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Value creation and appropriation of software vendors: A digital innovation model for cloud computing

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ABSTRACT

Do software vendors propose, create, and capture value in the era of digital transformation? Drawn on the literature of business models, digital innovation, and firms' capabilities, we examine this cutting-edge research question. We conducted a multiple case research of 10 software vendors operating in Germany and Austria. The thematic analysis yields a conceptual model that explains whether and how software vendors leverage cloud computing-enabled innovation for the digital boost, which is this study's primary contribution to information systems research. Software vendors use a complementary portfolio of information technology and organizational capabilities to innovate in their value proposition, creation, and capture.

1. Introduction

The digital transformation era provides opportunities and challenges to software vendors/firms (i.e., in short, software vendors). User companies with limited information technology (IT) capabilities must outsource their IT function to software vendors [1]. The rapid evolution of digital technologies (e.g., social media, mobile, cloud computing, analytics, Internet of Things, artificial intelligence, machine learning, and blockchain) presents to software vendors important challenges in innovating on their business models and proposing, creating, and capturing business value. As cloud computing has been one of the most impactful digital technologies in software vendors' business models and the transformation of customer companies, this study focuses on the role of cloud computing.

Digital innovation refers to the firms' strategic choices to execute digitally enhanced value-adding activities, transforming business models, and enabling new product and service offerings [2,3]. The rapid evolution of digital technologies has fundamentally changed the innovation strategies and related software firms' IT services [4–7]. One widely proliferating type of digital technology in the software industry is cloud computing, enabling the ubiquitous, Internet-based provision of on demand software applications [8]. Cloud computing has thus emerged as a disruptive digital technology, altering software vendors' business processes and reshaping the value mechanisms of their business models [9,10].

The business model reflects the way through which the firm offers value to customers, entices customers to pay for value (i.e., value creation), and converts those payments to profit (i.e., value capture) [11,12]. The firm's business model derives from dominant managerial logic and choices on doing business successfully in a specific industry [7,13]. The digital transformation in the software industry challenges this dominant logic, as it requires specific IT and organizational (i.e., business, non-IT) firm's capabilities [9,14–16]. *"With cloud computing, a product-centric model for IT provisioning is transformed into a global, distributed, service-centric model, leading to a disruptive shift from IT-as-a-product to IT-as-a-service"* ([17], p. 720); software vendors face new challenges that may require the integration and assimilation of cloud computing, and the development of IT and organizational capabilities [15,18]. The appropriate cloud computing's assimilation and the complementarity of IT and organizational capabilities may help

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software vendors to design a cloud computing-enabled innovation strategy for the digital boost[1], a topic that has received limited attention in Information Systems (IS) research (e.g., [9,17]). Do and how software vendors propose, create, and capture value from their cloud computing-enabled innovation strategy? This is the core research question this study aims to answer.

Our study used a multiple case research of 10 software vendors that operate in Germany and Austria. We conducted 28 in-depth interviews with top executives and added complementary archival records from these firms to understand how they integrate cloud computing technologies into their resource base and develop IT and organizational capabilities to transform their business model. Our thematic analysis of the data reveals a salient complementarity of software vendors' IT and organizational capabilities in reconfiguring their business model and executing a digital innovation strategy. This paper provides a conceptual model that explains this complementarity of IT and organizational capabilities theoretically. Specifically, we find that customer-centric offerings and customer relationships' intensification are crucial to redesign software vendors' customer value proposition. IT capabilities, business flexibility, and dynamic ecosystem architecture are the pathways to create value. Finally, software vendors capture value through improved cash flow management and adaptive revenue flows.

This paper contributes to IS research by the provision of a conceptual model that explains theoretically whether and how software vendors leverage cloud computing-enabled innovation for the digital boost. Our conceptual model suggests that software vendors use a complementary portfolio of IT and organizational capabilities to innovate in their value proposition, creation, and capture in a B2B context. The remainder of the paper is organized as follows. The second section provides the theoretical background using prior literature on cloud computing, digital innovation firm's strategy, and the capabilities required to execute this strategy. The second section concludes with the firm's business model's conceptualization and the evolution of the software vendors' business model. The third section explains the data, research design, and methodology used in this study. After that, we explain our findings that derive a conceptual model of the cloud computing-enabled software vendors' business model. Our paper ends with a discussion of the results and core conclusions.

2. Theoretical background

This section discusses the theoretical perspective used to analyze the base and complementarity of IT and organizational capabilities for digital innovation and related business model configuration of software vendors. To do so, we first define the digital infrastructure of cloud computing and describe its impact on software vendors' innovation practices. We then outline these capabilities' roles and specify the business model's organizing function from the perspective of the digital innovation strategy. Finally, we explain the implications and knowledge gaps that motivate us to pursue an empirical study on the cloud computing-enabled business model's role in software vendors' digital innovation.

2.1. Cloud computing: an integrated IT infrastructure driving digital transformation

IS research provides various perspectives to describe cloud computing's nature and its impact on software and business innovation (e.g., [19]). Technologically, cloud computing is specified as an integrated digital infrastructure combining various technological developments, such as large-scale computer data centers, virtualization, IT standardization, and a ubiquitous IT infrastructure. Cloud computing solutions provide numerous on demand software applications through the Internet. Cloud infrastructure centrally hosts and maintains data and applications that serve multiple clients at any time and from any place [20]. Mell and Grance [8] define cloud computing as a model for enabling ubiquitous, convenient, on demand network access to a shared pool of configurable computing resources that can be rapidly provisioned and released with minimal management effort or service provider interaction. Complementing the technological dimension, the business perspective on cloud computing considers its role in the digital transformation [2]. The proliferation of cloud computing across industries has profoundly changed how organizations store and share information [21], and its disruptive nature made established innovation strategies redundant [6]. Digital innovation requires firms to develop and integrate new IT and organizational capabilities enabling the efficient deployment of cloud infrastructure in value-adding activities [7,15,18].

However, cloud computing has profoundly changed business processes and organization modes on the user firm side, but it has likewise fundamentally transformed the software industry's modus operandi [22,23]. Already before the arrival of the digital transformation, software vendors' innovation strategies needed to account for organizational changes resulting from rapidly evolving industry conditions such as intense competitor rivalry, customer demands for flexible and customizable software [20,24], and expectation to access state of the art technologies at affordable and predictable costs [25]. Traditionally, software vendors commercialized software through on-site models, which produce in-house software solutions that were then shipped and deployed at customers' locations. Rapid IT advances, such as ubiquitously available bandwidth and modular software design, resulted in the evolution of digital infrastructure and the proliferation of cloud computing solutions [25]. Consequently, software vendors transitioned their core technologies and business processes to the cloud computing model, selling and delivering software applications on demand and remotely [26].

The technological properties of cloud computing infrastructure initiated substantial software innovation changes [19]. The transition of software vendors to the digital innovation paradigm altered their supply-side and demand-side practices. Supply-side digital innovation practices comprise new IT and organizational capabilities to rapidly up- and downscale services on cloud infrastructure (e.g. [6,27],) and to increase the variety of integrated system functionalities [17]. Platform-based cloud solutions generate network effects and enable value cocreation with customers [28]. The instant provision and perpetual beta-state of cloud-hosted applications help software firms to reduce value chain activities and lower production costs. Demand-side digital innovation practices of software vendors comprise the agile adaptation of cloud applications to changing customer needs, differentiating the scope and speed of product and service innovation [29], and continuously improving the service quality through shorter software upgrading and maintenance cycles [24,6]. In summary, the digital transition to cloud computing requires software vendors to rethink their innovation strategy, develop their competitive resource base, and reconfigure their business models accordingly [7,9,30].

2.2. Digital innovation strategy: definition, implications, and required capabilities

Despite the transformative impact of digital technologies [31,32] such as cloud computing on the software industry, we lack a comprehensive understanding of digital innovation as a coherent set of strategic choices of software vendors about how to do business in the digital age

[1] Digital boost refers to the forced acceleration and transformation of the firms' digital channel, which might require the support of a software vendor. This concept comes from the real-world (software vendors, e.g., https://www.digitalboost.es/). The second author wants to thank Jose Sanchez (CEO of Prodware Spain and Vice-President of Strategic Accounts of Prodware Group; Prodware is a software vendor) for sharing and inspiring the usage of the concept of digital boost in this paper.

[6]. Research on digital innovation has predominantly taken the user firm perspective to examine the strategic implications of digital business transformation. In their review on digital innovation IS research, Kohli & Melville [2] demonstrate that the topic simultaneously evolves within several IS literature streams. Kohli & Melville [2] summarize the current understanding of digital innovation in a framework comprising external and internal organizational factors that influence four core firm activities of initiating, developing, implementing, and exploiting their respective product, service, and process outcomes. Besides, Hinings et al. [33], Teece [7], and Tian et al. [34] argue that digital innovation outcomes also include platforms (e.g., Uber) and business models (e.g., Netflix) beyond new products (e.g., e-books), processes (e.g., online banking), and services (e.g., software updates). Independent of specificities of digital value offerings, the digital transformation profoundly reshapes established innovation activities and strategies of software vendors and user firms [6,30].

