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Employee-driven digital innovation: A systematic review and a research agenda

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ABSTRACT

As the digital shift in society affects both private and public organizations, the role of digital innovation is critical if digital transformations are to succeed. Research has developed models to explain how digital innovation affects organizations and societies. During the last ten years, employee-driven innovation has emerged as a new approach to explain innovation. Through this systematic literature review, we offer insight into the intersection between employee-driven innovation and digital innovation, and we coin the term *employee-driven digital innovation*. We review 58 studies published at this research intersection since 2010. The findings show a research field of growing interest that is divided into two main streams of research, one focused on the outcomes of employee-driven digital innovation and the other on the use of digital tools to support employee-driven innovation processes. We describe this research area, identify critical research gaps and propose future research directions.

1. Introduction

Digital technology has been critical in reaching business goals, and its pervasive effects have have enabled the transformation of entire industries (Nylen and Holmström, 2015) leading to innovative products, services, processes and business models. Innovation is both a buzzword and a multidimensional concept that can be viewed from different perspectives and disciplines (Høyrup, 2010). Innovation is a vibrant field of research with constantly new contributions, such as user-led innovation (von Hippel, 1988), open innovation (Bogers et al., 2017), digital innovation (Yoo et al., 2010) and employee-driven innovation (Høyrup, 2010).

Traditionally, work tasks related to innovation have been organized through R&D departments or dedicated units consisting of senior managers or experts within an organization (Haapasaari et al., 2018), which indicates a strategic centralization of innovation by management. In opposition to this, von Hippel (1988) and Høyrup (2010) point to user- and technology-driven innovation as alternative starting points for innovation. User-led innovation, which emphasizes that users can develop what they desire (von Hippel, 2005), is less limited by internal factors in organizations that may hinder innovation. While user-led innovation often is perceived as a pull-strategy to innovation, technology-driven innovation is perceived as a push-strategy with limited user involvement (De Moor et al., 2010). However, the transition from an industrial society to a knowledge society, with a workforce that increases its knowledge base, lays the foundations for organizations to abandon the belief that only experts should be responsible for innovation and development. This movement towards the democratization of the innovation process, from development in closed spaces and laboratories to co-creation and open collaboration (Laviolette et al., 2016), leads to the emergence of employee-driven innovation.

Different definitions exist for the concept of employee-driven innovation. Ciriello et al. (2016) describe employee-driven innovation as a new form of direct participation in which employees take the initiative to generate, develop, and implement ideas. Kesting and Ulhøi (2010) and Høyrup (2012) use the term "ordinary employees" to describe employees as key contributors to the innovation process. "Ordinary employees" are people in an organization without innovation-specific functions in their job description (Bäckström and Lindberg, 2019), ranging from shop-floor workers and professionals to middle managers, and crossing the boundaries of existing departments and professions (Kesting and Ulhøi, 2010). All employees can therefore contribute to the entire innovation process, from idea generation to implementation (Bäckström and Lindberg, 2019). Located close to users/customers and equipped with specific knowledge of products and services, as well the internal conditions of organizations, "ordinary employees" can

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contribute to innovation in both private and public organizations. In contrast to user-led innovation (von Hippel, 1988), the "ordinary employee" is at the centre of innovation and can influence innovations through knowledge of both the organization and users. This provides fertile ground not only for product and service innovation, but also for process and business model innovation.

Employee-driven innovation refers not only to the initiation of innovation by employees but also to locating them as key actors in development and implementation. To think that this happens by itself is in many contexts naïve. Organizations must facilitate this type of innovation, for instance through autonomy and management support (Bäckström and Bengtsson, 2019). According to O'Reilly and Tushman (2013), organizations are continuously affected by demands in their business environment, and their adaptability to these changes are referred to as ambidexterity. This points to a duality that organizations experience: they must focus on keeping the "wheels turning" while also searching for innovative solutions. In many organizations, "ordinary employees" are left to make sure the "wheels are turning", which implies less structural ambidexterity (O'Reilly and Tushman, 2013) for organizing innovation activities. In such cases, the exploration and exploitation (March, 1991) related to innovation is left to the "ordinary employees" themselves and can better be described as contextual ambidexterity (Gibson and Birkinshaw, 2004).

Employee-driven innovation embraces the principle that all "ordinary employees" possess the ability to be innovative (Kesting and Ulhøi, 2010) but that it is the organization's responsibility to recognise and give them the opportunity to do so (Haapasaari et al., 2018; Laviolette et al., 2016). Existing literature reviews have examined employee-driven innovation, highlighting management support, autonomy, collaboration and organizational norms of exploration as antecedents of employee-driven innovation (Smith et al., 2012; Bäckström and Bengtsson, 2019). We go beyond previous studies that have examined the anteceedents of employee-driven innovation by incorporating the digital focus into this innovation approach. Bäckström and Bengtsson (2019) conclude in their systematic mapping that employee innovation is a research area that spreads across multiple academic fields. "Ordinary employees" can contribute to the development of digital products, services, processes or business models, leading to *employee-driven digital innovations*. We define employee-driven digital innovation as the initiation, development and implementation of new digital products, services or processes originating from "ordinary employees", or the use of digital tools to support employee-driven innovation processes.

Organisations have been working to adapt to digital trends, especially during major crises such as the recent pandemic, by closing the digital skills gap and preparing for future success (Cheng et al., 2021). As digital innovation is gaining interest in academia, the emergence of digital solutions has also led to an increasing number of people questioning the explanatory power and utility of existing innovation theories (Holmstrøm, 2018; Yoo et al., 2012). Existing work on digital innovation highlights that as the digital world expands and more products and services become embedded with IT, digital innovation concepts and issues will become of considerable interest not only to information system scholars, but also to innovation scholars (Nambisan, 2013).

According to Kohli and Melville (2019), digital innovation as a research area is still not fully developed and consists of unexplored elements, which suggests that digital innovation does not yet have an independent body of literature. We aim to add to the theoretical knowledge and understanding of both these innovation concepts by studying them in combination, rather than in isolation. Building on knowledge from previous reviews in the area (Opland et al., 2020) that were based on publications from 2010 onwards, we aim to pave the way for a more thorough review based on larger data collection and to describe both the research area and interesting future research paths. Particularly in the last decade, organizations, industries and societies have been coordinating for successful digital transformations (Pappas et al., 2018; Vial, 2019). Such changes can be achieved through the implementation of digital innovation (Svahn et al., 2017), when both leadership and employees explore, experiment with and employ new technologies and new processes (Herbert, 2017). We argue that deeper insight into the intersection between employee-driven innovation and digital innovation can spur on new contributions that will complement the research area and create interest among practitioners. To this end, we focus solely on employee-driven digital innovation and propose the following research questions (RQs):

RQ1: How has the research field of employee-driven digital innovation developed since 2010?

RQ2: What characterizes current research on employee-driven digital innovation?

RQ3: What are the future derived research paths within employee-driven digital innovation where research could make the largest contributions?

To address these RQs, we performed a systematic literature review in the area and found that employee-driven digital innovation is a fragmented research area that has not merged its parallel research traditions, and that more research is needed in several aspects of the concept. Our systematic literature review contributes by showing that research in the area is still limited, and our findings reveal the need to view employee-driven digital innovation from different perspectives. The main theoretical contribution of this paper is the theoretical framework of employee driven digital innovation, which can be used as a starting point for further exploration within the research area. To develop our framework, we build on existing works within digital innovation (Kohli and Melville, 2019) and intrapreneurship (Desouza, 2011), offering the framework as a guide both for researchers and practitioners engaging in employee-driven digital innovation. The novelty of this framework stems from the fact that we combine the generic innovation phases of intrapreneurship with the characteristics of digital innovation. In addition, the paper identifies four research gaps in the literature and proposes a research agenda that will help advance both research and practice in the area of employee-driven digital innovation.

The paper is organized in the following sections. Firstly, we present a theoretical framework. Secondly, we explain our research method and our search procedure. Thirdly, we present our results, and fourthly, in the discussion we provide an analysis of the research area. Finally, we present our agenda for future research on employee-driven digital innovation, explain the limitations of our work and provide concluding remarks.

2. Background and related work

2.1. Digital innovation

Digital innovation can lead to new market offerings, business processes or models that result from the use of digital technology. Digital innovation has been examined either as a process (Yoo et al., 2010) or as an outcome (Fichman et al., 2014). Here, we argue that it should be examined as both a process and an outcome when it comes to combining digital technologies in new ways or with physical components that enable socio-technical changes and create new value for adopters (Osmundsen et al., 2018). Through digitalization, the dependencies between the innovation process and the outcome of innovation are more complex and dynamic, challenging some of the well-known prerequisites for innovation (Nambisan et al., 2017), which have primarily viewed innovation processes and outcomes as distinct phenomena. Furthermore, the rise of employee-driven innovation challenges existing assumptions, such as the assumption that the nature of the innovation agency is centralized, arguing instead that actors/entities can organize for innovation (Nambisan et al., 2017). Digital innovation as a concept needs to be further developed in both the academic environment and public debate (Holmstrøm, 2018), as the emergence of new digital products and services makes it more difficult to distinguish the process of innovation from its outcomes.

