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Digital innovations

Embedding in organizations

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Abstract
In the digital era, organizations can use digital technologies to develop new digital products and services, business processes, or business models. These so-called digital innovations pose a serious challenge for both theory and practice. Accordingly, the last years have brought forward a multitude of research in this area. With this article we want to link existing research streams on digital innovations and, thus, pave the way for future research in this area. Therefore, we consolidate prevailing work on digital innovations into a technology-driven "linking" framework on digital innovations and their embedding in organizations. According to our framework, the realization and embedding of digital innovations into organizations manifests along three concentric rings: the technology-driven development and the different implementation categories of digital innovations at the core, the enablers of digital innovations in a second ring, and the governance of digital innovations in a third ring. Based on the proposed framework we point out promising areas for further research in this field.

Keywords Digital transformation · Digital innovation · Digitalization · Digital business models · Digital products and services · Digital business processes · Digital management

JEL classification M15 IT Management

Introduction

Organizations use digital technologies for establishing new products and services, to implement new business processes, or to operate new business models (Legner et al. 2017; Nambisan et al. 2017). They invest in more flexible information technology (IT) landscapes or in new forms of organizational structures that allow them to harvest the benefits offered from digital technologies. And they think about the establishment of appropriate governance structures that allow them to strategically approach their digital transformation.

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All these issues are being discussed in literature. The conceptual development of digital innovations – which depict an essential element of an organization's digital transformation – has been of special interest to Information Systems (IS) research over the last decade (Kohli and Melville 2018; Nambisan et al. 2017; Vial 2019; Yoo et al. 2012). In addition, there is a growing amount of studies on the enabling factors of digital innovations including newly emerging capabilities (Li et al. 2018), cultural change (Hartl and Hess 2017), new forms of organizational structures such as digital infrastructures (Henfridsson and Bygstad 2013) or digital platforms (Gawer and Cusumano 2014; Karimi et al. 2009; Yoo et al. 2012), but also new ways of cooperation (e.g. co-design, co-creation, co-production) (Mauerhoefer et al. 2017; Nambisan et al. 2017). A further research stream investigates the governance of digital innovations in organizations (Bharadwaj et al. 2013; Hess and Barthel 2017; Kohli and Melville 2018; Nambisan et al. 2017).

Also in practice we see the growing evidence for the many challenges associated with digital innovations and, thus, the value of a structured approach towards their governance. On the one hand, in the context of digital innovations

organizations have to deal with volatile markets, disruptive technologies, and accelerating innovation cycles (Chan et al. 2018; Karimi and Walter 2015). On the other hand, organizations that want to develop digital innovations need to establish dedicated digital units that oftentimes employ cross-functional teams (Fuchs et al. 2019). Moreover, many organizations struggle with the realization that in the context of digital innovations IT needs to be seen as an innovation enabler and not as a commodity (Ciriello et al. 2018).

However, the existing research streams on digital innovations are, at best, loosely coupled. Thus, we are in need of a "linking" framework that brings together prevailing research in this field. Such a framework helps managers to systematically approach digital innovations. Oftentimes, managers are confronted with a plethora of challenges associated with the advent of digital technologies and the resulting development and implementation of digital innovations. Accordingly, a framework that structures the many facets of digital innovations offers a valuable benefit to practitioners. Likewise, theory will profit from such a framework since it allows the classification of existing and future research in this field.

Digital innovations can act as the core of such a "linking" framework since they depict a central element of digital transformation and represent the domain where the use of digital technologies manifests within organizations (Kohli and Melville 2018; Nambisan et al. 2017). In addition, we know that the realization and the embedding of digital innovations will not happen automatically but requires a deliberate approach that allows them to translate digital technologies into digital innovations (Chan et al. 2018; Dinter and Krämer 2018; Kohli and Melville 2018; Nambisan et al. 2017; Wiesböck 2018; Yoo et al. 2012). We argue that digital innovations can only manifest if organizations know how to realize digital innovations in the first place, and if they know how to manage and prepare for the realization and embedding of digital innovations in the second place. With this article, we want to describe digital innovations along these three rings (i.e., the development and implementation of digital innovations, the preparation of the organization, and the governance of digital innovations).

Existing research on digital innovations can be structured along four main research streams. A first research stream concerns the conceptual development of digital innovations. Accordingly, we start with a discussion of existing conceptualizations of digital innovations and consolidate prevailing theories into a technology-centered conceptual model of digital innovations. Then, we present a second research stream that further distinguishes the different categories of digital innovations: digital product and service innovations, digital process innovations, and digital business model innovations. Subsequently, we present a third research stream that argues how organizations can prepare their organizations for digital innovations through the realization of four specific enablers. After that, we introduce a fourth research stream that elaborates on the important role of a dedicated digital transformation governance (DTG) approach in order to strategically address digital innovations and their embedding in organizations. Finally, we develop a technology-driven three-ring framework of digital innovations and their embedding in organizations that integrates the prevailing research streams and conclude with promising areas for future research in this field.