Prior IS and strategy literature on the digital business transformation commonly highlights the importance of developing insights into the relation and complementarity between IT and organizational capabilities undergirding firm-level digital innovation (e.g., [2,9,35,36]). For example, organizational capabilities represent a focal point for theorizing digital innovation strategy, as they constitute the competitive resource base enabling firms to appropriate business value from digital infrastructure [37,15,7,18,38]. The digital transformation induces significant changes in a broad range of IT and organizational capabilities undergirding firms' value-adding activities (e.g. [29]). The required IT and organizational capabilities can be operational, dynamic, or dual-purpose [39]. The effective deployment of cloud computing supposes that firms need to adapt their entire IT and organizational capability base to create and capture digitally enhanced value [30]. Table 1 summarizes some of the most relevant IS and strategy literature on digital innovation strategy in software vendors and user firms.

Our synthesis shows that digital innovation requires interdependent and complementary capabilities that enable firms to coordinate distributed agency and complementarities, deploy digital infrastructure in value-adding activities, and balance innovation tensions in digital contexts. Digital innovation is grounded in developing cognitive and collaborative capabilities, enabling executives to understand digital technologies' properties, and coordinate digitally enhanced value-adding activities [7,40]. Specifically, smaller software vendors need to build collaborative capabilities to leverage external knowledge, foster communities, involve users, and profit from design and programming expertise in software development [5]. Furthermore, digital innovation leads to identity shifts in firms and organizational cultures, requiring integrative capabilities to balance competing concerns in existing versus emerging innovation strategies and practices [14]. Digital innovation requires communication and transaction capabilities to manage network effects in distributed value chains [34,41]. Finally, the distributed nature of digital infrastructures such as cloud computing results in the challenge of orchestrating multiple actors, for which software firms need capabilities to configure effective business models [42,15].

2.3. Conceptualization of the firm's business model and evolution of the business model of the software vendors

The construct of the business model has been traditionally investigated in strategy research. This research topic has benefited from a theoretical debate about what a business model is and how it is connected with the firm's corporate and business strategies [43,44]. *"The essence of a business model is in defining the manner by which the enterprise delivers value to customers, entices customers to pay for value, and converts those payments to profit. It thus reflects management's hypothesis about what customers want, how they want it, and how the enterprise can organize to best meet those needs, get paid for doing so, and make a profit"* ([11], p. 172). The firm's business model refers to how a company functions and how it makes business [44]. Drawn from prior business model research, we can

Table 1
Digital innovation strategy: Definition, implications, and capabilities.

Authors and paper's title	Definition digital innovation	Implications for firm strategy	Required firm capabilities
Rose et al. [5]: An integrated model of innovation drivers for smaller software firms.	Digital innovation is a type of high-technology innovation that results from a combination of innovation drivers in the software industry.	To remain successful in the digital innovation context, software vendors need to respond effectively to a range of critical innovation drivers.	Specifically, smaller software vendors need to enact and evaluate innovation leadership, leverage external knowledge, foster communities, engage users, and efficiently nurture design and cognition capabilities in collaborative software team processes.
Nambisan et al. [6]: Digital innovation management: Reinventing Innovation Management research in a digital world.	Digital innovation is the creation or change of market offerings, business processes, and business models that result from digital technologies.	Digital innovation causes a shift in innovation agency, residing in various actors with distinct goals. This shift challenges long-standing innovation strategies and influences multiple firms' processes.	Match digital technologies with market offerings. Collaborate with infrastructure actors. Problem-solving to match needs and solutions in innovation practices. Balancing existing and digital innovation and complementarities between customer involvement and IT-moderated capabilities.
Scott et al. [41]: The long-term effect of digital innovation on bank performance: An empirical study of swift adoption in financial services.	Digital innovation is the organizational adoption of emerging technological infrastructure resulting from the development of new ITs. Value-adding digital infrastructure as an integral part of digital innovation.	The adoption of digital innovation implies a long-term perspective of up to 10 years before benefits can be generated. Network effects arise, particularly during the early digital innovation stage. Particularly SMEs benefit from digital innovation, facing less complexity to overcome outdated resources, and create digital innovation capabilities.	To benefit from the value-adding mechanisms of digital innovation, a firm must develop capabilities to communicate with complementary technology adopters operating in the digital infrastructure. Further, a firm must develop capabilities to communicate and handle multiple transactions and benefit from the digital infrastructure's network effects.
Svahn et al. [14]: Embracing digital innovation in incumbent firms: How Volvo cars managed competing concerns.	Digital innovation is a fundamental organizational challenge comprising capability, focus, collaboration, and governance as four conflicting concerns to break away	Firms must shift their identity to embrace digital technologies in implementing a digital innovation strategy. Adopting systems integration perspective, because digital technologies intertwine with routines,	Needs to develop new capabilities alongside existing innovation practices. At the institutional level, the need to balance four competing concerns for implementing a digital innovation strategy. At the innovation unit level, leveraging

(*continued on next page*)

Table 1 (*continued*)

Authors and paper's title	Definition digital innovation	Implications for firm strategy	Required firm capabilities
	from established innovation paths.	procedures, and belief systems beyond institutionalized architectural thinking.	change to benefit from digital opportunities versus handling rigidities of existing innovation routines.
Teece [7]: Profiting from innovation in the digital economy: Enabling technologies, standards, and licensing in the wireless world.	The digital revolution, the presence of enabling technologies, and the growing importance of complementary assets allow firm-level digital innovation.	Designing business models to benefit from digital technology challenges existing logic and choices to propose customer value. Need to acquire analytical granularity to understand digital technologies' impacts on value creation and value capture.	Business models evolve around software solutions hosted in digital platforms, allowing continual modifications in response to customer feedback. Creating value with business models results from choices on digital technologies' properties and orchestrating complementarities in ecosystems.
Helfat and Raubitschek [15]: Dynamic and integrative capabilities for profiting from innovation in digital platform-based ecosystems.	Digital technologies allow platform ecosystems. The firm's digital innovation involves building ecosystems and designing appropriate business models.	Designing digitally moderated business models in multifaceted and networked digital platform ecosystems implies complexity for managerial capabilities. Complex business models result from the need to orchestrate distributed actors.	Need to acquire dynamic integrative capabilities, formulating and executing a digital strategy; i.e., the firm-level capacity to communicate and coordinate digital platform ecosystems to introduce new products, resources, capabilities, and business models.
Tian et al. [34]: The differential impact of types of app innovation on customer evaluation.	Digital innovation results from the rapid advancement of digital technologies and the pervasive digitization of products and services, transforming industries and creating substantial economic value.	Software vendors rely on pervasive innovation and imitation strategies in application development to cope with hypercompetition that arises in the digital innovation context.	Complementing capabilities to collaborate in platforms and leverage network effects, software vendors need to efficiently understand and integrate continuous customer evaluations of core and imitation innovations in new application development.

conclude that a business model's three key ingredients are the firm's value proposition, value creation, and value capture [12,44]. The value proposition refers to product and service offering that firms propose to customers [11]. Value creation refers to the degree to which the value proposition aligns with what customers want and how they want it to satisfy their needs [12]. The value capture is the firm's appropriation and returns on investment obtained by the firm in compensation to the value proposition and offer [11].

Extant research provides some evidence for changes affecting software vendors' resources and activities during their business model transition to cloud infrastructure [9,30]. The digital transition to the cloud induced a radical change in commercializing software by offering IT outsourcing, variable IT costs, reduced IT complexity, and flexible customization [45]. Outsourcing of software functions and expertise allows user firms to focus on their core competencies [46] and benefit from converting fixed into variable IT costs. IT complexity is reduced by central maintenance of cloud applications [10], and real-time user analytics allow customization of cloud solutions. Changes in value-creating software vendors activities comprise developing integrated service delivery solutions [46,47] and dynamic up- and downscaling capabilities [27,48]. Data security assurance, zero downtime [45], and orchestrating interactions between multiple IT partners and customers constitute further critical activities to run cloud services. Finally, software vendors move to subscription-based revenue streams, integrating usage-based metrics, and automated online sales of their cloud offerings [26,49,50], while economies of scale and network effects reduce software development costs. However, while extant studies surface on these cloud-induced changes of software vendors' resources and activities, they do not elaborate further on the cloud computing-enabled digital innovation of software vendors.

In a longitudinal case research, Xiao and Hedman [30] examined the transition of leading software vendors to cloud computing. Their research shows that the digital transition not only transforms the software vendors' business model, but major challenges result from organizational changes that need to be handled internally and in the firm's ecosystem to effectively deploy cloud services. Hahn et al. [9] identified B2B IT and business capabilities and studied their role in cloud platform ecosystems. Their findings provide a business model framework surfacing four effective configurations of complementary IT and business capabilities. IT capabilities comprise customization (creating and transforming services, onboarding, integration, support, and IT consulting) and process standardization (design and modularize architecture, operating platform and infrastructure, and complement and manage platform services). Business capabilities contain incentives and rules, ecosystem marketing and sales, and partner development and support. Hahn et al. [9] acknowledge that their findings cannot be considered exhaustive and encourage further IS research on the complementarity of IT and organizational capabilities in software vendors' digital evolution. In this sense, additional IS research is needed on whether and how software vendors have assimilated and leveraged cloud computing to innovate digitally and transform their value proposition, creation, and appropriation. We try to fill this gap in this study.