The literature on digital innovation is diverse and diffused: studies

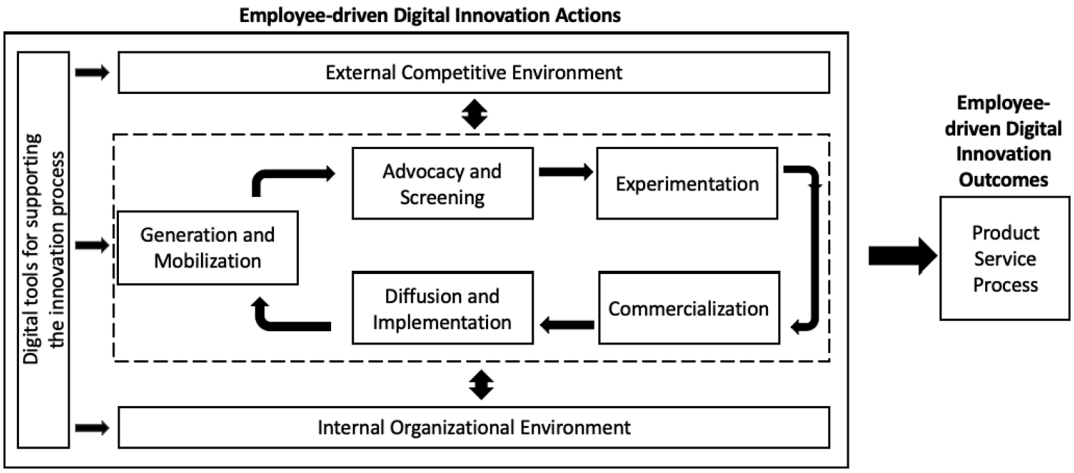

Fig. 1. Theoretical framework of employee-driven digital innovation.

are related to other domains, as well as those within their own identified cluster (Kohli and Melville, 2019). Digital innovation is inevitable for organisations as they need to incorporate digital technologies into the very core of their products, services and work processes (Yoo et al., 2012). Furthermore, Yoo et al. (2010) describe how digital products, services and processes are based on the specific characteristics of digital information: that it can be easily stored, changed, transmitted and tracked; that it is editable through programming; and that digital technology is self-referencing. The special characteristics of digital innovation mean that "ordinary employees" can also contribute to the innovation processes, in that digital products and services can be more easily influenced than physical products. Building on existing definitions of digital innovation (Fichman et al., 2014; Nambisan et al., 2017; Yoo et al., 2010), our definition of employee-driven digital innovation is twofold, including: 1) the development by "ordinary employees" of new digital products, services or processes that are outcomes-driven; and 2) digital tools used to support "ordinary employees" in the innovation process. With this perspective, we claim that both the processes and outcomes of employee-driven digital innovation are distinct from the traditional theory of innovation. This is supported by Oldham and Da Silva (2015), who claim that computing devices and tools can boost employee engagement at work.

Kohli and Melville (2019) propose a theoretical framework of digital innovation that focuses on both the actions and the outcomes of digital innovation. Their model focuses on seven constructs: initiate; develop; implement; exploit; the internal organizational environment; the external competitive environment; and digital innovation outcomes. "Initiate" refers to the organizational capability to identify, assimilate and apply valuable knowledge from inside and outside the organization toward opportunities for digital innovation. "Develop" refers to the design and development of new digital artifacts while "implement" refers to the implementation of those artifacts. "Exploit" refers to the use of the digital artifacts to maximize value. Others have used Kohli and Melville's model as a starting point for understanding digital innovations (Wiesböck and Hess, 2018) and digital transformation projects (Barthel and Hess, 2019).

Kohli and Melville's (2019) phases of "development" and "implementation" can also be related to the discussion of digital materiality (Kallinikos et al., 2013), i.e. the extent to which the same properties can be attributed to digital artifacts as to physical materials. According to Kallinikos et al. (2013), digital artifacts are increasingly editable, interactive, reprogrammable and distributable, which corresponds to the charachterisitcs of the "development" phase in Kohli and Melville (2019). Both the outcomes of digital innovation and the tools for supporting these processes can be described as digital artifacts. Reibenspiess et al. (2019) highlight that idea generation on digital platforms founded on knowledge from external sources has received significant attention, and Ciriello et al. (2014) observe that collaboration and interaction with relevant stakeholders can be enabled through these digital artifacts.

Around these four constructs are two others that mutually influence them. "Internal organizational environment" refers to the organizational backdrop, including business strategies, cultures and knowledge management, while "external competitive environment" refers to the competitive marketplace within which firms are embedded. These constructs comprise the digital innovation actions in the framework of Kohli and Melville (2019), who describe the last construct, "digital innovation outcomes", as referring to projected or actual new business processes, products and services that result from digital innovation.

2.2. *Employee-driven innovation*

Innovation, a multidimensional concept that has been approached from several perspectives (Haapasaari et al., 2018), refers to the successful application of new ideas that can take shape as both an outcome and a process (Whittington, 2018). Innovation is not in itself invention, but rather an idea that leads to something new and provides a financial gain or benefit (Baregheh et al., 2009). Innovation is typically driven by new market and technological opportunities, both digital and physical (Yoo et al., 2012). Interest in inclusive forms of innovation is currently growing among researchers and practitioners as they seek new and improved solutions to complex organisational and societal challenges (Bäckström and Lindberg, 2018). This has led to research focused on the sometimes fluid boundaries between an organization and its stakeholders, as described, for instance, in open innovation (Bogers et al., 2017; Chesbrough, 2003).

However, not all research has focused on this boundary or on what is happening outside the organization. Research in the last decade has also focused on the organization itself, and especially on the role of "ordinary employees" (Høyrup, 2010; Aasen et al., 2012; Voxted, 2018). Employee-driven innovation studies concentrate on the ways in which organizations can foster innovative practices among "ordinary employees", those who do not have innovation as a defined part of their job description in the way that employees in R&D units or senior experts do (Høyrup, 2010; Kesting and Ulhøi, 2010). The aim is to tap into the creativity and experience of employees in the development of novel products, services, processes and business models. Previous studies identify employees as being key actors in the development and implementation of innovations, and not only in the generation of ideas (Høyrup, 2012; Smith et al., 2012). Indeed, recent research shows that we are moving away from closed R&D units as the only source of innovation, providing new viewpoints that can build better explanatory models adjusted to today's businesses and ecosystems (Bogers et al.,

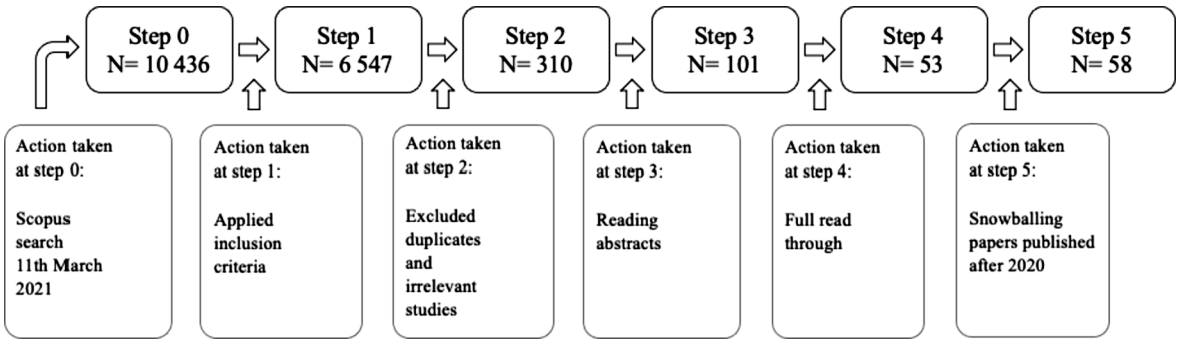

Fig. 2. Review process.

2017). The driving force for using employees as innovators results from their inherent creativity (Lee et al., 2018) and the desire for learning and development (Alasoini, 2013).