Research stream 1: conceptual development of digital innovations

A first research stream addresses the conceptual development of digital innovations. Following the advent of digital technologies (such as SMAC technologies) (Legner et al. 2017), we have seen the emergence of a new kind of innovation – digital innovations – that concerns the development and implementation of innovative artefacts and related solutions that are based on the innovative (re)use of digital components (Fichman et al. 2014; Yoo et al. 2010). Prior research has argued that the characteristic element of digital innovations is the use of innovative digital technologies in novel ways (Kohli and Melville 2018; Nambisan et al. 2017). Thus, digital innovation is defined "as the creation of (and consequent change in) market offerings, business processes, or models that result from the use of digital technology" (Nambisan et al. 2017, p. 224).

Conceptualization

Digital innovations can be conceptualized as a combination of two digital artefacts (Wiesböck 2018; Yoo et al. 2010): an innovative digital solution (Aral and Weill 2007) and (indispensable) a complementary digital business concept (Westermann et al. 2011), both driven by the opportunities of new digital technologies ("technology-push") and the needs and requirements in the domain of application ("technology-pull"). Both digital artifacts need to be heavily integrated and can only act in harmony. Traditionally, new business requirements (e.g., the willingness to introduce a new sales concept) depict the impetus for digital innovations. Such new business requirements are being implemented through the development of a digital solution (in our example: a new sales database). In this case, new business requirements initiate the search for novel technological opportunities based on digital technologies ("technology-pull"). However, as a consequence of the increasing prevalence of digital technologies, the impetus for digital innovations often also comes from the emergence of a new digital technology which induces novel business opportunities ("technology-push"). Figure 1 consolidates this view on digital innovations into a technology-push-pull model of digital innovations.

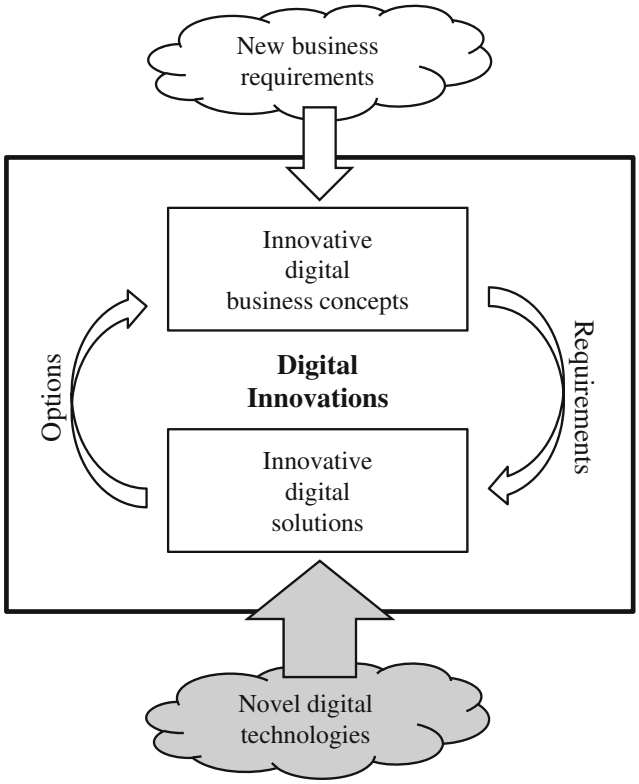

Fig. 1 Technology-push-pull model of digital innovations (Based on Wiesböck 2018)

Development process

From an IS development perspective, the development of digital innovations follows a logical evolutionary path (Kohli and Melville 2018; Wiesböck 2018). Based on abstract digital technologies, organizations develop specific innovative digital solutions. Innovative digital solutions, then again, trigger the development of innovative digital business concepts. While the transition from an abstract digital technology to a concrete digital solution characterizes an organization's digitalization, the transition from digital solutions to digital business concepts is also referred to as an organization's digital transformation and captures the organizational change induced by digital technologies (Fichman et al. 2014; Legner et al. 2017; Wiesböck 2018). Oftentimes, the transition from digital solutions to digital business concepts is not a singular, linear event but happens iteratively (Orlikowski 1992).

One example that stands testament for this evolutionary path of digital innovations has been the realization of the first enterprise resource planning (ERP) systems, driven mainly by the emergence of relational database systems. The appearance of ERP systems led to the development of new business processes handling the core resources of organizations. In a similar spirit, organizations nowadays are changing their management IS based on in-memory databases and new technologies for the human-machine-interaction (e.g., user experience design). Ultimately, this allows organizations to integrate such systems in board meetings and to work with complex simulations. Other prominent examples are social media technologies. Besides changes in corporate communication, they facilitated the emergence of a new generation of media companies such as Facebook or Twitter.