3. Data and research method

We conducted a multiple case research to study and pursue our general research goal. A case research design is appropriate when the study focuses on whether, how, why, and it explores what questions are required to investigate a phenomenon of interest in its real-life context [51,52]. We referred to the definitions of firm-level capabilities as abilities to undertake specific activities [15] and to the business model's strategic function as the framework or model of organization [7,44] to examine value-adding activities in the digital innovation of software vendors. Capabilities remain hidden or latent until they become tangible and observable in activities [4,11]. Consequentially, firm-level activities and related processes reflect inherent capabilities to leverage digital technologies for value creation, appropriation, and capture. We examine the complementarity of IT and organizational capabilities that underly the identified activities within and across the sampled firms to develop a conceptual model of cloud computing-enabled innovation for software vendors' digital boost.

We focused specifically on managerial perspectives about salient firm-level innovation activities and processes that manifest in the development of cloud-based software solutions. The epistemological position informs this investigative focus of symbolic interaction [53], an approach to studying subjective theories of study informants through their accounts of experiences made in lived reality. This approach

allowed us to look at the social distribution of respondents' perspectives on relevant activities and their underlying IT and organizational capabilities in the sampled software vendors' business model transformation. The guiding assumption for the analytic approach is that the software industry's digital transformation creates a substantial change to which firms respond by the development of digital innovation strategies. The relevant IT and organizational capabilities and their complementarity become salient in verbal and textual accounts of top executives responsible for the development of cloud-enabled software solutions. Study respondents reported to us during in-depth interviews and provided complementary written records on how they established value-adding activities and configured the business model of cloud solutions to seize market opportunities in the digital transformation.

3.1. Sampling logic

We followed a purposive sampling strategy to identify cloud computing technology configurations and capabilities in software vendors' digital innovation [54]. Purposive sampling relies on selecting cases according to their potential to provide theoretical inferences for the phenomenon of interest from the collected evidence [55]. The development of inferences for a group-specific perspective on IT and organizational capabilities in the cloud computing-enabled business model required us to meet two conditions. First, the collected evidence must be comparable, and second, it must contain a range of experiences that represent managerial perspectives for the phenomenon under study [55]. Consequently, our sample combines two subsets of large and small software vendors to identify software vendors managers' group-level perspectives on business model configurations and related innovation activities across distinct organizational settings and variations in resources and market positions [51]. We pursued a theoretical sampling approach within the two subsets to develop theoretical inferences for key dimensions (i.e., capabilities) concerning the deployment of cloud-based product and service offerings. We contacted respondents purposively based on their professional positions and their potential abilities to address this study's questions [51,56]. In consequence, the combination of a priori contrasting sampling subsets of large and small vendors and successive theoretical sampling of respondents within the selected software vendors helps to improve the validity of our findings, as these procedures ensure to comprehensively examine possible variations or replications in data patterns deriving from the distinct cases [51,54]. As a result of our sampling procedures, we collected evidence from 10 software vendors that provide cloud solutions in Germany and Austria. We did not compare the actions of the individual software vendors. Table 2 displays the selected software vendors and interview respondents in the study.

Our data collection combines several sources of evidence for each case software vendor. Between mid-2015 and mid-2017, we conducted

Table 2
Summary of firms and respondents used in data collection.

Firm and sector's focus	Brief description	Interviews	Follow -up(s)	Position of interviewees	Additional data	Number of employees
A, multimedia	Offers software solutions for digital media and digital marketing projects for creative professionals such as publishers and advertisers to create, edit, and publish media content.	6	2	Senior Product Manager, Product Manager, Product Owner, and Account Manager.	FAQs, handbook, community forum, tutorial, and support portal.	366600
B, mobile application development	Offers clients a simple web-based solution to build mobile apps. Clients range from individual app developers to freelancers, large corporations, and independent software vendors.	2	2	Senior Manager, Customer Relationship Manager	Website, blog, press release, and two showcases	21350
C, IT systems integrator	Offers an innovative cloud-based system integration solution for the agricultural sector linking farming machinery, end devices, and software.	1	0	CEO	Annual report, two community forums, two showcases, and four blogs	> 18
D, project management	It provides customers with a range of functions to manage projects effectively. It allows customers to dismantle, distribute, and reassemble the structures into projects.	1	1	CEO	FAQs, two blogs, two press releases, and three showcases	> 15
E, data warehousing	Its software generates a new automated data warehouse. It can merge an unlimited number of data types from various data sources in real time.	1	1	CEO	Website, press release, training, case study, and user story	> 5
F, personnel planning	It has developed an innovative online scheduler that creates and manages shift plans for employees. Typical clients range from various industries such as gastronomy, clinics, or logistics.	1	1	CEO, Member of the Management Board	FAQs, three showcases, tutorial, and three websites	> 5
G, enterprise content management	It offers enterprise content management solutions for different industries. The software facilitates daily operations with business-related data and documents by optimizing processes and reducing decision-making risks.	2	0	CEO and Product Support Manager	Website, showcases (3)	> 50
H, educational institution	It offers management software solutions for educational institutions. The solution focuses on a simplified planning tool based on graphic layout planning through drag -and-drop and additional features.	1	1	CEO	Enterprise documentation, blogs, websites, and press releases	> 30
I, ERP	It provides enterprise application software. Its cloud portfolio ranges from applications such as human capital management, finance, or procurement solutions, to business networks, infrastructure, platforms, and social collaboration apps for different industries.	2	1	Vice President of Cloud Computing, Partner Manager, and Sales Manager	Annual report, podcasts, virtual training, community forums, and website blog	96500
J, cloud services	Its solution offers clients a rapid and efficient way to carry out change processes for metrology to fulfill the federal network agency's legal requirements.	1	1	Director of Business Unit	Press releases, websites, and handbook	> 400

28 interviews in two consecutive rounds with 18 senior managers from the selected case firms (Table 2). In the first round, we organized 18 in-depth face-to-face interviews with senior managers responsible for digital innovation in the sample firms. As face-to-face interview situations allow establishing trust between interviewers and respondents, they increase the chance to collect detailed and meaningful insights for the research subject [57]. The interviews lasted 60 min on average. We recorded and transcribed all interviews and added written notes during the conversations for in-depth coding of the data. After the first data analysis round, we conducted 10 follow-up interviews providing us with additional insights into salient sets of resources and activities in cloud solution projects. To ensure confidentiality, we disguised the identities of firms and respondents in the study.

We used a semi-structured interview guide to frame our theory-informed questions concerning the IT and organizational capabilities and respective business model configurations in emerging cloud solutions. The questions of the semi-structured interview guideline are structured within five consecutive parts to inquire our research topic, namely: 1) entering the interview and biographical data of respondent; 2) understanding of cloud computing as part of digital innovation strategy; 3) inquiring about cloud computing and respective business model configuration; 4) specifying core IT and organizational capabilities in cloud computing; and 5) finalizing the interview with other important facets of the topic. The interview guide has been omitted for the sake of brevity. It is available from the corresponding author upon request. Complementing the interview data, the sample firms provided us with a range of written records relating to their cloud solution development and digital innovation strategy. These records comprise internal and external strategy documents, presentations, and documentation about cloud solutions and other ongoing digital innovation projects. Where possible, we included this complementary evidence in our data analysis, thereby allowing us to mitigate potential biases in the verbal accounts of interview respondents by triangulating our findings in the analytic process [52]. The data triangulation provides a more robust corroborative strategy for interpreting evidence in each case and creates a convergence of the identified cross-case dimensions in the data [51]. Data triangulation strengthens the reliability and validity of the study findings [54].

3.2. Coding methodology

As our research interest focused on firm-level perspectives about combinations of cloud infrastructure and organizational technologies in cloud-based software solutions, we coded the evidence in a two-step thematic analysis. The thematic analysis provides an effective method to identify salient patterns in diverse sets of verbal and textual accounts on a specific theme and surface representation of higher-level thematic domains [55,58]. We followed in a first step open and selective coding procedures to develop a category system and to identify salient patterns and potential themes at the single-case level. We then observed patterns and emergent themes across the data sets provided by the sampled cases. The emerging thematic structure from the first step helped us establish the portfolio of IT and organizational capabilities in the cloud solutions to specify the study results' central thematic domains [55]. While our purposive sampling strategy combined large and small software vendors to capture a group-level perspective of software vendors' managers across distinct organizational settings and variations in resources and market positions, our coding procedure surfaces a converging thematic structure for the central IT and organizational capabilities involving the cloud computing-enabled business model. Throughout the coding process, we ensured trustworthiness by two researchers agreeing on the coding approach, independently coding the data, and frequently discussing results until they reached a consensus on the thematic domains [51]. In the final analytical stage, we built the model from the thematic structure.

An important aspect for assuring the validity of the proposed model is to specify how the themes emerging from the thematic coding of the data at single case level constitute the further coding process thematic categories representing insights for the phenomenon of interest [55]. To describe how exemplary the coding procedure leads consecutively to the model's aggregate dimensions, we give two examples. One respondent provided the following description of the flexibility of cloud infrastructure: *"One of our customers uses our solution to consolidate or eliminate several legacy systems. Instead of managing numerous complex systems, cloud computing provides such customers with functionality and flexibility thanks to the ease of adding or removing services without having to change the whole architecture"* (Vice President of Cloud Computing of the company I).