Employee-driven innovation, an umbrella concept that covers a broad range of innovation processes and issues, refers to both process and product (Høyrup, 2012). This concept is not detached from the organization's products, services, processes and context; thus, it is the strategic task of management to ensure that innovations are aligned with the goals and strategic choices set by their organization (Kesting and Ulhøi, 2010). Employee-driven innovation is closely related to intrapreneurship as well (Desouza, 2011), although this concept also includes leader-initiated innovation that is carried out by individuals within the organizations who are dedicated to research and development. Høyrup (2012) refines the strategic approach to employee-driven innovation into three levels based on whether the processes are top-down, mixed or bottom-up. The first-order strategic approach refers to bottom-up initiated innovation processes by "ordinary employees"; the second-order strategic approach refers to mixed bottom-up and top-down initiated processes; and the third-order strategic approach refers to top-down initiated innovation processes by management. According to Høyrup (2012), whether one includes the third-order strategic approach to employee-driven innovation depends on whether one uses a broad or narrow definition of the phenomenon.

2.3. Employee-driven digital innovation

We claim in this paper that there is reason to explore the above-mentioned concepts of digital innovation and employee-driven innovation in relation to each other; therefore, we propose the concept of *employee-driven digital innovation*. Based on the previous work on employee-driven innovation by Høyrup (2010) and Kesting and Ulhøi (2010), on intrapreneurship by Desouza (2011) and on digital innovation by Kohli and Melville (2019), we propose a theoretical framework (Fig. 1) for conceptually grounding employee-driven digital innovation. Our intention is to focus on the innovations that emerge through "ordinary employees" exploring the opportunities provided within their organizations. We have therefore used the phases from the process perspective of intrapreneurship, combining this with theories from employee-driven innovation and digital innovation. Our theoretical framework is centered around the phases described in the intrapreneurial model proposed by Desouza (2011). These phases are affected by both the internal and external factors of the digital innovation actions described in the digital innovation framework of Kohli and Melville (2019). By integrating Desouzás (2011) intrapreneurial phases into Kohli and Melvillés (2019) model, which explains research streams within digital innovation, we have created a framework that explains the different phases that "ordinary employees" experience in the employee-driven digital innovation process and the inherent dynamics within this process. We claim that the use of Desouza's (2011) intrapreneurship framework explains the employee-driven digital innovation process in a more specific way than the initial phases of Kohli and Melville (2019).

Our proposed framework also incorporates an explanatory factor which affects the innovation process that is examined neither by Desouza (2011) nor by Kohli and Melville (2019). This is the development and use of digital tools to drive and support employee-driven digital innovation actions. The development and use of digital tools is included in many publications about employee-driven digital innovation, especially within information systems, such as research on ideation systems (Beretta, 2018). One of the most notable effects of digital tools is increased efficiency in the innovation process, although these tools can also help to solve some of the challenges identified in the intrapreneurial innovation process. The goal of our theoretical framework is to offer a better understanding of employee-driven digital innovation and to support research in the area by explaining how to avoid treating employee-driven digital innovation processes as a black box. The framework can therefore serve to explain both employee-driven digital innovation actions and the outcomes of those actions.

The different phases of the model are described as follows. "*Generation and Mobilization*" relates to the initiation phase, where ideas are generated. "*Advocacy and Screening*" describes the selection of ideas to take forward and explore. "*Experimentation*" describes the process of identifying technology and developing a solution. "*Commercialization*" describes the development of a solution to the identified problem or idea. "*Diffusion and Implementation*" describes the dissemination and use of the developed employee-driven digital innovation outcome, based on the original employee-originated idea. "*Digital tools*" can support the process, but are not mandatory for the process of employee-driven digital innovation. These phases are also affected by both internal and external factors in the business environment, where the external can be explained by organizational ambidexterity (O'Reilly and Tushman, 2013).

To exemplify the explanatory factors in our framework, we describe a specific case of how it can be used by a public organization that supports employee-driven digital innovation (Opland, Pappas, Engesmo, & Jaccheri, 2021). Here an "ordinary employee" generated an idea about the creation of a digital tool that could both provide better services to citizens and increase efficiency in the organization. Management saw this as a promising idea, so they ran a pre-project to find a suitable form of technology to solve the problem. This was affected by both external and internal environmental factors, the most notable external factor being usable technologies and the most notable internal one being how to adapt to new processes. In the end, a solution was developed and implemented within the organization.

3. Methodology

3.1. Development of review protocol

Our literature review protocol was developed in accordance with recommendations from seminal papers in the field (Webster and Watson, 2002; Kitchenham, 2004; Rowe, 2014) in order to create a

trustworthy, rigorous and auditable methodology. Furthermore, we also took existing related literature reviews as examples, using them to develop our review protocol (Müller et al., 2010; Müller and Ulrich, 2013). Based on their guidelines, we conducted a review with clearly defined steps: development of a review protocol, formulation of a strategy for searching for relevant studies, identification of inclusion and exclusion criteria, extraction of data, assessment of data and synthesis. Fig. 2 presents the review process and the clearly defined steps included in it. The rest of this section will give a detailed description of the specific steps and methods used to search, evaluate, analyze and, not least, create a synthesis based on our data collection.

3.2. Search strategy for relevant studies

With the aim of collecting high-quality data, we used the international online bibliographic database Scopus in March 2021 - referred to as Step 0 in Fig. 2 - to search for possible publications. We searched for journal articles and conference proceedings published between 1 January 2010 and 11 March 2021. In Scopus, we searched within titles, abstracts and keywords using the following four search strings:

1. "Digital AND Employee-Driven AND Innovation"
2. "Employee-Driven AND Innovation"
3. "Employee" AND "Innovation"
4. "Digital" AND "Employee" AND "Innovation"

The search strings were based on a review of the keywords used in publications in the subject area that we had already identified. After the search was finished at Step 0, a control search was conducted through Google Scholar, which did not lead us to include any more studies in the data set. In Step 0, we identified 10,436 possible relevant publications.

3.3. Inclusion and exclusion criteria

In Step 1, the collected data was screened by applying a set of inclusion criteria, which stated that the publications had to be peer-reviewed journal and/or conference articles that were written in English. Applying these inclusion criteria reduced the number of collected data to N = 6,547. In Step 2, we excluded duplicates of journal and conference articles, as well as studies that did not include an abstract. The first author then went through the remaining studies, using the title and publication channel of the publication to determine whether it was relevant to employee-driven digital innovation. The publications that did not clearly indicate whether they were within the scope of the review, either through their title or publication channel, were included in the data collection at least as far as the next step. By applying these exclusion criteria, we further reduced the number of data collected to N = 310.

3.4. Screening the literature

The initial screening of the literature was done by the first author, while the other authors were involved where there were cases of uncertainty. The abstracts of the 310 publications were reviewed for further exclusion in Step 3. An abstract often provides a good understanding of the overall research work in the individual publication, as it includes its theme, objectives, methodological approach and summarized results. When reading the abstracts, we looked specifically for keywords or other indications, such as terms or descriptions, that could indicate connections with employee-driven digital innovation. Reading the 310 abstracts narrowed the collected data to 101 possible publications for inclusion. However, abstracts may not always provide a full insight into the content of the research work. A complete read-through of the remaining 101 publications was therefore conducted to achieve complete understanding. In the complete read-through of the studies, it became clear whether the possible publications were related to employee-driven digital innovation (Step 4). Step 4 reduced the data to 53 relevant publications. To reduce the possibility that relevant publications could have been omitted, we then included Step 5 in our review protocol. In Step 5, we went through the reference lists of all the papers published in or after 2020 (an action described by Boell and Cecez-Kecmanovic (2014) as "citation tracking") to see if we had missed any cited publications. Across these ten publications from 2020 onwards, we discovered five further publications that were then included in the review, making the final number of relevant publications included in this review N = 58.

3.5. Analyzing the literature

The 58 publications were analyzed according to categories derived from theory related to the research area. During the analysis, the data were extracted using a predefined extraction form along the following themes: conceptualization; channel of publication; geographical origin of cases; methodological approach; purpose of publication; organizational origin; phase of the innovation process; strategic approach; level of analysis; scholarly origin; epistemology; time period of study; research design; and contributions or main findings of the research. These themes formed the basis for further analysis with a view toward providing greater insight into the contexts of the literature and developing a synthesis (Duriau et al., 2007). The first author analyzed and coded each paper, and the results were presented to the other authors at weekly meetings for validation and discussion. In case of disagreements, a discussion ensued in order to reach an agreement. These meetings ensured that the analysis of the results in the collected data was both consistent and valid.

The purpose of the analysis, which used the theory-dervied categories, was to identify relationships and discover possible gaps in the literature. Here, we used the software NVIVO to systematize and analyze the collected data. This facilitated the analysis process and enabled us to discover connections among the 58 publications included in this review. This contributed to richer and more detailed findings, as presented in the next section. We use the theoretical framework of digital innovation presented by Kohli and Melville (2019) as a structure for the discussion, further developing their framework as an explanatory model of employee-driven digital innovation.