In the end, the development of digital innovations is characterized by a recursive interdependence between the involved digital artefacts. In case of the social media example, the appearance of a new digital technology (social media technologies) led to the development of new digital solutions (social media networks) which triggered the development of new digital business concepts (social media marketing concepts). However, the emergence of a new digital business concept (social media marketing) may then trigger follow-up developments of additional digital solutions (e.g., big data analytics applications) which, then again, lead to the development of additional complementing digital business concepts (e.g., data-driven customer segmentation). Ultimately, these follow-up recursive circles can lead to the replacement of already existing solutions and concepts (in our example: marketing concepts that are based on big data analytics replace existing offline marketing approaches). Such an argumentation is in line with structuration theory in IS research because the emergence of new structures (here: digital solutions or digital business concepts, respectively) triggers change processes within existing structures (Jones and Karsten 2008; Orlikowski and Robey 1991).

Research stream 2: categories of digital innovations

A second stream of research further differentiates digital innovations. Similar to traditional innovation taxonomies, digital innovations can be distinguished into three different categories (Fig. 2). Firstly, organizations can take a market perspective and use digital technologies to develop new digital products and services (Lyytinen et al. 2016). Secondly, organizations can take a production view and pursue digital business processes (Nambisan et al. 2017). Lastly, the emergence of digital products and services and digital business processes inevitably leads to novel forms of digital business models (Nambisan et al. 2017). Additionally, the different categories are interrelated (Fichman et al. 2014). For instance, new

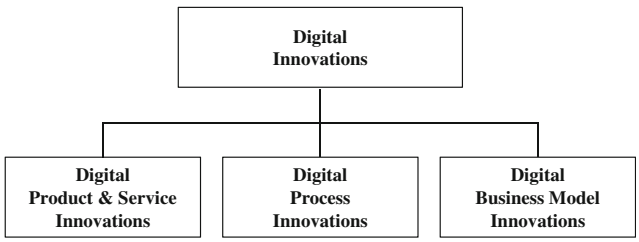

Fig. 2 Categorization of digital innovations

digital products and services may demand or enable new digital business processes that, together, allow the introduction of new digital business models.

Digital product and service innovations

Digital product and service innovations depict the first category of digital innovations (Nambisan et al. 2017). They refer to new products or services that result from the innovative use of digital technologies (Fichman et al. 2014; Lyytinen et al. 2016). This includes the use of digital technologies to either create fundamentally new digital products and services or enhance existing products and services through the addition or integration of digital components (Fichman et al. 2014; Lyytinen et al. 2016). Typical examples for the former case are smartphones or content streaming services. Examples for latter case are the integration of smartphones in cars (e.g., Apple CarPlay) or voice control services for all kinds of electronic devices (e.g., remote controls for smart TVs). Both kinds of digital product and service innovations offer significant value potentials for organizations.

The last years have brought forward plenty valuable studies on digital products and services in the digital age (Kohli and Melville 2018; Lyytinen et al. 2016). Therefore, we already know a lot about their idiosyncrasies. To begin with, digital products and services are easy to copy and therefore, similar to all kinds of digital intellectual property, hard to protect against piracy (Sundararajan 2004). Consequently, organizations need to develop dedicated digital rights management (DRM) strategies to protect their digital rights. Furthermore, digital product and service innovations depend strongly on novel customer preferences and behaviors (Lyytinen et al. 2016). As a consequence, organizations have to come up with new strategies to meet these groups' specific demands (Nambisan et al. 2017). This requires a strong integration of customers and suppliers in the innovation process (Koch and Bierbamer 2016; Lau et al. 2010) or the embedding of digital technologies in customer relationship management (CRM) practices (e.g., in the form of social media technologies) which, ultimately, leads to the digitalization of the customer interface (Choudhury and Harrigan 2014; Hadaya and Cassivi 2009). Apart from this, digital tools and architectures foster increasing levels of product and service modularity and personalization (Fichman et al. 2014; Yoo et al. 2012) which surely offers additional benefits to the end customers but in the end also induces increasing levels of complexity (Nambisan et al. 2017). Moreover, digital products and services make increasing amounts of customer data available and accessible (Yoo et al. 2012) which allows the emergence of data-driven innovations (Akter and Wamba 2016; Dinter and Krämer 2018; Willing et al. 2017). However, organizations also have to consider data transparency issues both in their market offerings as well as with regard to privacy and data security sentiments (Spiekermann et al. 2015). Another essential characteristic of digital product and service innovations is that they typically trigger follow-up innovations (Fichman et al. 2014) – either in the form of complementary services (e.g., mobile application stores add to the value of smartphones) or in the form of complementary products (e.g., smart home applications such as Amazon's Echo trigger the development of compatible household appliances). What is more, digital platforms and electronic markets play an important role in the context of digital product and service innovations (Ciriello et al. 2018; Yoo et al. 2012). For instance, media companies can resort to content platforms to produce, promote, or distribute content (Alt 2018; Karimi and Walter 2015; Koch and Bierbamer 2016). Finally, the advent of digital technologies has led to an increasing convergence of products and services. For instance, smartphones reach their end-users with many pre-installed applications. Consequently, firms have to rethink their bundling strategies and offer specific digital product and service bundles (Nylén and Holmström 2015).

