to suppliers, producers, or customers. Actors should include all the components that partake in the realization of a business model, potentially also including owners, employees, forwarders, and other partners. Similarly, activities may take place not only within the firm or conventional industrial value chain but also outside these domains, such as in other sectors. The investigated firms show that, when conducting their activities, actors may be governed in different ways and linked through different transaction mechanisms. A change of governance



Fig. 2. Relationship between actual and potential value architecture space constituted by actual and potential actors in various sectors or industries. The configuration of selected actors and their activities constitutes a given business model that activates a business model theme for value creation and in turn leads to superior firm performance.

setup, as well as a change of transaction mechanisms, may release novel value. Next, managers should conceive any alterations to these five dimensions in concert with each other. They should not attempt to alter them one by one in isolation. They should do so while aiming to activate one or more of the four business model themes. A business model seems to depend on the interactions between the five dimensions, which may activate one or more business model themes. Furthermore, such multidimensional alterations can be made using digital technologies. A machine can constitute an actor that conducts activities. Technology can then link activities and their actors in a novel configuration, where machines govern the execution of activities through various algorithmic measures and where technology can be part of an exchangeable such as a forklift. Hence, the business model innovation of an incumbent firm can seldom be managed by a single functional manager from sales, marketing, manufacturing, finance, or some other area. The five dimensions cover all parts of the focal firm and its environment, so business model re-design must take place at the top management of the focal firm. Doing so can guarantee a holistic understanding of a firm's business model and secure the necessary authority for business model re-design, mitigating the risks of sub-optimization. By extension, the findings also suggest that business model innovation of an incumbent firm may require negotiations with actors outside the hierarchical executive structure of a focal firm. The findings show the key importance of the dynamic capabilities of a firm in establishing a business model (Teece, 2018; Wang, Fang, & Zhang, 2022). A focal firm may change its business model and may even pursue multiple business models (Casadesus-Masanell, & Tarziján, 2012; Kim, & Min, 2015). Hence, managers need to identify market opportunities and a value architecture space (Keen, & Williams, 2013; Trapp, Kanbach, & Kraus, 2022), which refers to the total space of actual and potential actors and the activities they perform. This space is well beyond a single industry's value chain. One or more business models can be configured in terms of these five dimensions, with actors linked within an activity system aiming to activate one or more business model themes to achieve superior firm performance (Fig. 2).

5.3. Limitations and future research

First, the results of this study are based on multiple case explorations. Despite theoretical saturation in the data analysis, the results should be confirmed or else refuted in an alternative empirical setting. Second, the empirical data consisted of large industrial incumbent firms, so the results of this study are potentially only applicable to such firms. However, there is nothing to suggest that the five dimensions of business model innovation and their systemic nature would not apply to the business models of other firms. In any case, to confirm this applicability, this study should be replicated in an empirical setting that includes other kinds of firms.

A final consideration is that although this study focuses on the

business model dimensions that influence business model themes, which then affect firm performance, the organization and strategy literature shows that there is seldom one solution that fits all contexts (Volberda et al., 2012). Therefore, future research should examine potential contingency factors that may be related to the five dimensions of business model innovation and explore the nature of such relationships in their influence on business model themes and firm performance.

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Darek. M. Haftor: Writing – original draft, Validation, Methodology, Formal analysis, Data curation. **Ricardo Climent Costa:** Investigation, Conceptualization.

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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