During the analysis, a quality assessment of the publications was also performed. The first author used a quality scheme to appraise the publications according to various dimensions. This scheme was developed following established recommendations from Dybå and Dingsøyr (2008). Each paper was analyzed in detail with regard to the following aspects: whether the publication was a research paper; the aims of the research; its context; research design; recruitment strategy; data collection; data analysis; relationship between researcher and participants; statement of findings; and value for research or practice. This provided a foundation for assessing the quality of the publications in Step 5. This work was subsequently reviewed by the other authors with the aim of ensuring the quality of the data.

3.6. Selection discussion

During the process of selecting papers for this systematic literature review, we encountered papers that were borderline candidates for inclusion. We will discuss here considerations related to two of these papers. These examples are two studies that were not included, and we will explain our reasons for this choice. "Identifying Barriers to Intrapreneurship" by Reuther et al. (2018) and "The digital workplace is key to digital innovation" by Dery et al. (2017) were both omitted at the "read-through" phase of the review process, Step 4 in Fig. 2.

The paper "Identifying Barriers to Intrapreneurship" was included up to the phase of read-through in the review process. This was because both the title and abstract gave the impression that it could provide interesting insights into employee-driven digital innovation based on

Table 1
Scholarly origin of publications.

Innovation Management Research	26 (45%)
Information Systems Research	32 (55%)

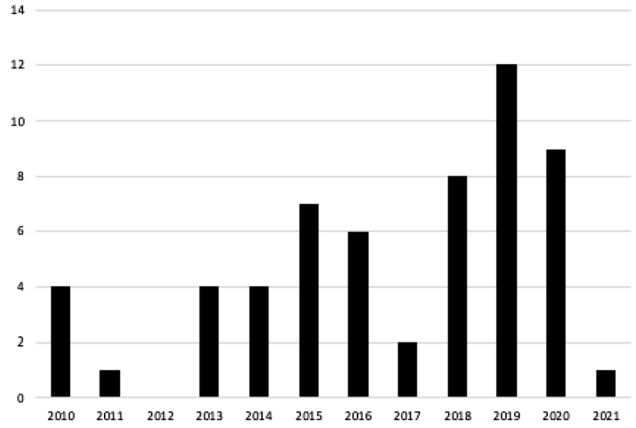

Fig. 3. Publications by year.

Table 2
Conceptualization of the primary studies in the review.

Employee-driven digital innovation	19 (33%)
Digital tools supporting employee-driven innovation	14 (24%)
Both	25 (43%)

Table 3
Goals of the studies.

Efficiency	23 (40%)
Product/service improvements	25 (43%)
Unclear	10 (17%)

Table 4
Level of analysis.

Organization	26 (45%)
Individual	21 (36%)
Multilevel	3 (5%)
Industry/market	8 (14%)

Table 5
Theoretical origin.

Employee-driven innovation	13 (22%)
Digital innovation	9 (16%)
General innovation	36 (62%)

Table 6
Organizational origin of the primary studies in the review.

Private	51 (88%)
Public	4 (7%)
Both	3 (5%)

the process of intrapreneurship, focusing on both the individual and organizational levels. However, the read-through made it clear that the paper had very few aspects related to digital innovation, and we therefore decided not to include it in our systematic literature review.

The paper "The digital workplace is key to digital innovation" was also omitted in the read-through. It was included until Step 4 because its title and abstract gave the impression that its focus on digital innovation could also provide insights into employee-driven digital innovation. It does focus on digital innovation, but the read-through showed that it was more devoted to employee connectedness and responsive leadership in the context of digital innovation. It was then decided that this did not fall within the definition of employee-driven digital innovation as explained in Section 2.3, and the publication was therefore omitted from the literature review.

4. Findings

This section presents the findings from our analysis of the 58 primary studies collected in this review, which will provide a basis for the discussion of employee-driven digital innovation in the next section. The findings describe the focus of the literature in the area and how the field has developed in the past decade, leading to the identification of research gaps and the presentation of an agenda for future research.

The scholars who have contributed to the development of employee-driven digital innovation as a research area are evenly distributed between the areas of innovation management and information systems (Table 1). The even distribution between the two research streams and the increase in publications towards the end of the analyzed period (Fig. 3) show that the topic is highly relevant to both research streams. We find little evidence in our data of integration between the researchers who represent the different research streams, either past or present. This is despite the fact that they examine aspects of the same topic, albeit from different points of view. None of the authors contributes to both research streams, and they all publish in channels associated with their own domain.

Combining the concepts of employee-driven innovation (e.g. Høyrup, 2010) and digital innovation (e.g. Yoo et al., 2010), we analyzed the 58 publications with reference to the concept they mainly focus on, using our definition in Section 2. The findings of these studies suggest that the concept is explored in two parallel research streams (Table 2), even though most of the publications focus both on digital tools and employee-driven digital innovation (43%). The first direction deals with the outcome of the innovation process while the second examines the digital tools used to support it. The division into these two research streams supports the finding that innovation management and information systems research are only a partially integrated research direction, even though they focus on similar topics in their approach. This also becomes apparent when looking at the goals and intentions of the studies (Table 3).

Analysis of the goals of the studies (Table 3) reveals a fairly even division between studies focusing on efficiency (40%) and those focusing on product and service improvements (43%). It is therefore not the case that the places of origin of the research streams determine the research focus. Both research areas examine efficiency considerations as well as product and service improvement considerations. The different innovation types can therefore be said to be evenly distributed, considering that efficiency falls into the category of process innovation in the most common division of innovation types (Damanpour, 1991; Marinova and Phillimore, 2003; Whittington, 2018).

When the level of analysis (Table 4) in the publications is examined, some interesting insights are revealed. The analysis level of the publications is evenly distributed between the organizational level (45%) and the individual level (36%). Combining the level of analysis with the intention of the studies reveals, not surprisingly, that the studies that focus on the organizational level are concerned with efficiency (24%) while those that focus on the individual level are concerned with improvements to products and services (24%).

An analysis of the publications' theoretical origins (Table 5) reveals that most of them (62%) build on general innovation theory. Only 16% of the publications are based on previous research on digital innovation. Almost all of the publications that refer to the theory of digital

Table 7
Methodology of the primary studies in the review.

Qualitative	28 (48%)
Quantitative	25 (43%)
Mixed methods	5 (9%)

Table 8
Type of studies.

Single case studies	28 (48%)
Multiple case studies	13 (22%)
Not available/not relevant	17 (30%)

Table 9
Publication sources of the primary studies in the review.

Journal publications	37 (64%)
Conference publications	21 (36%)

Table 10
Strategic approach to employee-driven digital innovation.

First order	34 (59%)
Second order	8 (14%)
Third order	2 (3%)
Not available/not relevant	14 (24%)

Table 11
Case origin of the primary studies in the review.

Europe	33 (57%)
Global	10 (17%)
Asia	10 (17%)
North America	4 (7%)
Africa	1 (2%)

innovation are related to the research field of information systems, and almost all of the publications referring to general innovation theory are related to the research field of innovation management research. The publications therefore suggest that the various research streams refer to their own specific theories about innovation, only drawing on explanatory models from other disciplines to a small extent.

The organizational origin of the primary studies (Table 6) reveals a large number of studies that focus on private organizations (88%). We were only able to find four publications from the public sector that examine employee-driven digital innovation, which was surprising. A few studies examined both the private and public sectors. More recent research has examined innovation in public organizations (Bysted and Jespersen, 2015), and we expect interest in this field of research to increase in the near future.

When the publications' methodological approaches are examined, it becomes clear that there is an even division between qualitative and quantitative research within the field. There is also a substantial number of studies that use a mixed-methods approach. Our findings therefore show that research in the area is methodologically diversified (Table 7). We identified a range of quantitative research approaches, but the majority are qualitative studies (48%).

Categorizing the studies by type reveals a large proportion of single case studies, with 48% of the identified studies based on data from only one company (Table 8). This could indicate lower transfer value between organizations and countries, which may prove to be a challenge as the field of innovation often attracts great interest from practitioners. In order to maintain the transfer value to practitioners, it is crucial for the research area to ensure that the type of studies we present are appealing to both academia and industry. The choice of organizations studied is therefore important to the development of the research area.

Of the 58 primary studies, 37 are journal publications while 21 were published in conference proceedings (Table 9). The journals that contributed the most publications were the *European Journal of Innovation Management* (6) and the *Journal of Creativity and Innovation Management* (3) while the conferences with the most publications were the European Conference of Information Systems (ECIS) (4) and the Hawaii International Conference on System Sciences (4). Based on our data, the researcher with the most publications in the field is R. F. Ciriello. Alone or in collaboration with others, he has contributed to five different publications. It is interesting to note that his main focus is information systems research, in particular the use of digital tools in employee-driven innovation processes. Several other researchers have also contributed to more than one publication, e.g. Victoria A. Reibenspiess, with three publications.