Digital process innovations

Besides the emergence of digital products and services, the advent of digital technologies has significantly changed organizational functioning. Accordingly, the second category of digital innovations – digital process innovations – captures the innovative use of digital technologies to enhance existing or create new business processes (Fichman et al. 2014; Nambisan et al. 2017).

In general, organizations pursue digital process innovations to optimize their operational and administrative processes. Digital business processes allow for improved service quality (e.g., by offering digital communication channels) and extended production possibilities (e.g., 3D printing) at reduced operative or administrative costs. Against this backdrop, organizations can use digital technologies for the automation of their business processes (Venkatraman 1994). The financial services industry, for instance, has started to use robotic process automation (RPA) technologies to automate contract management or claim management processes. Furthermore, digital technologies can be used to implement chat bots for marketing and sales or customer service purposes (e.g., the booking of flights via the Facebook messenger) as well as paperless contract management systems or digital inter- and intra-organizational collaboration tools (Alt and Zimmermann 2018; Nambisan et al. 2017). Additionally, digital business processes are a basic requirement for the delivery of digital services. For instance, media companies need to provide Internet-based contract management and payment processes if they want to offer music or video streaming services.

Digital business model innovations

Lastly, on a more fundamental level, organizations need to recognize the opportunities offered from digital technologies to adapt and extend their business model portfolios (i.e., finding new (additional) ways to create and appropriate value based on digital technologies). In general, digital technologies have the potential to substantially disrupt existing revenue and business models – as we have seen with the media industry, for instance (Hess and Constantiou 2018). Against this backdrop, organizations need to look for novel combinations of digital products or services, new ways of production, and novel forms of digital revenue creation or business models (Hess et al. 2016).

Existing research has argued that digital business model innovations can refer to the transformation of either certain elements or the entire business model based on digital technologies (Veit et al. 2014). The former case is usually driven by the emergence of new sales channels and revenue models. Organizations can use digital technologies to establish new forms of digital (typically online-based) sales channels and revenue models. For instance, content platforms can monetize their online content based on freemium models (e.g., Spotify) (Wagner et al. 2014). Typically, digital sales channels and revenue models demand that firms adapt their existing business models around these new channels and models. For instance, car rental companies (e.g., Sixt) or (direct) insurance provides (e.g., HUK24) now offer their services on online platforms and car sharing providers (e.g., BWM's and Daimler's Share Now) use digital technologies to charge their customers based on actual usage. While in both cases the core business model – individual mobility and risk insurance, respectively – remains the same, the underlying sales channels and revenue models, and subsequently also the facilitating business processes, differ from the pre-digital business approaches.

Besides digital sales channels or revenue models, organizations can also leverage digital technologies to extend ex ante analogue business models into the digital domain, as we have seen with the establishment of eCommerce platforms or digital media services (Berger 2018; Hess et al. 2016), or to initiate entirely new, purely digital business models. This manifests, for example, in the emergence of platform-based business models such as electronic market platforms (e.g., ebay), electronic mobility platforms (e.g., UBER), or online video-on-demand platforms (e.g. YouTube) (Koch and Bierbamer 2016; Lyytinen et al. 2016; Willing et al. 2017). Typically, such digital business models go hand in hand with digital revenue models (Berger 2018) and follow the general principles of electronic markets and platform businesses (Gawer and Cusumano 2014).

Research stream 3: enablers of digital innovations

Digital innovations induce significant changes in an organization's products and services, business processes, or business models. This so-called digital transformation can only manifest if organizations are adequately prepared. Accordingly, a third group of studies focuses on the enablers of digital innovations. This research stream investigates, inter alia, the contribution of organizational capabilities (Alt and Zimmermann 2014; Levallet and Chan 2018; Nwankpa and Datta 2017; Stoeckli et al. 2018) and the relevance of digital resources (Nambisan 2013; Nwankpa and Datta 2017; Wiesböck 2019; Yoo et al. 2010) such as digital infrastructures (Bañares and Altmann 2018; Blaschke et al. 2016; Henfridsson and Bygstad 2013) or digital platforms and ecosystems (Karimi and Walter 2015; Lyytinen et al. 2016; Parker et al. 2017) as a basis for digital innovations.

The realization of four enablers on the organizational level seems to be of particular importance (Hess and Barthel 2017). The (re)combination of digital technologies leads to the development of digital solutions and, subsequently, triggers the development of digital business concepts (Fig. 1). For a digital innovation to manifest and create value, such digital solutions and digital business concepts need to be embedded into an organization. This embedding relates to the integration of digital solutions and digital business concepts into both existing IT structures (Bygstad 2017; Hansen and Sia 2015; Tilson et al. 2010) and existing organizational structures (Hess et al. 2016). The former is generally represented through an organization's IT application portfolio, the latter typically involves three essential elements: organizational culture (Hartl and Hess 2017), organizational structures (Matt et al. 2015), and organizational capabilities (Grant 1996). Figure 3 illustrates these four enablers of digital innovations.