Here, the respondent emphasized the importance of cloud computing's modular technological architecture to provide customer value with its cloud solution. We coded this statement as the first-order concepts integration of service modules based on customer needs and to eliminate work related to managing software. We assigned these first-order codes during the further coding process to the second-order thematic categories of modularity and increased customer flexibility. In our coding's final analytical step, we assigned modularity and increased customer flexibility to the aggregate dimension customer-centric offering. A second interview excerpt from another respondent reads as follows: *"Cloud solutions are highly specialized solutions. Especially when there is a high fluctuation of resource requests, some internal experts are needed"* (CEO of company B). In this statement, the respondent points to the specificities of IT expertise in cloud computing. We coded this statement in an initial step as the first-order concept skills to anticipate the customer's future resource needs, and then, we assigned it to the second-order thematic category of integration capabilities. Ultimately, we placed this second-order theme into the aggregate dimension (i.e., capability) of developing technological (IT) capabilities.

We finally sorted the seven dimensions (IT and organizational capabilities) to the three architectural business model components of value proposition, value creation, and value capture, which we deduced a priori from the existing theory on business models (e.g., [12,44]). We applied Gioia et al.'s categorization approach to present our findings with rigor and relevance [59]. We present the conceptual model and the underlying structure of salient first-level concepts, resultant second-order themes, and the seven aggregate dimensions (IT and organizational capabilities) surfacing from our coding procedure in the next section.

4. Results and findings of the study

Our thematic analysis of the evidence reveals seven dimensions that represent a portfolio of seven IT and organizational capabilities, which commonly surface in cloud computing-enabled business model configurations of the sampled software vendors. They are customer-centric offerings, intensifying customer relationships, developing technological (IT) capabilities, business flexibility, creating a dynamic ecosystem architecture, improved cash flow management, and adaptive revenue flows. Fig. 1 shows the resultant conceptual model of the cloud computing-enabled business model innovation of software vendors, detailing the seven IT and organizational capabilities, their embedded components, and their interrelated configuration in the three architectural components of value proposition, value creation, and value capture.

4.1. Do software vendors propose value?

Our evidence shows that software vendors focus on developing customer-centric offerings and intensifying customer relationships in the cloud-computing enabled business model to propose customer value. Fig. 2 summarizes our findings' categorization structure for the value proposition component, and Table 3 provides representative quotes from the evidence supporting the interpretation of the second-order

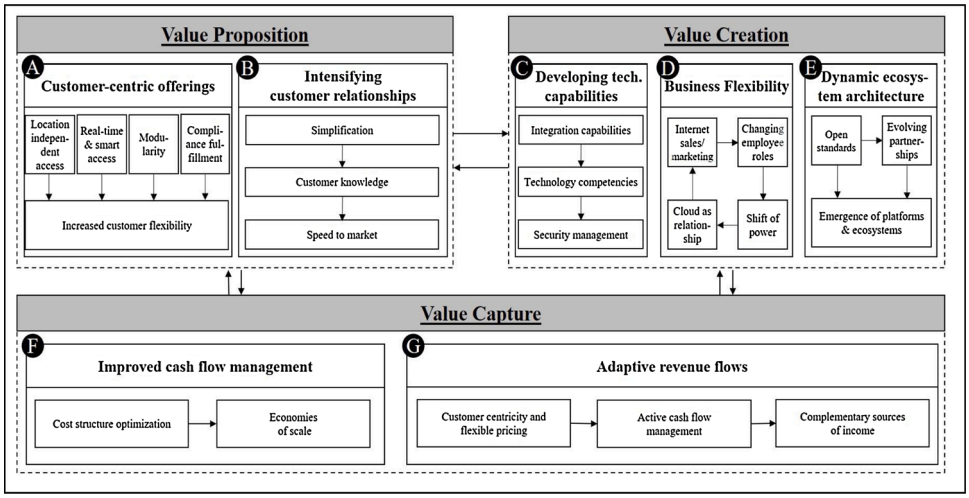

Fig. 1. A conceptual model of the cloud computing-enabled business model innovation of software vendors.

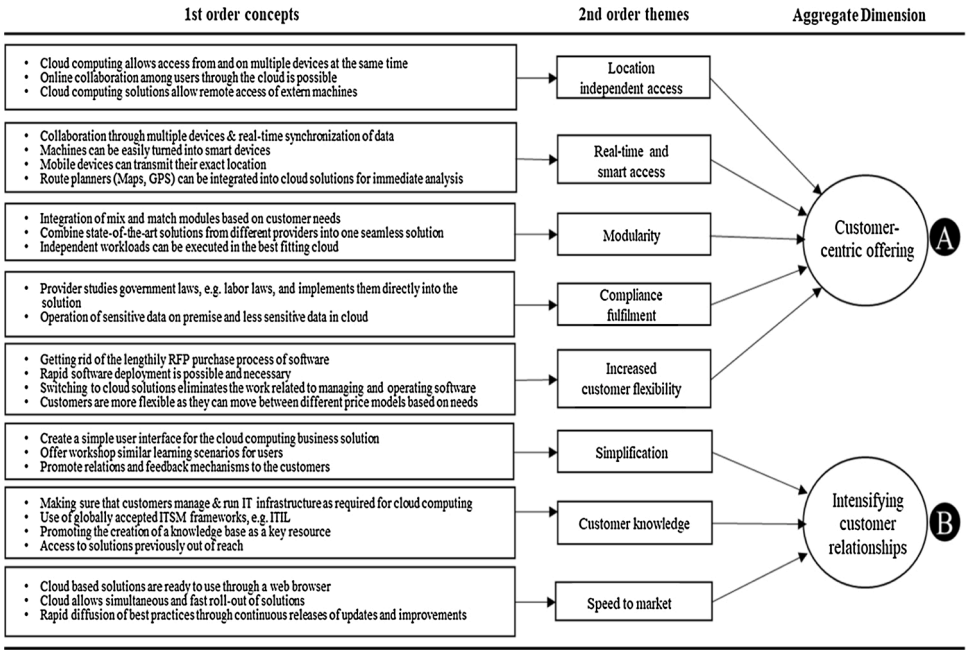

Fig. 2. IT and organizational capabilities for leveraging cloud computing for the value proposition.

themes.

Our analysis unveils the importance of addressing evolving customer needs. We also find that intensifying relationships with customers evolve into a central activity to effectively propose value in their cloud-based services. The development of customer-centric services results from the capability to handle continuous collaboration between software vendors and customer firms. Simultaneously, emerging cloud technologies facilitate managing this complicated relationship and enable software vendors to serve evolving customer firms' needs. The following quotes highlight cloud infrastructure's capacity to provide flexible customer solutions: *"Nowadays, mobility is a vital topic. How and when do cloud computing users work? When we talk about the usage or the commercialization of our services, it sounds very technical. However, our customers are interested in the advantages for their business that work in location-independent and time-independent ways."* (Vice President of the company I).

Furthermore, comprehensive user behavior analytics allow us to measure behavioral items such as user adoption of new features and identify application bundles deficiencies. Thus, real-time analytics provided the basis for continuous quality improvement in cloud computing: *"We see that, while we operate with the solution, and it is also a great opportunity to change, adapt, or disable things not used (by customers). Now we see what is happening; now we can intervene" (Vice President of company D)*. Cloud infrastructure also allows software vendors to intensify their customer relationships. The ease-of-use of many cloud technologies helps to expand the customer base rapidly. As a result, software vendors need to balance advanced functionality with a neat interface design: *"Once you have identified the key features that customers desire, it is essential to maintain a simple and self-explaining front-end operation for customers without adding feature by feature and thus increasing complexity both for clients and for us as the vendor" (CEO of company F)*.

Besides, software vendors engage in extensive educational work when approaching customer firms. Concerns arise on security and loss of control over data, as the quote below reflects: *"What we need to ensure is that customers understand that cloud computing makes their data more secure owing to well-secured server farms, frequent data backups, more*

Table 3
Value proposition: IT and organizational capabilities and related quotations.