When we analyzed the studies with regard to strategic approach, we chose to follow Høyrup̊s (2012) division into three orders (Table 10). This shows that only Orso et al. (2018) and Nicolajsen et al. (2019) can be defined as studies that describe a top-down strategic approach to employee-driven digital innovation while most of the studies (59%) appear to describe bottom-up approaches. The rest of the studies present second-order approaches with different kinds of top-down initiated innovation processes or do not reveal information about each organization's strategic approach to the innovation process.

The majority of the 58 publications originate from Europe (33), although we identified a substantial number of studies from Asia (10), North America (4) and Africa (1) (Table 11). Moreover, ten studies take a global approach to the research area. Opland et al. (2020) argue that this research area has been strongly rooted in Europe, with European researchers largely researching the concept within the context of European organizations. In many ways, our analysis supports this argument, although the existence of several studies from other areas of the world makes the picture seem more nuanced. It still appears that the main emphasis of the research area is the work of European researchers. Regardless of geographical origin, the research area of employee-driven digital innovation has been the subject of an increasing number of publications in recent years. Of all the publications included in this paper, 52% were published between 2018 and 2020.

5. Discussion

In this section, we discuss the findings from the systematic literature review. Our goals are to analyze what characterizes employee-driven digital innovation as a research area and to identify the implications of these characteristics for further research. First, this paper contributes by offering a broad overview of the literature on employee-driven digital innovation. Second, we contribute by developing a theoretical framework of employee driven digital innovation, which is used in the analysis of the literature and the synthesis of the findings. Our framework is based on extant works on digital innovation (Kohli and Melville, 2019) and intrapreneuership (Desouza, 2011) and can act as a guide both for researchers and practitioners engaging in employee-driven digital innovation. The main strength of this framework is that it combines the generic innovation phases of intrapreneurship with the characteristics of digital innovation. Finally, our third contribution is the identification of four gaps in the literature along with a research agenda designed to advance research and practice in the field of employee-driven digital innovation. To this end, in the following four subsections we discuss each of the identified gaps, using the developed framework as a guide. In our synthesis of the findings, multiple outcomes emerge, enabling us to propose a research agenda for the future that can help advance knowledge on employee-driven digital innovation.

5.1. Research streams – Innovation management vs. information systems

The analysis of the 58 publications in our systematic literature

Table 12
Research questions, research gaps and the future research agenda for employee-driven digital innovation.

Research question (RQ2)	Identified research gaps in literature	Future derived research agenda (RQ3)
What characterizes the current research on employee-driven digital innovation?	Integrating the research streams of innovation management research and information systems research (Gap 1)	• Need for more research that integrates scholars of innovation management and information systems to understand how employee-driven digital innovation affects organizations. • Need for more research into the preconditions for employee-driven digital innovation. • Need for more research into how digital tools affect the employee-driven digital innovation process. • Need for more research into whether employee-driven digital innovation provides value to organizations. • Need for more research into measuring the effects of employee-driven digital innovation.
	Exploring the balance between a focus on the outcome and the process of employee-driven digital innovation (Gap 2)	• Need for more research into how employee-driven digital innovation affects both private and public organizations. • Need for more research into how to develop digital tools to support employee-driven digital innovation processes so that they are aligned with each organization's goals and strategies.
	Focusing on external competitive environmental factors and internal organizational environmental factors in employee-driven digital innovation (Gap 3)	• Need for more research into different external competitive environmental factors and internal organizational environmental factors. • Need for more research into the similarities and differences between the characteristics of employee-driven digital innovation in private and public organizations. • Need for more research using different methodological approaches that can illuminate employee-driven digital innovation.
	Creating holistic digital tools to support employee-driven innovation (Gap 4)	• Need for more research into the design of holistic digital tools to support employee-driven digital innovation. • Need for more research into how to use new technology to design digital tools that solve the challenges of idea screening and idea selection. • Need for more research into designing digital tools that can connect employee-driven digital innovation to the strategic management levels of private and public organizations. • Need for more research into the design of more sophisticated digital tools for innovation purposes, using new and advanced technology.

review demonstrate that the research on employee-driven digital innovation has developed into two distinct parallel streams. The reason for this split comes from the fact that researchers in this area originate from two clearly different research fields: innovation management research and information systems research (Table 1). Nevertheless, there is little evidence that the research focus on the conceptualization of employee-driven digital innovation is significantly different in the two research streams. However, they shed light on the same concepts from different points of view, in terms of theories (Table 5), approach to research (Table 7) and the goal of each study (Table 3). Within the innovation management research stream, we find publications related to the outcome of innovation (e.g. Kesting et al., 2016; Uddin et al., 2019; van Zyl et al., 2019), as well as publications focusing on the development and use of digital tools, (e.g. Lathinen et al., 2017; Gressgård et al., 2014; Huesig and Endres, 2019). Within information systems research, we find publications focused on the outcomes of innovation (e.g. Orso et al., 2018; Arvidsson and Mønstad, 2018; Köffer et al., 2015), as well as publications related to the development and use of digital tools (e.g. Ciriello et al., 2015; Mueller and Renken, 2017; Benbya and Leidner, 2018). The fact that two different research areas examine the same concepts is considered beneficial as they can contribute complementary findings. Indeed, the findings indicate that employee-driven digital innovation as a research field is equally influenced by these two different academic traditions. Both are encompassed by the definition of employee-driven digital innovation that we have derived from existing definitions of innovation (Dodgson et al., 2014) and digital innovation (Nambisan et al., 2017).

Nevertheless, we find evidence that the research area of employee-driven digital innovation is still not fully developed. Key contributors such as Yoo et al. (2012) and Holmstrøm (2018) have highlighted the need for more research on digital innovation in order to create more explanatory models for this type of innovation. A clear example of this is obtained by combining the research point of view (Table 1) with the theoretical grounding (Table 5) in the publications. On the one hand, the publications on innovation management research are almost exclusively theoretically rooted in general innovation theory and theory related to employee-driven innovation. Only one of these 26 publications was theoretically grounded in theory originating from the discourse on digital innovation. On the other hand, the theory of digital innovation is to a greater extent included in the research on information systems. Nonetheless, general innovation and employee-driven innovation form a large part of the theoretical basis of these publications. The theoretical grounding exemplifies in many ways how the research area can benefit from greater integration between the two parallel research traditions. Just as Yoo et al. (2012) and Holmstrøm (2018) advocate more research into digital innovation, we argue that more research into employee-driven digital innovation is required. To develop better explanatory models, the two research traditions should combine their different points of view to provide a more coherent and holistic understanding of

the field.

This lack of interest in combining innovation management research and information systems research constitutes the first research gap in the area (Table 12). As the evidence shows that these research streams have similar intentions (Table 3) and attain similar levels of analysis (Table 4), we argue that the two streams can complement each other and gain greater insight into the concept itself, as well as how it affects organizations. Increased knowledge of employee-driven digital innovation and how it affects organizations can offer both academic and practical implications. A challenge for this integration may come from the maturity of the two fields of research, since all the research on innovation management is published in journals, while most of the research on information systems is published at conferences. This can be attributed to different levels of maturity, or it could just express the differences between the research traditions. As a consequence of these differences, we propose the lack of integration between the two parallel research streams as Research Gap 1 (Table 12).

5.2. Employee-driven digital innovation studies – Outcomes or actions?

As Table 3 shows, while these studies have many different aims, the dominant intention to study innovation can focus either on the outcome or the process. Kohli and Melville (2019) define the outcomes of digital innovation as new products, services or processes while the actions, on the other hand, incorporate the innovation process and the elements affecting it. Our definition of employee-driven digital innovation, derived from the definitions of innovation (Dodgson et al., 2014) and digital innovation (Nambisan et al., 2017), embraces both these areas.

Studying the outcomes of innovation - an important element in developing the research area of employee-driven digital innovation - may prove to be more elusive than studying the processes (i.e. the use of digital tools). Researching outcomes can provide many insights into the importance of this type of innovation for organizations, in terms of effectiveness, productivity and financial gain. Much of this research is led by researchers originating from the innovation management field (e.g. Kesting et al., 2016; Bäckström and Lindberg, 2018; Uddin et al., 2019). Regardless of research origin, studies attempting to quantify the gains that organizations make from employee-driven digital innovation are completely absent, regardless of whether the research takes a positivist or interpretive epistemological approach. Focusing on the outcome of innovation is a research tradition based on many of the conditions and assumptions of research on employee-driven innovation (Høyrup, 2010; Kesting and Ulhøi, 2010; Høyrup, 2012; Smith et al., 2012; Voxted, 2018). More research is needed to achieve greater integration of outcomes from innovation management and information systems. Such integration could make it easier to explore the outcomes of the innovation processes, therefore giving a clearer picture of the effects of employee-driven digital innovation on organizations, in terms of efficiency, productivity and financial gain.