Enabling organizational IT application portfolios

To begin with, organizations have to prepare their IS landscapes in order to accommodate digital innovations. Both an organization's IT application portfolio, its IT systems, and its general IS infrastructure need to be able to accommodate the changes triggered by digital technologies. Generally, digital technologies induce IS infrastructures (oftentimes also referred to as "digital infrastructures") that allow the efficient replication of data and processes without a centralized database or application logic and, thus, pave the way for generative innovation (Bygstad 2017) or decentralized blockchain-based electronic marketplaces (Alt 2018; Subramanian 2018). Accordingly, organizations need to establish IS infrastructures that offer adequate levels of centralization and flexibility and provide the necessary interfaces.

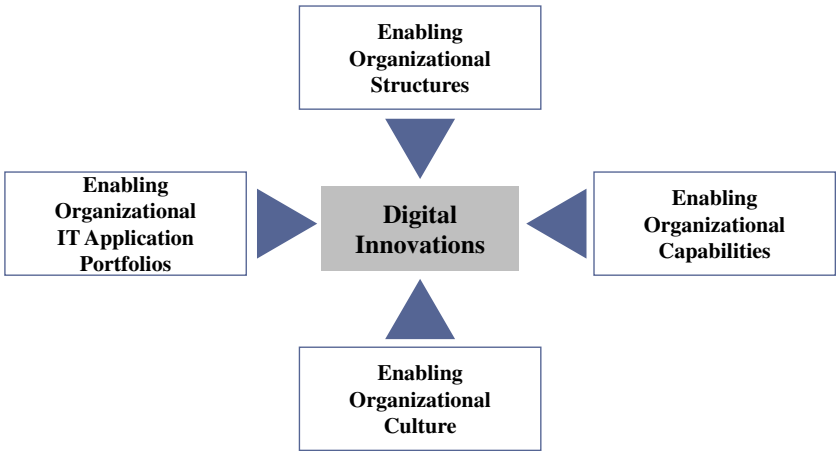

Fig. 3 Enablers of digital innovations (Based on Hess and Barthel 2017)

Enabling organizational structures

Secondly, organizations need to establish organizational structures that enable digital innovations. For one thing, the commercialization of digital products and services, and likewise the execution of digital business models, demands intensive market coordination because digital markets are usually subject to heavy interdependencies (two-sided markets) and turbulent market environments (Lyytinen et al. 2016). One important approach that allows organizations to deal with such turbulent markets is the concept of organizational agility (Tallon and Pinsonneault 2011). In the context of digital technologies, agility allows organizations to mitigate rigidities, to develop and leverage the necessary technological and innovation capabilities, and to balance the tension of organizational ambidexterity (Chan et al. 2018; Ravichandran 2018). Without sufficient levels of agility, organizations will not be able to adequately exploit the benefits offered from digital technologies.

For another thing, the integration of digital technologies into organizational structures can lead to "a shift from decentralized resources and activities towards more networked and centralized platforms" (Alt and Zimmermann 2018, p. 1). For instance, the media industry profits from shared standards and electronic platforms for collaboration, promotion, or distribution purposes that often go in hand with modularized media content based on semantic web technologies (Hess and Constantiou 2018). At the same time, however, the integration of digital technologies into organizational structures may also induce a move towards decentralization (Alt 2018). So far, electronic markets typically gravitated towards centralization. With the advent of digital technologies such as open data, blockchain, or distributed ledgers technologies, this trend is expected to change. Internal and external innovation platforms offer a promising way to meet these requirements (Koch and Bierbamer 2016). Organizations need to be able to realize and operate such platforms and embed them into their existing structures and innovation processes – or at least be able to manage the interface to external providers that can supply the respective innovation approaches.

Enabling organizational culture

Thirdly, organizations need to adapt their organizational culture in order to accommodate digital innovations (Hartl and Hess 2017). An organization's culture determines how employees accept the many changes induced by digital technologies on organizational functioning in general and how innovation project teams pursue the development of digital innovations in particular. Furthermore, culture is responsible for an organization's general attitude towards digital technologies, its risk seeking (or risk adverse) behavior towards new business opportunities, or how it values innovative ideas from the in- and outside. Apart from this, the advancing democratization of digital innovation processes induces innovation environments in which project teams typically represent dynamic, oftentimes random combinations of actors with various different goals and motives that do not necessarily align with an organization's actual interests (Nambisan et al. 2017).