Capabilities from coding	Additional aspects of the capabilities	Related supportive quotes
Customer-Centric offerings (A)	A.1) Customers require location-independent and real-time access that leads to increased flexibility. A.2) Besides improving business mobility, the potential to generate and analyze data in real time is a major success factor. A.3) The modularity of cloud computing solutions is a key success factor. Company B's product considerably simplifies mobile app development because it allows customers to build mobile apps by choosing from various modular components. A.4) Company F emphasized that customers benefit from the highest possible legal compliance levels when using the firm's online shift planner solution. A.5) Location independence, real-time access, modularity, and compliance fulfillment build the important capability of customer flexibility.	*"Cloud computing allows one to work in virtual teams, which means that it no longer matters where the employees are. Cloud computing makes data accessible from anywhere and at any time"* (Product Manager of company B). *"I think that the most important aspect of cloud computing is highly improved speed. A very simple example: a few years ago, building a nice corporate website took up to three months. Nowadays you need at worst three days. There are cloud-based software programs that take employee information from LinkedIn or corporate information from newspapers"* (Product Developer of company F). *"Our solution allows customers to simply drag and drop modules such as a Facebook interface into their development project to build tailored apps. Everything is pre-configured, and the whole process to connect the front-end is fully automated, which not only significantly reduces coding failures but also enables scalability of the complete app development process for our customers"* (CEO of company B). *"Day-care centers must prove that there is at least one teacher in each shift to ensure insurance coverage. In this context, our solution features a pop-up that specifically asks to confirm the presence of a teacher, enabling continuous legal compliance for customers via only one click"* (CEO of company F). *"One of our customers uses our solution to consolidate or eliminate several legacy systems. Instead of managing numerous complex systems, cloud computing provides such customers with functionality and flexibility thanks to the ease of adding or removing services without having to change the whole architecture"* (Vice President of company J).

efficient data administration, and constant and on-demand availability. Still, an enormous amount of time and effort is required to convince customers" (CEO of company D). To sum up, we find that developing customer-centric offerings and intensifying customer relationships are vital capabilities to provide new value with cloud computing services. Integrating direct customer feedback enables software vendors to propose customer value through rapid update cycles for their cloud solution offerings. However, developing these capabilities requires software vendors to adapt to established value chain architectures in software development.

4.2. Do software vendors create value?

Our evidence shows that resource and activity requirements for value creation from cloud solutions profoundly impact software firms' established project routines and sales and support structures. We specifically identify developing technological (IT) capabilities, business flexibility, and creating a dynamic ecosystem architecture as central IT and organizational capabilities supporting the digital transition of software vendors' product and service offerings to cloud infrastructure. Fig. 3 and Table 4 include our results related to software vendors' IT and organizational capabilities to leverage cloud computing for value creation.

Our analysis reveals that software vendors fully embrace the shift of responsibilities in cloud computing solutions, often acting as an outsourced IT department for their customers. Concerning IT challenges, scalable architectures' importance to ensure resource efficiency and flexible cloud solutions adjustments become salient in our analysis. Furthermore, the modular infrastructure of cloud computing requires software vendors to develop IT capabilities for instant resource upscaling of when the system load increases and downscaling when it decreases, as the following quote illustrates: *"The whole architecture must be built in a way that the application and the infrastructure layers are completely synchronized. What we need is an automated layer in between that facilitates on-demand upscaling or downscaling, depending on the resources the application requires, without our manual interference"* (CEO of company G).

Our evidence surfaces the critical role of support for cloud computing provisions. Many respondents express concerns about the complexity inherent in cloud support and sales activities, which contradicts cloud solutions' aspired simplicity. In consequence, several software vendors envisage separating their on-site and cloud computing businesses. As the quotes below show, a two-tier strategy is considered a viable option to distinguish support-intensive project management and lean designed cloud solutions: *"Cloud computing offerings only make sense if they imply no project characteristics, that is, when they offer customers the option to carry out self-contained tasks without a need for an explanation"* (CEO of company F).

Our results also suggest that cloud computing solutions create considerable operational and IT challenges for software vendors, as they imply profound changes to sales and support structures, developing new mindsets, changing customer roles, and the effective handling of scalability aspects. One common strategy surfacing from the data is moving marketing and sales processes of cloud computing solutions from personal contacts toward web-based solutions. However, this move requires the cognitive adaptation of sales teams. This adaptation of mindsets is a difficult task to implement, as this quote illustrates: *"Our sales teams used to present at customer sites, nowadays it is more about talking to customers on the phone. There is a shift from a face-to-face-driven business towards a marketing-driven one"* (CEO of company G). *"It is incredibly challenging to familiarize your sales staff with the new model, considering that their perception completely changes when selling services worth sixty to one hundred and twenty euro per month instead of working on a commission basis when selling licenses worth a hundred thousand euros"* (CEO of company D). Software vendors often struggle to handle this challenge. As contracts' conclusion entails considerable sales expenses, subscription models at a month's notice risk creating imbalances between customer lifetime value and sales expenses. Focusing on efficient sales structures and including customer self-service are prominent aspects, as mentioned in the following evidence: *"There is great potential concerning sales automation and efficiency. We want our customers to use our self-service offerings on the website, to speed the whole sales process while reducing our expenses"* (CEO of company E).

Furthermore, network effects and ecosystem connectivity become key factors, reflecting the vital importance of partnerships and enhanced collaboration. By engaging and even taking central orchestrating roles in cloud ecosystems, software vendors benefit from broader and effective relationships with customers, partners, affiliates, and integrators.

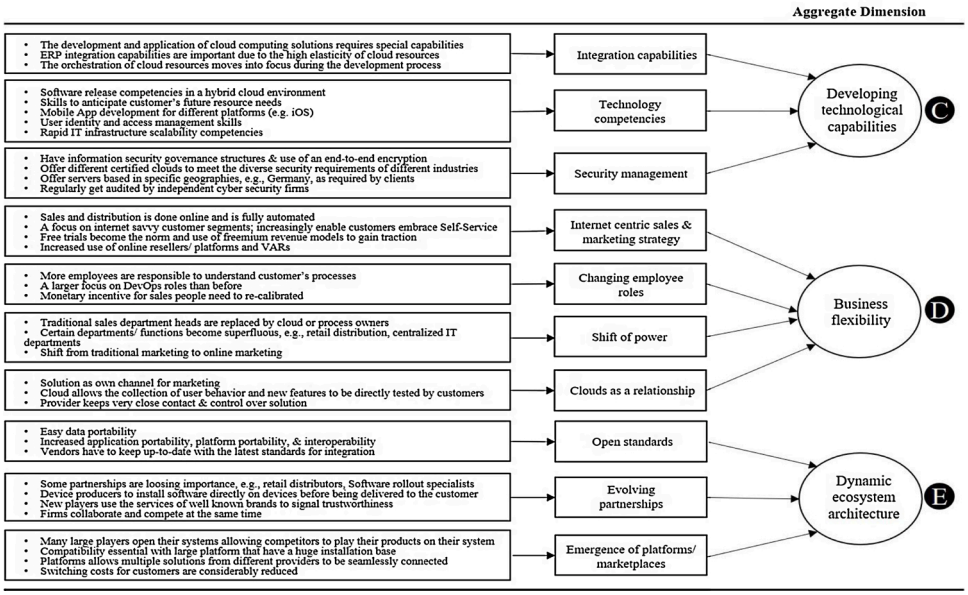

Fig. 3. IT and organizational capabilities for leveraging cloud computing for value creation.

Software vendors develop trust in their solutions by simultaneously creating strong community ties and partnering with cloud hosting providers, as the following quote reflects: *"Partnering with private cloud providers helps us to attract a broader range of consumers, especially larger corporations seeking certified solutions"* (CEO of company B). Although several respondents perceive ecosystem connectivity as a key aspect in transitioning to the cloud, they acknowledge that most software vendors have not yet tapped its full potential: *"I strongly believe that you need to build a sense of teamwork among vendors so that they set up clear interfaces between their offerings, which then creates a win-win situation by delivering customer value"* (CEO of company D). In conclusion, we found that software vendors leverage the complementarity of IT capabilities, business flexibility, and the creation of a dynamic network architecture to attract and retain customers for their cloud solutions.

4.3. Do software vendors capture value?

Our evidence shows that software vendors develop capabilities to align and complement their revenue logic with cloud computing to commercialize services. We find that software vendors use leverage and complement two unique capabilities: improved cash flow management and adaptive revenue flow (Fig. 4 and Table 5). Pricing strategies revolve around pricing metrics, such as price-per-user or features that build on free but time-limited testing phases to attract customers. Over time, software vendors become capable of offering customers moving from fixed costs into variable costs.

Our data analysis reveals that cloud computing solutions' one-to-many approach produces substantial economies of scale effects in software vendors' cost structures. However, these economies of scale incur higher initial costs for marketing and customer acquisition. Software vendors frequently encounter the challenge that customers hesitate to switch to cloud solutions, creating, in turn, considerable transaction costs, as the following quote illustrates: *"Initially, we have two kinds of expenses. First, we must convince a customer to use cloud computing in the first place; in a second step, we must convince them of the product's benefits"* (CEO of company F).

The increasing demand of customer firms to outsource their IT operations to cloud computing providers creates the expectation of providing 24/7 service support. As software vendors traditionally do not offer this support, they must overhaul their established support systems. Adding support capabilities for cloud solutions increases costs and counteracts intended cost efficiencies in sales structures. The evidence also suggests the importance of having a transparent price policy, which flexibly aligns with usage-based consumption. For example, companies C and F developed pricing models that consider customers' seasonal business fluctuations. Company F charges a flat price of 1€ per user per shift, allowing customers in markets to cushion personnel fluctuations during seasonal changes. The introduction of usage-based cloud pricing models is, however, often unwarranted as customers prefer out of habit to calculate fixed prices for fixed periods to ensure cost predictability: *"The usage-based model allows our customers to benefit from several things: they could terminate whenever they want, they are charged on a minute-based price. However, they still prefer to know in advance what they have to calculate on, instead of considering that they could probably save half of the price"* (CEO of company D).