Table 2 shows that most of the studies focus on both employee-driven digital innovation as a concept and the various digital tools used to support this form of innovation. Combined with the goals of these studies (Table 3), where there is an even distribution of focus between efficiency and product and service development, it is evident that the field is concerned with both the process and the outcome of innovation. Among the 39 publications that do not focus solely on the outcome of the employee-driven digital innovation process, we find varying focus on the phases of the innovation process. Our results show that only 21% of the studies that focus on the innovation process have an approach that covers the entire process (e.g. Reibenspiess et al., 2019; Gressgård et al., 2014; Tirabeni and Soderquist, 2019). The majority of such studies (79%) are concerned with idea generation and the first phases of the innovation process (e.g. Zimmerling et al., 2016; Yu and Liu, 2020; Nicolajsen et al., 2019). Here, some of the challenges in the development of digital tools to support employee-driven innovation are presented, as it has not been possible to create digital tools that support the entire innovation process. The main problem here is that when we focus on the innovation process, there may seem to be more differences than similarities between the companies. Different products, services and business models, different organizational structures, different ways of interacting and different innovation cultures are just some of the challenges encountered in the development of digital tools. This explains why research has focused on the first phases of the innovation process, with a special focus on idea generation, and also indicates another research gap.

Our data on the primary studies (Appendix A) show an increase in studies from 2018 onwards (Fig. 3), with more publications focusing solely on digital tools since 2019. Digital tools have mainly been seen as systems for generating a large quantity of ideas, based on the assumption that the more ideas an organization generates, the greater the probability there is of finding a good one (Verganti, 2017). The increased number of recent publications related to digital tools therefore seems inconsistent with the assumption within innovation management that generation of ideas is not a problem. Nevertheless, it seems that digital tools give many opportunities for researchers to contribute to research. There may be several reasons for these developments: firstly, technological development now offers opportunities that did not exist a few years ago by providing exciting new opportunities for functionality (Verganti, Vendraminelli, & Iansiti, 2020); secondly, research on innovation and digital innovation has shown that digital tools can overcome some of the challenges that exist in innovation processes (Beretta, 2018); thirdly, the development and implementation of digital tools may seem more easily accessible to researchers as a topic (Benbya and Leidner, 2018); and fourthly, practitioners within organizations are now interested in these tools, and this is therefore driving their development (Ciriello et al., 2016).

To examine the type of value that new digital innovations bring to organizations, research should focus on the outcome of the innovation process and should quantify value concepts to examine the extent to which these innovations create efficient solutions and profit for the organizations. A strategic approach to employee-driven digital innovation is therefore needed to align innovation with each organization's goals and strategies, whether they are private (Hartley, 2013) or public (Arundel et al., 2019). There are different orders that connect strategy to employee-driven digital innovation (Høyrup, 2012); our findings (Table 10) show that most studies examine bottom-up initiatives. This shows that organizations do not necessarily direct innovation processes in one particular direction (e.g. towards previously existing goals, strategies or business areas). However, the generation of ideas and initiatives needs to be aligned with each organization's goals and strategies (Arundel et al., 2019), even when it is the "ordinary employees" who are doing the innovating. Here, further research on the strategic approach could help determine the contexts in which employee-driven digital innovation can best contribute, either as a spontaneous self-initiated process (first-order employee-driven innovation) or as a more structured approach (mixed or third-order employee-driven innovation). This applies to both private and public organizations, although the goals and strategies will be different. While public sector innovations occur mainly through formal political mandates (Mergel, 2015), new forms of open collaboration have recently emerged outside trusted and formalized acquisition procedures, in both the private and public sectors. Therefore, it is crucial for new research to examine this concept and study the outcomes of employee-driven digital innovation to an even greater extent, to uncover the strengths, weaknesses and connections that can provide a better understanding of such innovation.

5.3. External competitive environment and internal organizational environment

Digital innovations are influenced by both the external competitive environment and the internal organizational environment (Kohli and Melville, 2019). However, our findings (Table 4) demonstrate that only

a few publications have examined the external competitive environment. Our analysis shows that these publications have a different approach to the external competitive environment as they focus on collaboration rather than competition. For example, Schaarschmidt et al. (2011) examine collaboration in SME networks; Laviolette et al. (2016) look at absorptive capacity for inbound open innovation; and Yan et al. (2018) describe the differential innovativeness outcomes of user and employee participation. Specifically, Laviolette et al. (2016) focus on collaboration with external companies in order to not only draw inspiration for innovation but also further develop products and services. Therefore, it does not seem that the articles particularly wish to reveal industry secrets that could change the competitive situation; rather, they focus more on how organizations can make use of their stakeholders in the environment to improve products, services, processes and business models.

Technological development, a factor often originating in the external environment, is crucial for the emergence of new products, services, processes, and business models. An organization's approach to technological development will therefore also be crucial to the success of employee-driven digital innovation. For every organization, technological development is a resource and strategy issue, which suggests that only large organizations can drive this development. At the same time, several characteristics of digital innovation (Yoo et al., 2010) disprove the assumption that this activity is reserved only for specific organizations. Technological development can to a great extent be exploited by all organizations, even though much of it is driven by larger actors. For example, a small business can use the same technological platforms to reach its customers as a larger one. In other words, it can adopt the same technological advances as others in the same market. This can be understood as exploitation related to the theories of organizational learning (March, 1991). We claim that "ordinary employees" can contribute to innovation through both exploration and exploitation (March, 1991), and that this is made possible through contextual ambidexterity (Birkinshaw and Gupta, 2013).

As the majority of the studies focus on internal organizational environment (Table 4), they contribute to various aspects of employee-driven digital innovation. For example, Mueller and Renken (2017) look at how employees can become digital transformers; Ruan et al. (2010) examine the motivation of employee innovation behavior; and Muller et al. (2013) look at crowdfunding within an enterprise. Many environmental elements within organizations will affect their ability to innovate, and this is also the case in terms of employee-driven digital innovation. Some of the publications focus on this, as shown above, but more knowledge is still required about those organizational elements that can foster employee-driven digital innovation and those that can impede it. These include organizational structure, culture, learning, creativity, motivation and leadership. This applies not only to employee-driven digital innovation, but to employee-driven innovation in general.

In the quest for greater understanding of the external competitive environment and the internal organizational environment, some research challenges emerge. Our analysis of the publications shows a strong focus of current research on private organizations, looking both at the outcomes of employee-driven digital innovation and digital tools. There could be several reasons for this - it may be easier to undertake research in private organizations, or there may be more innovation in private organizations - but this only demonstrates that more research within public organizations is required in order to provide a better understanding of the concept. This one-sided approach offers limited understanding of the overall role of employee-driven digital innovation as only a few studies consider public organizations, either on their own (Lahtinen et al., 2017) or alongside private ones (Gressgård et al., 2014; Kesting et al., 2016). Although there are many similarities between private and public organizations, there are some fundamental differences, such as their goals and strategies (Lan and Rainey, 1992; Bysted and Jespersen, 2015), that affect the innovation processes leading to the development of products, services and processes. Adopting a broader definition of innovation that includes the process approach to innovation (Demircioglu and Audretsch, 2017) shows that a wide range of innovations exist in public organizations. There is great potential for the use of digital technology in the design of new services in public organizations, together with process innovation to increase efficiency. Many innovations in the public sector are related to the use of old technologies in new contexts, but these are nevertheless still innovations. We believe that public organizations should be explored further as a research area.

To increase our understanding of employee-driven digital innovation, it is necessary to examine the concept from different directions and different perspectives (Gap 3), such as those of private or public organizations. This will provide better insights into employee-driven digital innovation and increase the validity of the results and their transferability between organizations. In other words, it is important to study the similarities and differences between private and public organizations, in terms of both the inclusion of employees in digital innovation processes and the outcomes of digital innovation itself. Many of the existing publications describe single case studies, so more research is needed that compares different companies and countries. Currently, there is only a limited number of such publications. There is another methodological challenge in this area, in that only 31% of the studies are longitudinal in their approach while the rest present a cross-section of each organization's actions. There is therefore a need for more studies that follow organizations over time.

The European perspective still appears to be central to the study of employee-driven digital innovation, with almost 60% of the publications originating from Europe (Table 11). This may have important implications as it may create institutional bias, although to a lesser extent than previously thought (Opland et al., 2020), leading to situations where the external validity of the primary studies could be questioned. Greater diversity both of approach and of organizations studied will therefore be important to the creation of knowledge about employee-driven digital innovation.