Enabling organizational capabilities

Finally, organizations need to develop the necessary organizational capabilities to realize and embed digital innovations (Li et al. 2018; Stoeckli et al. 2018; Wiesböck 2018). Initially, organizations need sufficient levels of IT capabilities that allow them to handle digital technologies as the basis for digital innovations (Nwankpa and Datta 2017). In addition, organizations need dedicated digital capabilities (Li et al. 2018; Wiesböck 2018). Such digital capabilities allow organizations to use digital resources for innovation purposes (Chan et al. 2018; Lyytinen et al. 2016; Nwankpa and Datta 2017; Wiesböck 2019). To develop these capabilities, organizations can resort to different means. They can either try to build up the necessary capabilities organically (e.g., through trainings,

job rotations or webinars) or acquire them inorganically (e.g., through M&A activities or outsourcing).

Research stream 4: governance of digital innovations

A fourth research stream concerns the governance of digital innovations. Past research in this area has investigated the design and setup of organizational governance structures (Alt 2018; Hess and Constantiou 2018; Nambisan et al. 2017) or the development and implementation of IT and digital transformation strategies (Bharadwaj et al. 2013; Chanias et al. 2019; Matt et al. 2015; Yeow et al. 2017). Additionally, this stream also investigates how organizations can manage the diffusion trajectory and adoption of digital innovations (Pousttchi and Dehnert 2018; Repschlaeger et al. 2013) or how organizations should effectively and efficiently govern digital innovation projects (Hess and Barthel 2017).

In order to "make ready" for digital innovations, organizations need to cultivate a dedicated digital transformation governance (DTG) approach that allows them to realize and deploy the four enablers illustrated in the previous section (Fig. 3) and, thus, aids them in the successful development and implementation of digital innovations and in their embedding in organizations. Organizations can design their DTG and, thus, approach the governance of digital innovations, either in the form of dedicated structures (e.g., management roles or digital business units), dedicated processes (e.g., for formulating a digital transformation strategy or the execution of digital transformation projects), or dedicated relational mechanisms (Bharadwaj et al. 2013; Chanias et al. 2019; Hess et al. 2016; Jewer and McKay 2012; Van Grembergen and De Haes 2009). Figure 4 illustrates these three perspectives on an organization's governance of digital innovations.

Digital transformation governance structures

DTG structures describe how organizations can adjust their organizational structures according to their digital transformation efforts and, thus, prepare their organizations for digital innovations. Generally, they can be designed in three different ways. A first approach is to allocate the tasks relating to an organization's digital transformation efforts to its IT department. Organizations that follow this approach typically make the Chief Information Officer (CIO) responsible for their digital transformation. Traditionally, the IT department presents the locus of IT-based innovation activities and has always been the center of IT-related decision rights. This IT internal solution has the advantage that it does not demand far-reaching structural changes and is especially reasonable if the focus is more on an organizational level and less on product and service or business model innovations (Hess et al. 2016). However, IT departments oftentimes lack the necessary customer or market orientation.

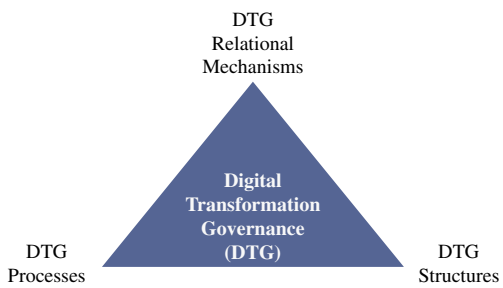

Fig. 4 Perspectives on the governance of digital innovations

A second approach is to establish deliberate executive departments and assign them with the task to coordinate an organization's digital transformation. As the head of such executive departments firms usually appoint a Head of Digital Transformation or even decide to establish a new C-Level position: the Chief Digital Officer (CDO) (Singh and Hess 2017). First studies on this new management position have shown that the successful implementation of a CDO strongly depends on the support of other C-Level managers, in particular the CEO. Moreover, the coordination between CDO and CIO needs to be arranged efficiently and bordering responsibilities and authorities need to be clearly defined. This second approach depicts a very comprehensive, company-spanning approach and, thus, meets the requirement that digital transformation affects many different parts of organizations, often at the same time (Matt et al. 2015). Nevertheless, such executive departments are not endowed with individual budget or profit and loss (P&L) responsibilities related to their digital transformation activities.

A third approach is to strictly separate an organization's digital business activities from the core business and establish a dedicated digital business unit (DBU). Typically, a Head of Digital Business is in charge of such DBUs and endowed with the necessary budget and P&L responsibility to run the DBU. This approach is usually sensible if firms can offer digital products and services, leverage digital business processes or, more comprehensively, run digital business models distinctly from their core business. One large advantage of this approach is that DBUs are typically responsible for their own P&L and operate close to the market. Yet, due to their isolated nature DBUs oftentimes face the challenge that they may fail to assume a company-spanning view on digital transformation. In practice, we can also observe combinations of the three approaches depicted above. The travel and tourism company TUI Group has given its digital activities into the care of a CDO who is at the same time the Head of the IT (i.e., a combination of the first and second approach). And with the appointment of a Head of Digital Business who also holds the office of the CDO, the home appliances manufacturer BSH Group follows a combination of the second and third approach.