While cloud solutions create long-term economies of scale, our evidence shows that a precondition for achieving positive cash flows is to gain short-term network effects by establishing a growing customer base. The following quote illustrates this pressure of software vendors to grow the customer base exponentially so that the cash flow remains balanced: *"Sometimes, it is not even about being better than your competitors; it is about quickly establishing your solution in the market. If you do not get enough people aboard or if you switch too quickly, there is a risk that you can no longer balance your cash-flows"* (CEO of company D). In summary, we find that the value capture of software vendors that provide cloud solutions engages in improved cash flow management and adaptive revenue flows. The value capture of the cloud computing-enabled business model depends on combining internal firm decisions to develop capabilities, investing in required resources, and risk-taking in pushing rapid customer adoption of cloud solutions with limited control over short-term revenues.

5. Discussion and core conclusions

5.1. Research goal's follow-up and summary of results

Firms' strategic choices about complementing digital technologies and capabilities in value-adding activities represent an essential aspect of theory building on digital innovation [2,21]. This study examines whether (and in positive cases, how) software vendors propose, create, and capture value from their cloud computing-enabled innovation strategy. Our multiple case analysis comprised 10 software vendors that

Table 4
Value creation: IT and organizational capabilities and related quotations.

Capabilities from coding	Additional aspects of the capabilities	Related supportive quotes
Developing technological (IT) capabilities (C)	C.1) If a separation of on-premise and cloud computing solutions is not possible, firms should increase integration capabilities. C.2) Because any coding failures immediately affect all users of the application and pose a significant threat to software vendors, they have to improve their technological capabilities. C.3) The integration and management of security competencies are crucial for the cloud computing-based business model innovation.	*"Vendors had traditionally handed over most of the responsibilities to consumers, internal or external partners when the deal was closed. This has certainly changed in times of cloud computing, in which vendors must ensure enough subscription renewals. In sum, we must improve our capabilities"* (Vice President of the company I). *"Cloud solutions are highly specialized solutions. Especially when there is a high fluctuation of resource requests, some internal experts are needed"* (CEO of company B). *"The knowledge and the expertise by taking care of that many databases are huge. We are better prepared for any attack than the companies, which have to take their data onto their servers themselves"* (Product Manager of company A).
Business flexibility (D)	D.1) Transition toward efficient online sales and marketing structures based on cloud technology. D.2) The promotion of a company-wide change of mind to address the specifics of cloud computing. D.3) Changing roles in cloud computing deployment represents an important aspect. We found that managers perceive a reallocation of IT responsibilities on their customers' side, which considerably changes the way software vendors approach customers. D.4) Centralized hosting and cloud computing architecture enhance customer relationships and enable software vendors to respond to customer feedback by continually updating integrated applications rapidly.	*"When we talk about cloud computing and a cheap product, usually you do not have a sales representative, just a few. The marketing and the sales should be done online, electronically. You would rather push everything in marketing rather than sales"* (Product Manager of company A). *"Cloud computing enables all our customers to benefit from rapid update cycles, be it SMEs or large corporations. This was simply not possible in the on-premise era, in which each customer had their version management, foreclosing any synergies for both customers and vendors"* (CEO of company D). *"The head of marketing, the sales manager, or the chief buyer has a much stronger influence on IT budgets, which, in turn, implies that the solution we offer must be tailored to their specific requirements. Things that were of importance for IT, such as process and data consistency, are no longer of any interest to them; they want the right solutions"* (Vice President of the company I). *"Such collaborations have existed for a long time already, but what makes it so special in times of cloud computing is the fact that even the smallest players can provide instant value-added that reaches all customers in the context of a cloud ecosystem"* (Vice President of the company I).
Dynamic ecosystem architecture (E)	E.1) The promotion of a certain openness of cloud computing solutions is a key success factor. Opening the cloud computing system allows customers and competitors to adapt selected aspects. E.2) Partnering with well-established cloud providers to increase trust is an important success factor. Furthermore, this leads to collaboration platforms for customers and partners who create lock-in effects. E.3) Company C considers network effects a very important success factor to extend customer segments and increase customer loyalty.	*"On the one hand, our cloud computing solutions are already a kind of platform. We provide a special service, and our customers can use it to the desired extent. On the other hand, it is possible to offer every software as a cloud computing service. A certain openness of our software allows an adaptation that is required by many customers"* (CEO of company H). *"We offer a great electronic personnel file, but another vendor develops the corresponding accounting system. If all of these applications communicate with one another, it would be an effective and complete solution with real value-added. This necessitates specific interfaces and high standardization, which is not yet present"* (CEO of company G). *"We have established a collaboration platform for our cloud solutions that enables farmers to save their data on the platform, which is then accessed and utilized by contractors or machinery rings. Thus, different parties can share information in real-time, leading to network effects that, in any case, reach a critical mass and thus enable important binding effects"* (Senior Manager of company C).

operate in Germany and Austria. We conducted 28 in-depth interviews with top executives and added complementary archival records from these firms to understand how they integrate cloud computing technologies into their resource base and develop IT and organizational capabilities to transform their business model. The thematic analysis reveals a salient complementarity of software vendors' IT and organizational capabilities in reconfiguring their business model and executing a digital innovation strategy. We provide a conceptual model that explains this complementarity of IT and organizational capabilities theoretically. We find that customer-centric offerings and customer relationships' intensification are crucial to redesign software vendors' customer value proposition. IT capabilities, business flexibility, and dynamic ecosystem architecture are the pathways to create value. Finally, software vendors capture value through improved cash flow management and adaptive revenue flows.

5.2. Incremental contributions to IS research

Drawn on the literature of business models, digital innovation, and firms' capabilities, this study makes two key contributions to IS research. First, digital innovation is the creation or change of market offerings, business processes, and business models that result from digital technologies [6]. Prior research on digital innovation has mainly focused on conceptualizing digital innovation firms' initiatives and strategies (e.g. [14]) and highlighting the relevance of orchestrating

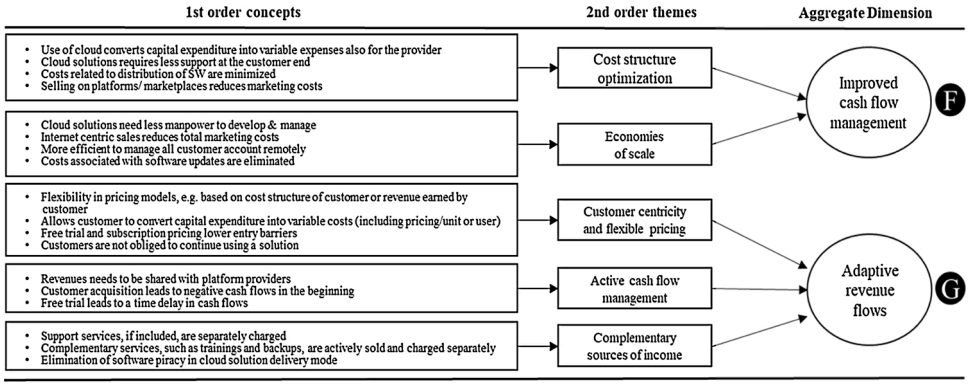

Fig. 4. IT and organizational capabilities for leveraging cloud computing for value capture.

complementarities in the business partnerships ecosystem (e.g. [7]). The main unit of analysis has been the user firm. However, many companies must outsource partially or totally their resource base and capabilities for digital innovation, working with software vendors (e.g. [46]). Drawn on this prior literature on digital innovation, we focus on the software vendors, a unit of analysis less explored on this research topic [60]. This study provides a conceptual model that explains theoretically whether and how software vendors leverage cloud computing-enabled innovation for the digital boost. Specifically, our conceptual model explains theoretically how software vendors have transformed their business models in the integration and assimilation of cloud computing through the complementary portfolio of IT and organizational capabilities. This is the primary contribution of this paper to IS research.

Second, we draw on prior IS research on cloud computing-enabled business model transformation (e.g., [9,17,27,30]) to explain whether and how software vendors can leverage cloud computing to transform their value proposition, value creation, and value capture. We find and argue that software vendors require customer-centric offerings and customer relationships' intensification to redesign the customer value proposition. IT capabilities, business flexibility, and dynamic ecosystem architecture are the pathways to transform value creation. Finally, our conceptual model suggests that software vendors can transform the way they capture value through improved cash flow management and adaptive revenue flows. This complementary portfolio of IT and organizational capabilities to transform value proposition, creation, and capture (i.e., the three key ingredients of a business model) constitutes a contribution to the business model literature and the second contribution of this paper. Our findings and contributions are consistent with Hahn et al.'s [9] and Kathuria et al.'s [27] arguments of combining technology and business capabilities to navigate theoretically in IS research on cloud computing.