5.4. Digital tools to support employee-driven innovation

The main problem for organizations trying to increase innovation is not a lack of ideas, but rather an inability to notice the good ideas that are already there (Barkus, 2013). Organizations must also be able to screen the most promising ideas and select the best of them to take forward (Verganti, 2017). This challenge is linked to the organization's goals and strategies, which are questions for management. When looking at the number of researchers and organizations that are concerned with the use of digital tools, it seems to be assumed that innovation is mainly about the generation and collection of ideas. In our review, 29 of the 39 publications that examine digital tools, either holistically or in combination with employee-driven digital innovation, focus on the first phases of the innovation process, i.e. idea generation and idea gathering (Desouza, 2011). Extensive research in the area has led to significant resources being spent on developing systems that can generate and collect these ideas, creating possibilities for the organizations that utilize them (Fairbank et al., 2003; Ciriello et al., 2016; Yang and Han, 2019). However, this creates a management problem in relation to the screening and selection of ideas to proceed with, as well as the challenge of how to create digital tools that can support these parts of the innovation process and predict which ideas to take forward. There is a need for better processes and tools to facilitate not only idea generation, but also the recognition and selection of the ideas that are generated (Verganti et al., 2020). This view supports the need for digital tools to be developed that can support the innovation process, so that new ideas are aligned with the organization's goals and strategies. Our findings show some elements of these ideas in the development of digital tools, such as crowdfunding within enterprises (Muller et al., 2013) and gamification (Viberg et al., 2020), but this is the exception rather than the rule. The critical question about employee-driven digital innovation is this: How can the organization's strategic direction be maintained when it is

confronted by many more or less good ideas? This does not mean digitalization for the sake of digitalization. However, positive effects can come from digitizing these processes, for example in large organizations, which may have organizational structures and geographically separated units that make it difficult to cooperate and innovate at the employee level. Future research could therefore examine whether digital tools could be developed to support employee-driven digital innovation - as well as different approaches to innovation - across many different industries and sectors.

A limited number of publications in this review do indeed explore the selection of ideas (Elerud-Tryde and Hooge, 2014; Ciriello et al., 2015; Campos-Blázquez et al., 2020). Different solutions are presented, from various forms of internal crowdfunding (Muller et al., 2013) to the appointment of managers and experts within each organization to evaluate the ideas. However, it is surprising that the majority of these systems rely on the use of managers and experts as assessors. This may simply move the bottleneck from the idea collection stage to the evaluation stage. This raises a number of interesting questions. For example, what competence do these experts have that qualifies them to assess ideas? Could the experts have ulterior motives for promoting certain ideas over others? To what extent should the creativity of employees (Elerud-Tryde and Hooge, 2014; Müller and Ulrich, 2013) be influenced by the organization's goals and strategies (Høyrup, 2012)? While these are worthwhile questions, it is striking that so few of these information systems use technology, or suggest its use, in the selection of ideas. With the constant emergence of new technology in, for example, artificial intelligence and machine learning, it is reasonable to believe that, in the next few years, new technology could be implemented in these information systems to reduce the barriers created by idea abundance (Dennehy, Pappas, Wamba, & Michael, 2021; Verganti, 2017). However, as the current literature suggests, the immediate solution to this problem would be to include the whole organization in the process. This solution could involve employees voting on the most promising proposals or a form of internal crowdfunding in which employees invest in the ideas that impress them. Such approaches solve the management problem that often arises when so many ideas are generated that the most innovative of them are not identified or implemented. This is an interesting dynamic because we argue that there must be a management responsibility related to innovation to ensure that these innovations support the organization's purpose and goals.

In the near future, it will become possible to implement cutting-edge technology in all types of information systems. We have only seen the start of developments that will introduce new and exciting technology and overcome several existing challenges (Meadows et al., 2022; Verganti et al., 2020). This technological advancement relates not only to the steps following idea generation, but also to employees choosing to get involved in the organization's innovation processes. If the potential of including employees in the innovation processes is to be fully exploited, we would argue that it is not enough if only 30–50% of employees choose to get involved. Instead, a larger number need to see that their ideas are taken seriously and can make a difference for the organization in the short and long terms. New technology can change the ways in which we work with innovation, creating new ways of including "ordinary employees" in the innovation process. We therefore believe that this area will face rapid development in the future and require much more research, particularly given its relevance to practitioners. At the same time, these technologies must be discussed and problematized in the light of innovation management. Regardless of the quality of technological support for the innovation process, it is ultimately the responsibility of management to ensure that the direction of innovation matches the goals and strategies of the organization. We therefore propose further research into digital tools as Gap 4 (Table 12).

Below (in Table 12), we summarize the various research gaps derived from the discussion, relating them to RQ2: What characterizes current research on employee-driven digital innovation? These gaps demonstrate more research is needed to connect the two research directions we have identified in employee-driven digital innovation. As an extension of these research gaps, we also present proposals for future research questions that may help to shed light on these issues (Table 12). These proposed future research questions correspond to RQ3: To which future derived research paths within employee-driven digital innovation could research make the largest contributions? In this way, Table 12 summarizes our contribution to an understanding of the challenges in the research area and the solutions we see being achieved through the future research agenda.

6. Limitations

We are aware that methodological limitations may affect the validity of this study's findings. These limitations result from the choices we made as researchers in the development of the review protocol and in the execution of the study. We have not included studies published before 2010, and we have only collected data using Scopus. This could mean that we have missed important publications from the period before 2010, as well as publications that are not included in Scopus. Nonetheless, we have conducted searches in Google Scholar and citation tracking to reduce these limitations.

Other choices in the execution of the study may also have created biases and led to the exclusion of possible relevant studies (e.g. through the selection of search terms). This may, in particular, have led to the exclusion of studies from adjacent research areas that use different terms to describe employee-driven digital innovation. Future studies may be able to perform a systematic mapping of the area or employ bibliometric analysis to gain a broader overview of the field. Being aware of these methodological limitations, we assessed them against our methodological choices in order to present a thorough, systematic and comprehensive literature review.

7. Conclusions

Our analysis of the selected publications shows two clear directions in which the research area has developed. The parallel research streams have emerged as a result of different research focuses within innovation management research and information systems research. Researchers have either studied the development of digital products, services and processes using employee-driven innovation or the development and use of digital tools to support employee-driven innovation processes. Both directions qualify as employee-driven digital innovation according to our definition, and both constitute the overall empirical basis for the theory of employee-driven digital innovation.

Based on the discussion above, we can make the following conclusion to the research questions:

RQ1: How has the research field of employee-driven digital innovation developed since 2010?

RQ2: What characterizes current research on employee-driven digital innovation?

RQ3: What are the future derived research paths within employee-driven digital innovation where research could make the largest contributions?

The research area appears to have more facets than initially thought (Opland et al., 2020), as shown in several recent publications. In recent years, one can clearly see an increase in research activity in this area. However, it is also possible to see distinct areas within employee-driven digital innovation where research is still lacking, as demonstrated by the research gaps identified above (Table 12). In connection with the identified research gaps (Table 12), we highlight topics where more research is required to provide theoretical insight. Future studies can follow many different paths, and we present the most interesting ones based on the following research gaps: how digital tools can influence the employee-driven digital innovation process (Gap 1), how to measure the effects of employee-driven digital innovation (Gap 2), which similarities and differences exist between private and public organizations in relation to employee-driven digital innovation (Gap 3) and how more

sophisticated digital tools can be developed (Gap 4).

This literature review shows research on employee-driven digital innovation to still be in a maturing phase. Just as the research is at a crossroads between several different research traditions and disciplines, the research area itself is also affected by different points of view. This adds to the dynamics of the research area and makes it very interesting to follow. New research is needed to develop greater understanding and create better explanatory models, both for researchers and practitioners. As shown in Fig. 1, we have developed a theoretical framework that can be used by researchers to structure further research.

CRediT authorship contribution statement

Leif Erik Opland: Conceptualization, Writing – original draft, Writing – review & editing, Formal analysis, Methodology. **Ilias O. Pappas:** Conceptualization, Writing – original draft, Writing – review & editing, Formal analysis, Methodology. **Jostein Engesmo:** Conceptualization, Writing – review & editing. **Letizia Jaccheri:** Conceptualization, Writing – review & editing, Methodology.

Declaration of Competing Interest

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

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None.

Appendix

See the Tables A and B.

Table A
List of included primary studies in the systematic literature review.