Digital transformation governance processes

With regard to dedicated DTG processes, organizations need to develop and implement a company-spanning digital transformation strategy that defines all tasks and activities related to an organization's overall digital transformation and that, thus, also covers its digital innovation initiatives (Bharadwaj et al. 2013; Chanias 2017; Matt et al. 2015). Digital transformation strategies enable organizations to coordinate and prioritize their digital innovation efforts across different organizational functions. However, it is crucial for organizations to align their digital transformation strategies with other organizational or functional strategies such as IT or general business strategies (Bharadwaj et al. 2013; Hess et al. 2016). Besides, the development and realization of digital transformation strategies depends strongly on the interplay of an organization's centralized (i.e., management driven top-down) and decentralized (i.e., emerging bottom-up) digital transformation activities (Chanias 2017; Chanias et al. 2019; Yeow et al. 2017).

In general, a digital transformation strategy has three dimensions (Matt et al. 2015). Firstly, it describes the necessary changes in an organization's value creation and governance structures that result from the use of digital technologies and the resulting digital innovations. Secondly, it defines the rules for an organization's attitude towards and use of digital technologies. Thirdly, it reflects an organization's financial background. In practice, we have seen different manifestations of digital transformation strategies in the media industry, for instance, where media companies have implemented different forms of digital transformation strategies depending on their specific business models and subindustry backgrounds (Hess et al. 2016).

Digital transformation governance relational mechanisms

Relational mechanisms complement an organization's DTG structures and processes. Relational mechanisms come into play whenever the realization and implementation of formal governance structures demands internal or external social interaction and relationships between actors (Luo et al. 2016). Relational mechanisms act as a connecting piece that facilitates active participation and information exchange among the different internal and external parties involved in innovation activities that demand the alignment of IT and business departments – which is the case in the context of digital innovations (Cao et al. 2013; Jewer and McKay 2012). This makes them an important element of an organization's DTG (Chanias 2017). In the end, it is relational mechanisms that de facto allow organizations to organize their internal and external digital innovation efforts.

In the context of an organization's digital innovation initiatives, relational mechanisms can manifest in new forms of intrafirm or cross-unit collaboration (Bala et al. 2017; Chanias 2017; Islam et al. 2017; Saldanha et al. 2017), business and IT co-location and cross-functional trainings (Jewer and McKay 2012; Van Grembergen and De Haes 2009), new forms of digital leadership (Bennis 2013; Hansen et al. 2011), or new forms of customer involvement (Hadaya and Cassivi 2009; Koch and Bierbamer 2016). Past research has shown the importance of relational mechanisms in the context of the tasks and activities related to digital innovation such as outsourcing to specialized service providers or the alignment of IT and business departments (Cao et al. 2013; Luo et al. 2016; Oshri et al. 2015). In practice, the establishment of specialized digital innovation boutiques offers proof for the former. Especially large-sized organizations with innovation-hindering legacy IT systems oftentimes transfer single phases (for instance, the identification of promising innovative digital technologies or the technological product development) or the entire wingspan of their digital innovation development process to such specialized digital innovation boutiques.

Conclusion

With this article we structured the existing research streams on digital innovations as a basis for future research in this area. First, building up on already existing conceptualizations, we introduced a technology-push-pull model of digital innovations (Fig. 1) and distinguished the three different categories of digital innovations (Fig. 2). Subsequently, we argued how organizations can prepare their organizations for digital innovations through the realization of four specific enablers (Fig. 3). Finally, we elaborated on the important role of a dedicated DTG that allows organizations to govern the embedding of digital innovations into their organizations (Fig. 4).

In our views, the four research streams are strongly interrelated and, thus, can be combined into a "linking" framework. The development of digital innovations (research stream 1) manifests in the implementation of three different categories of digital innovations (research stream 2). These categories can only be realized under the presence of the respective organizational and IS-based enablers for digital innovations (research stream 3). Both the realization and the deployment of the enablers of digital innovation requires a dedicated governance approach (research stream 4).

Figure 5 shows this integrated view on the four research streams in the form of a "linking" framework. Based on the framework the embedding of digital innovations into organizations manifests along three concentric rings: the technology-driven development and implementation of digital innovations at the core, the enablers of digital innovations in a second ring, and the governance of digital innovations in a third ring.