5.3. Lessons learned to software vendor's executives, and IT and business executives

Our study provides several lessons learned to software vendor executives and IT and business executives. Software vendors have transitioned their core technologies and business processes to the cloud computing model, selling and delivering software applications on demand and remotely. This digital transition to cloud computing requires software vendors to rethink their innovation strategy, develop their competitive resource base, and reconfigure their business models accordingly. First, this study provides software vendor executives with a conceptual model that explains how their companies can leverage cloud computing-enabled innovation strategies for the digital boost. Second and specifically, this study explains to these software vendors' executives how to reconfigure and transform their customer value proposition, creation, and capture. Software vendors can leverage customer-centric offerings and the intensification of customer relationships to redesign the customer value proposition. These providers can develop new IT capabilities, use business flexibility, and leverage the dynamic ecosystem architecture to transform value creation. Our conceptual model also suggests software vendors improved cash flow management and adaptive revenue flows as the mechanisms to capture value. Finally, our research highlights IT and business executives the critical role of software vendors, cloud computing, and the complementarity of IT and organizational capabilities to design and execute their digital business transformation firm's initiatives successfully.

5.4. Limitations and future opportunities for IS research

We have carefully designed and documented the procedures to ensure that our study complies with the common methodological criteria for theory building in multiple case study research. Nonetheless, our study has some limitations which present opportunities for future IS research. Interview data potentially faces the problems of impression management and retrospective sensemaking on the part of respondents. We address these potential biases by critically evaluating respondents' claims' credibility with a triangulation of the complementary sources [51,55]. While we pursue a purposive sampling strategy to identify the complementarity of IT and organizational capabilities to leverage cloud computing in software vendors' digital innovation, the collected evidence remains limited in size [54]. However, our study's objective is not to generalize findings to a statistically relevant population but to explore whether and how software vendors propose, create, and capture value through cloud computing-enabled innovation for the digital boost. Second, we recognize that case research and the resultant conceptual model is not appropriate for making causal claims [51,52]. In this respect, our conceptual model offers the theoretical foundations for future IS research to test the weight (i.e., importance) of the ingredients of each IT and organizational capability in shaping digital innovation of software vendors (i.e., the recipe, e.g. [61]). Future IS research can also test if the ingredients (potentially measurements) and the relationships derived (potential hypotheses) from the conceptual model are supported on a quantitative research study. Furthermore, we suggest complementing our study beyond the specific setting of the software industry to broader contexts of digital innovation in dynamically evolving ecosystems in which value is often cocreated in close collaborations between software vendors and customer firms.

The research topics on digital innovation and digital business transformation present several promising avenues for future IS research. First, our study focuses on the impact of cloud computing in the business model innovation of software vendors and derives a portfolio of complementary IT and organizational capabilities valuable for this goal. Future IS research should explore the firm's capabilities of other disruptive technologies (e.g., social media, artificial intelligence, blockchain, and Internet of everything) (e.g., [62]) that can enable the firm's design and execution of digital innovation and transformation

Table 5
Value capture: IT and organizational capabilities and related quotations.

Capabilities from coding	Additional aspects of the capabilities	Related supportive quotes
Improved cash flow management (F)	F.1) While software vendors initially assumed that established on-premises sales departments organize the distribution of cloud solutions, they realized that selling on-premise software differs significantly from selling cloud solutions. F.2) As the cost per unit of software decreases with increasing output, the usage of these cost advantages is an important success factor for software vendors.	*"What I can imagine is to separate our business units to also clearly segregate sales and support structures in our firm"* (CEO of company H). *"We offer a tool that allows an analysis of clicks and revenues. We give our customers the possibility to get an analysis of their customers online. They can see the effectiveness of clicks"* (Product Manager of company E). *"The development and test phase for software is extremely time and cost-intensive. However, after this process, we can offer a software product that many business firms can use. Consequentially, we achieve the break-even point faster when we sell the software as often as possible in a certain period "* (CEO of company B).
Adaptive revenue flows (G)	G.1) Software vendors can achieve a value cocreation process with customers during the value creation process and are in the position to determine customer-centric (and flexible) pricing strategies. G.2) We identified a danger in cloud computing solutions: that customers equate lower software costs per license with lower total costs for the provision of software services. This requires active cash flow management for being successful in the long term. G.3) Service and support can be a complementary source of income if software firms built the capabilities to support their customers.	*"The most important thing is to offer a pricing model that depicts customers' processes and thus allows for maximum flexibility. If you introduce pricing components such as per shift or unit, it could easily happen that you exclude half of your existing customer base"* (CEO of company F). *"Our old on-premise solution costs at least 2500€ for the very basic version. For freelancers or even private users, this is a huge investment to get started. Of course, this is an entry barrier, which leads to software piracy. Besides this, software piracy is no longer technologically possible because there is no software to download and install"* (Product Manager of company A). *"It's a well-known phenomenon: once customers think that the solutions are cheap, they expect everything else such as support also to be cheap. However, the support must always be of better quality, and this is costly"* (CEO of company D).

strategies. Second, we find that extremely interesting is the study of how firms can move from digitally driven digital transformation strategies to specific tactics (e.g., [63]) that provides a positive return on investments. Finally, recent IS research has found that complexity-altering corporate strategy changes (e.g., diversification, mergers and acquisitions, and divestitures) affect IT control's effectiveness [64]. Drawn on this IS research and looking up the reverse causality to our study's goal, examining how complexity-altering corporate strategy changes may affect the success of the user firm's digital transformation and the software vendors' support, it seems exciting IS research topics to explore in the short-term.

5.5. Concluding remarks

Digital innovation has become a central strategic challenge that user firms need to address to manage their digital business transformation successfully. Many user companies will need the support of software vendors in this innovation journey. Do software vendors propose, create, and capture value in the era of digital transformation? Drawn on the literature of business models, digital innovation, and firms' capabilities, we examine this core research question. We conducted a multiple case analysis of 10 software vendors that operate in Germany and Austria. The thematic analysis of data patterns yields a conceptual model that explains theoretically how software vendors leverage cloud computing-enabled innovation for the digital boost, which is this study's primary contribution to IS research. Software vendors use a complementary portfolio of IT and organizational capabilities to innovate in their customer value proposition, creation, and capture to obtain positive returns on investments. Quo Vadis?

Data availability

Data will be made available on request.

CRediT authorship contribution statement

Dirk Schneckenberg and **Jose Benitez** contributed to the conceptualization, research methodology, writing, and revision of this paper. **Christoph Klos** and **Vivek K. Velamuri** performed the data collection and analysis and wrote the paper's original draft. **Patrick Spieth** supervised the research project and helped in the writing and revision of the manuscript.

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References

[1] J. Benitez, R. Luo, G. Vastag, Information and operational decision sciences: the interplay of information technology and operational decision sciences, Decis. Sci. 51 (3) (2020) 458–463.
[2] R. Kohli, N. Melville, Digital innovation: a review and synthesis, Inform. Syst. J. 29 (1) (2019) 200–223.
[3] A. Hensen, J. Dong, Hierarchical business value of information technology: toward a digital innovation value chain, Inform. Manage. 57 (4) (2020) 1–14.
[4] T. Hess, A. Benlian, C. Matt, F. Wiesbock, Options for formulating a digital transformation strategy, MIS Q. Execut. 15 (2) (2016) 123–139.
[5] J. Rose, M. Jones, B. Furneaux, An integrated model of innovation drivers for smaller software firms, Inform. Manage. 53 (3) (2016) 307–323.
[6] S. Nambisan, K. Lyytinen, A. Majchrzak, M. Song, Digital innovation management: reinventing innovation management research in a digital world, MIS Q. 41 (1) (2017) 223–238.
[7] D. Teece, Profiting from innovation in the digital economy: enabling technologies, standards, and licensing models in the wireless world, Res. Policy 47 (8) (2018) 1367–1387.
[8] P. Mell, T. Grance, The NIST Definition of Cloud Computing Recommendations of the National Institute of Standards and Technology, National Institute of Standards and Technology, U.S. Department of Commerce, 2011, 800-145, 1-7.
[9] C. Hahn, J. Huntgeburth, T. Winkler, R. Zarnekow, Business and IT capabilities for cloud platform success, in: Proceedings of 37th International Conference on Information Systems, Dublin, Ireland, 2016, pp. 1–20.
[10] J. Kranz, A. Hanelt, L. Kolbe, Understanding the influence of absorptive capacity and ambidexterity on the process of business model change: the case of on-premise and cloud-computing software, Inform. Syst. J. 26 (5) (2016) 477–517.
[11] D. Teece, Business models, business strategy and innovation, Long Range Plann. 43 (2-3) (2010) 172–194.
[12] N. Foss, T. Saebi, Fifteen years of research on business model innovation: how far have we come, and where should we go? J. Manage. 43 (1) (2017) 200–227.