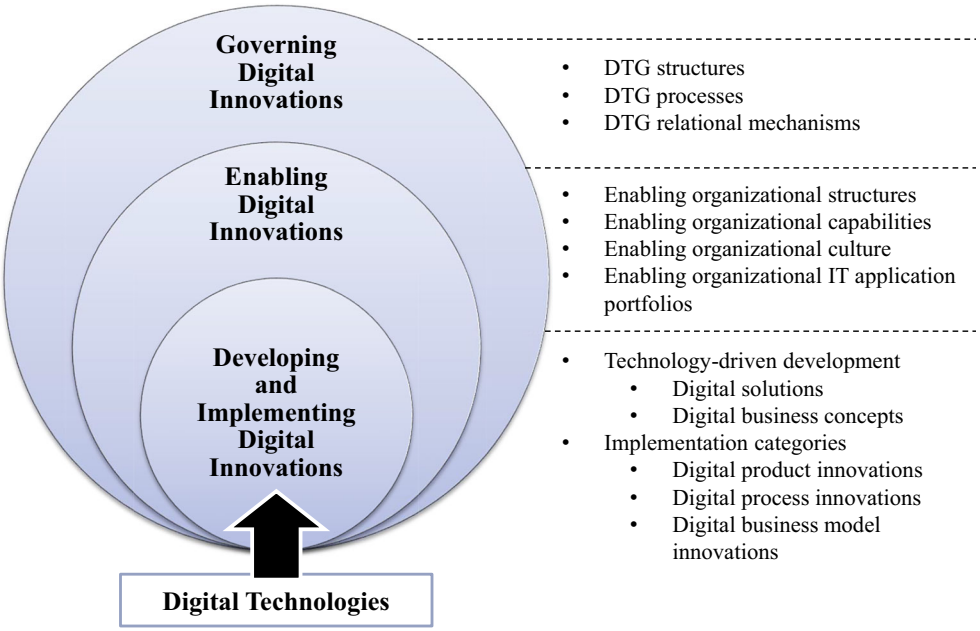

Fig. 5 The three-ring framework of embedding digital innovations in organizations

Our proposed framework (Fig. 5) can also be used to structure future research in this area. Our review of the existing literature on digital innovations showed that while there already exists a large body of knowledge on the development and the different implementation categories of digital innovations (ring 1), the four enablers of digital innovations (ring 2) and the governance of digital innovations (ring 3) present rather young academic research fields. Thus, owing to the different development stages of the individual research streams, we suggest the following future research agenda.

The innermost-ring of our framework (Fig. 5) on the conceptual development and implementation categories of digital innovations presents a first avenue for future research. However, the prevailing literature already offers a rather comprehensive picture in this area. In our view, the existing conceptualizations (research stream 1) sufficiently explain and address the idiosyncrasies of digital innovations detached from different technology-subclasses or innovation categories. Therefore, this stream is especially well-suited for future empirical studies that validate the prevailing theoretical and anecdotal evidence. Moreover, we acknowledge the relevance of the technological foundations of digital innovations as means to create value on electronic markets and digital platforms and, thus, encourage future research on the role and significance of digital platforms for digital innovations. Furthermore, existing research on the different implementation categories of digital innovations (research stream 2) also seems rather well-developed. Nevertheless, the ongoing technological progress in combination with the increasing penetration of digital technologies and changing consumer demands and production possibilities triggers new manifestations in each category. Today, we see the influence of newly emerging digital technologies on all categories of digital innovations. For instance, artificial intelligence technologies induce digital product and service innovations in the automotive industry (e.g., driverless cars) or digital process innovations in the insurance industry (e.g., automated claim processing). Likewise, we expect an increase in the interdependencies between the different categories. For the future, we believe this trend to continue and, thus, encourage future research on the influence of emerging digital technologies on the different implementation categories of digital innovations.

The second ring of our framework (Fig. 5) offers a second avenue for future research. Research on the enablers of digital innovations (research stream 3) represents a rather young academic field. The prevailing findings and solutions regarding the embedding of digital solutions and digital business concepts into their organizational IT application portfolios and organizational structures, respectively, mirror the early stage of this research stream. The same holds true for research on digital capabilities and digital culture. Accordingly, we encourage future research to further investigate the four enablers of digital innovations. Among other things, both theory and practice would benefit from additional insights on the embedding of digital infrastructures into existing IS landscapes or on the optimal integration of novel and existing organizational structures in the context of digital innovations. Moreover, the questions which digital capabilities enable firms to successfully pursue digital innovations and how organizations can build up these digital capabilities are still unanswered. Finally, future research in this area could contribute to theory and practice by creating insights on digital change and digital culture.

Finally, future research on the governance of digital innovations (research stream 4) offers a third promising avenue for future research. First, while we already know a lot regarding DTG processes such as the formulation and implementation of digital transformation strategies or the execution of digital transformation projects in general, we still lack understanding which DTG processes are best suited in which situations and how organizations can successfully manage DTG processes. Second, regarding DTG structures we expect a further differentiation of the discussions on digital management roles (e.g., the CDO) and digital business units. Among other things, the question of when to apply which management configuration will be of interest. Third, past research on DTG relational mechanisms has mainly dealt with the conceptualization of relational mechanisms such as IT-business alignment, collaboration, or the involvement of external parties in the innovation process. Future research could contribute in this area with empirical evidence on the application of different relational mechanisms in various settings and with theorizing on the interplay of existing relational mechanisms as well as the design of novel relational mechanisms that facilitate digital innovations (such as digital leadership or inverse transparency).

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