[13] L. Doganova, M. Eyquem, What do business models do? Innovation devices in technology entrepreneurship, Res. Policy 38 (10) (2009) 1559–1570.
[14] F. Svahn, L. Mathiassen, R. Lindgren, Embracing digital innovation in incumbent firms: how Volvo cars managed competing concerns, MIS Q. 41 (1) (2017) 239–253.
[15] C. Helfat, R. Raubitschek, Dynamic and integrative capabilities for profiting from innovation in digital platform-based ecosystems, Res. Policy 47 (8) (2018) 1391–1399.
[16] A. Castillo, J. Benitez, J. Llorens, J. Braojos, Impact of social media on the firm's knowledge exploration and knowledge exploitation: the role of business analytics talent, J. Assoc. Inform. Syst. (2021) in press (forthcoming) 1-64.
[17] A. Benlian, W. Kettinger, A. Sunyaev, T. Winkler, The transformative value of cloud computing: a decoupling, platformization, and recombination theoretical framework, J. Manage. Inform. Syst. 35 (3) (2018) 719–739.
[18] T. Li, Y. Chan, Dynamic information technology capability: concept definition and framework development, J. Strat. Inform. Syst. 28 (4) (2019) 1–20.
[19] M. Fahmideh, F. Daneshgar, F. Rabhi, G. Beydoun, A generic cloud migration process model, Eur. J. Inform. Syst. 28 (3) (2018) 233–255.
[20] O. Krancher, P. Luther, Key affordances of platform-as-a-service: self-organization and continuous feedback platform-as-a-service view project knowledge transfer in information systems outsourcing view project, J. Manage. Inform. Syst. 35 (3) (2018) 776–812.
[21] M. Fischer, F. Imgrund, C. Janiesch, A. Winkelmann, Strategy archetypes for digital transformation: defining meta objectives using business process management, Inform. Manage. 57 (5) (2020) 1–13.
[22] M. Armbrust, I. Stoica, M. Zaharia, A. Fox, R. Griffith, A. Joseph, R. Katz, A. Konwinski, G. Lee, D. Patterson, A. Rabkin, A view of cloud computing, Commun. ACM 53 (4) (2010) 50–58.
[23] S. Marston, Z. Li, S. Bandyopadhyay, J. Zhang, A. Ghalsasi, Cloud computing: the business perspective, Decis. Support Syst. 51 (1) (2011) 176–189.
[24] V. Ratten, Continuance use intention of cloud computing: innovativeness and creativity perspectives, J. Bus. Res. 69 (5) (2016) 1737–1740.
[25] T. Kang, C. Baek, J. Lee, The persistency and volatility of the firm R&D investment: revisited from the perspective of technological capability, Res. Policy 46 (9) (2017) 1570–1579.
[26] H. Cheng, Z. Li, A. Naranjo, Cloud computing spot pricing dynamics: latency and limits to arbitrage, Inform. Syst. Res. 27 (1) (2016) 145–165.
[27] A. Kathuria, A. Mann, J. Khuntia, T. Saldanha, R. Kauffman, A strategic value appropriation path for cloud computing, J. Manage. Inform. Syst. 35 (3) (2018) 740–775.
[28] T. Abrell, M. Pihlajamaa, L. Kanto, J. Vom Brocke, F. Uebernickel, The role of users and customers in digital innovation: insights from B2B manufacturing firms, Inform. Manage. 53 (3) (2016) 324–335.
[29] P. Constantinides, O. Henfridsson, G. Parker, Platforms and infrastructures in the digital age, Inform. Syst. Res. 29 (2) (2018) 381–400.
[30] X. Xiao, J. Hedman, How a software vendor weathered the stormy journey to the cloud, MIS Q. Execut. 18 (1) (2019) 37–50.
[31] J. Benitez, L. Ruiz, A. Castillo, J. Llorens, How corporate social responsibility activities influence employer reputation: the role of social media capability, Decis. Support Syst. 129 (1) (2020) 1–11.
[32] J. Lin, L. Li, R. Luo, J. Benitez, How do agribusinesses thrive through complexity? The pivotal role of e-commerce capability and business agility, Decis. Support Syst. 135 (1) (2020) 1–13.
[33] B. Hinings, T. Gegenhuber, R. Greenwood, Digital innovation and transformation: an institutional perspective, Inform. Organ. 28 (1) (2018) 52–61.
[34] H. Tian, V. Grover, J. Zhao, Y. Jiang, The differential impact of types of app innovation on customer evaluation, Inform. Manage. 57 (7) (2020), 103358.
[35] X. Busquets, Orchestrating smart business network dynamics for innovation, Eur. J. Inform. Syst. 19 (4) (2010) 481–493.
[36] Y. Yoo, R. Boland, K. Lyytinen, A. Majchrzak, Organizing for innovation in the digitized world, Organ. Sci. 23 (5) (2012) 1398–1408.
[37] J. Benitez, R. Walczuch, IT, proactive environmental strategy and firm performance: a resource-based analysis, in: Proceedings of the 17th Americas Conference on Information Systems, Detroit, USA, 2011, pp. 1–10.
[38] P. Mikalef, J. Krogstie, I. Pappas, P. Pavlou, Exploring the relationship between big data analytics capability and competitive performance: the mediating roles of dynamic and operational capabilities, Inform. Manage. 57 (2) (2020) 1–15.
[39] J. Benitez, G. Ray, J. Henseler, Impact of information technology infrastructure flexibility on mergers and acquisitions, MIS Q. 42 (1) (2018) 25–43.
[40] J. Eggers, S. Kaplan, Cognition and capabilities: a multi-level perspective, Acad. Manage. Ann. 7 (1) (2013) 295–340.
[41] S. Scott, J. Van Reenen, M. Zachariadis, The long-term effect of digital innovation on bank performance: an empirical study of SWIFT adoption in financial services, Res. Policy 46 (5) (2017) 984–1004.
[42] D. Battleson, B. West, J. Kim, B. Ramesh, P. Robinson, Achieving dynamic capabilities with cloud computing: an empirical investigation, Eur. J. Inform. Syst. 25 (3) (2016) 209–230.
[43] C. Zott, R. Amit, L. Massa, The business model: recent developments and future research, J. Manage. 37 (4) (2011) 1019–1042.
[44] L. Massa, C. Tucci, A. Afuah, A critical assessment of business model research, Acad. Manage. Ann. 11 (1) (2017) 73–104.
[45] S. Khanagha, H. Volberda, I. Oshri, Business model renewal and ambidexterity: structural alteration and strategy formation process during transition to a cloud business model, R&D Manage. 44 (3) (2014) 322–340.
[46] S. Schneider, A. Sunyaev, Determinant factors of cloud-sourcing decisions: reflecting on the IT outsourcing literature in the era of cloud computing, J. Inform. Technol. 31 (1) (2016) 1–31.
[47] A. Baird, T. Raghu, Associating consumer perceived value with business models for digital services, Eur. J. Inform. Syst. 24 (1) (2015) 4–22.
[48] F. Hacklin, J. Bjorkdahl, M. Wallin, Strategies for business model innovation: how firms reel in migrating value, Long Range Plann. 51 (1) (2017) 1–10.
[49] A. Pussep, M. Schief, T. Weiblen, T. Leimbach, J. Peltonen, M. Ronkko, P. Buxmann, Results of the German Software Industry Survey 2013, Darmstadts, Germany, 2013, pp. 1–38.
[50] M. Naldi, L. Mastroeni, Economic decision criteria for the migration to cloud storage, Eur. J. Inform. Syst. 25 (1) (2016) 16–28.
[51] K. Eisenhardt, M. Graebner, Theory building from cases: opportunities and challenges, Acad. Manage. J. 50 (1) (2007) 25–32.
[52] R. Yin, Case Study Research: Design and Methods, 4th ed., Sage Publications, Thousand Oaks, USA, 2009.
[53] H. Blumer, Symbolic Interactionism: Perspective and Method, University of California Press, London, UK, 1969.
[54] M. Patton, Qualitative Research and Evaluation Methods: Integrating Theory and Practice, 3rd ed., Sage Publications, Thousand Oaks, USA, 2002.
[55] U. Flick, An Introduction to Qualitative Research: Theory, Method and Applications, Sage Publications, Thousand Oaks, USA, 2014.
[56] K. Eisenhardt, Building theories from case study research, Acad. Manage. Rev. 14 (4) (1989) 532–550.
[57] Q. Song, Y. Wang, Y. Chen, J. Benitez, J. Hu, Impact of the usage of social media in the workplace on team and employee performance, Inform. Manage. 56 (8) (2019) 1–20.
[58] V. Clarke, V. Braun, N. Hayfield, Thematic analysis, in: J. Smith (Ed.), Qualitative Psychology: A Practical Guide to Research Methods, 3rd ed., Sage Publications, 2015, pp. 222–248.
[59] D. Gioia, K. Corley, A. Hamilton, Seeking qualitative rigor in inductive research: notes on the Gioia methodology, Organ. Res. Methods 16 (1) (2013) 15–31.
[60] A. Giessmann, C. Legner, Designing business models for cloud platforms, Inform. Syst. J. 26 (5) (2016) 551–579.
[61] J. Benitez, J. Henseler, A. Castillo, F. Schuberth, How to perform and report an impactful analysis using partial least squares? Guidelines for confirmatory and explanatory IS research, Inform. Manage. 57 (2) (2020) 1–16.
[62] D. Langley, J. Van Doorn, I. Ng, S. Stieglitz, A. Lazovik, A. Boonstra, The internet of everything: smart things and their impact on business models, J. Bus. Res. 122 (1) (2021) 853–863.
[63] R. Casadesus, J. Ricart, From strategy to business models and onto tactics, Long Range Plann. 43 (2–3) (2010) 195–215.
[64] H. Tanriverdi, K. Du, Corporate strategy changes and information technology control effectiveness in multibusiness firms, MIS Q. 44 (4) (2020) 1573–1617.

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