Author	Title	Journal/proceedings	Information management (IM)/Information systems (IS)
Bäckström and Lindberg (2019)	Varying involvement in digitally enhanced employee-driven innovation	*European Journal of Innovation Management*	IM
Ciriello and Richter (2019)	Scenario-Based Design Theorizing	*Business and Information Systems Engineering*	IS
Bäckström and Lindberg (2018)	Behavioural Implications of Employee-Driven Innovation – A Critical Discourse Analysis	*International Journal of Innovation Management*	IM
Ciriello et al. (2015)	PowerPoint Use and Misuse in Digital Innovation	*23rd European Conference on Information Systems (ECIS), Münster, Germany, 2015*	IS
Laviolette et al. (2016)	Open innovation from the inside: Employee-driven innovation in support of absorptive capacity for inbound open innovation	*International Journal of Entrepreneurship and Innovation*	IM
Kesting et al. (2016)	The role of employee participation in generating and commercialising innovations: insights from Chinese high-tech firms	*International Journal of Human Resource Management*	IM
Benbya and Leidner (2018)	How Allianz UK used an idea management platform to harness employee innovation	*MIS Quarterly Executive*	IS
Mueller and Renken (2017)	Helping Employees to be Digital Transformers – the Olympus. connect Case	*38th International Conference on Information Systems (ICIS), Seoul, South Korea, 2017.*	IS
Orso et al. (2018)	Employee-driven innovation for improving working practices: preliminary findings from a case-study	*6th International Conference on Enterprise Systems (ICES), Limassol, Cyprus, 2018*	IS
Lahtinen et al. (2017)	Framework Towards a Virtual Tool for the Front-End of Employee-Driven Innovation in Healthcare	*International Journal of E-Services and Mobile Applications*	IM
Ciriello et al. (2016)	Designing an Idea Screening Framework for Employee-driven Innovation	*49th Hawaii International Conference on System Sciences, Koloa, HI, USA, 2016*	IS
Gressgård et al. (2014)	Use of information and communication technology to support employee-driven innovation in organizations: a knowledge management perspective	*Journal of Knowledge Management*	IM
Reibenspiess et al. (2019)	Blessings and Pitfalls of Harnessing Employee-Driven Innovation within a Work Model	*25th Americas Conference on Information Systems (AMCIS), Cancun, Mexico, 2019*	IS
Stieglitz and Hassannia (2016)	Idea Generation by Employees and External Participants in Innovation Competitions	*49th Hawaii International Conference on System Sciences, Koloa, HI, USA, 2016*	IS
Tirabeni and Soderquist (2019)	Connecting the Dots: Framing Employee-Driven Innovation in Open Innovation Contexts	*International Journal of Innovation and Technology Management*	IM
Arvidsson and Mønstad (2018)	Generating innovation potential: How digital entrepreneurs conceal, sequence, anchor, and propagate new technology	*Journal of Strategic Information Systems*	IS
van Zyl et al. (2019)	Work engagement and task performance within a global Dutch ICT-consulting firm: The mediating role of innovative work behaviors	*Current Psychology*	IM
Köffer et al. (2015)	Innovation Through BYOD? The Influence of IT Consumerization on Individual IT Innovation Behavior	*Business and Information Systems Engineering*	IS
Wei and Yan (2010)	Research on the Key Factors of High-Tech Enterprises' Innovation Management Control	*2nd International Conference on Networking and Digital Society (ICNDS), Wenzhou, China, 2010*	IS
Ruan et al. (2010)	The impact of Motivation on Employee Innovative Behavior and the Disparity Analysis: An Empirical Study of Zhejiang Province in China	*5th IEEE International Conference on Management of Innovation and Technology (ICMIT), Singapore, 2010*	IS
Sutthijakra and Ubon (2010)	The Use of a Web-Based Suggestion Scheme to Facilitate Feedback toward Service Innovation: Lessons Learned from innov@ccor in Accor	*Portland International Center for Management of Engineering and Technology (PICMET), 2010*	IS
Schaarschmidt et al. (2011)	Web 2.0 enabled employee collaboration in diverse SME networks: A CEOs perspective	*19th European Conference on Information Systems (ECIS), Helsinki, Finland, 2011*	IS
Mourmant et al. (2013)	Spaces of IT Intrapreneurial Freedom: A Classic Grounded Theory	*ACM Conference on Computers and People Research (SIGMIS-CPR), Cincinnati, OH, USA, 2013*	IS
Muller et al. (2013)	Crowdfunding inside the Enterprise: Employee-initiatives for Innovation and Collaboration	*31st Conference on Human Factors in Computing Systems (SIGCHI), Paris, France, 2013*	IS

(*continued on next page*)

Table A (*continued*)

Author	Title	Journal/proceedings	Information management (IM)/Information systems (IS)
El-Ella et al. (2013)	Accelerating High Involvement: The Role of New Technologies in Enabling Employee Participation in Innovation	*International Journal of Innovation Management*	IM
Rosell et al. (2014)	Unleashing Innovation through Internal Hackathons	*1st IEEE Innovations in Technology Conference (InnoTek), Rhode Island, USA, 2014*	IS
Elerud-Tryde and Hooge (2014)	Beyond the Generation of Ideas: Virtual Idea Campaigns to Spur Creativity and Innovation	*Creativity and Innovation Management*	IM
Aziz and Rizkallah (2015)	Effect of organizational factors on employees' generation of innovative ideas: Empirical study on the Egyptian software development industry	*EuroMed Journal of Business*	IM
Wang et al. (2015)	The Effect of Organizational Levers and the Mediating Role of Individual Absorptive Capacity in Information System Innovation	*48th Hawaii International Conference on System Sciences, Kauai, HI, USA, 2016*	IS
Vel and Park (2018)	How ECS Improve Creative Use of Employees' Knowledge?	*24th Americas Conference on Information Systems, New Orleans, LA, USA, 2018*	IS
Beretta et al. (2017)	Moderating Ideation in Web-Enabled Ideation Systems	*Journal of Product Innovation Management*	IM
Yan et al. (2018)	Differential Innovativeness Outcomes of User and Employee Participation in an Online User Innovation Community	*Journal of Management Information Systems*	IS
Chasanidou et al. (2018)	Exploring employee interactions and quality of contributions in intra-organisational innovation platforms	*Creativity and Innovation Management*	IM
Beretta (2018)	Idea Selection in Web-Enabled Ideation Systems	*Journal of Product Innovation Management*	IM
Uddin et al. (2019)	Does a creative identity encourage innovative behaviour? Evidence from knowledge-intensive IT service firms	*European Journal of Innovation Management*	IM
Gode et al. (2019)	Employee engagement in generating ideas on internal social media: A matter of meaningfulness, safety and availability	*Corporate Communications*	IM
Chen et al. (2019)	Collective firm-internal online idea development: Exploring the impact of feedback timeliness and knowledge overlap	*European Journal of Innovation Management*	IM
Nicolajsen et al. (2019)	IT-enabled idea competitions for organizational innovation: An inquiry into breakdowns in adaptation	*Creativity and Innovation Management*	IM
Ciriello et al. (2014)	Communicating ideas purposefully: Toward a design theory of innovation artifacts	*22nd European Conference on Information Systems (ECIS), Tel Aviv, Israel, 2014*	IS
Huesig and Endres (2019)	Exploring the digital innovation process: The role of functionality for the adoption of innovation management software by innovation managers	*European Journal of Innovation Management*	IM
Ciriello and Richter (2015)	Idea Hubs as Nexus of Collective Creativity in Digital Innovation	*36th International Conference on Information Systems (ICIS), Fort Worth, TX, USA, 2015*	*IS*
Tirabeni et al. (2016)	Driving Innovation by Enhancing Employee Roles: The Balancing Act of Employee-Driven Innovation	*International Journal of Social, Behavioral, Educational, Economic, Business and Industrial Engineering*	IM
Reibenspiess et al. (2019)	A Work Model for Employee-Driven Innovation in Public Organizations	*27th European Conference on Information Systems, Stockholm, Sweden, 2019*	IS
Miao and Ji (2020)	Challenges to the Promotion of Employee-Driven Innovation in State-Owned Enterprises: Two Cases from the Automotive Sector in China	*Sustainability*	IM
Campos-Blázquez et al. (2020)	Employee Innovation Using Ideation Contests: Seven Step Process to Align Strategic Challenges with the Innovation Process	*Research Technology Management*	IM
Shafti et al. (2020)	The effects of transformational leadership on employee creativity: Moderating role of intrinsic motivation	*Asia Pacific Management Review*	IM
Wan et al. (2020)	How user-driven innovation and employee intrapreneurship promote platform enterprise performance	*Management Decision*	IM
Iqbal et al. (2020)	Entrepreneurial leadership and employee innovative behavior: an examination through multiple theoretical lenses	*European Journal of Innovation Management*	IM
Yu and Liu (2020)	The impact of employee participation in online innovation communities on idea quality	*Kybernetes*	IS
Viberg et al. (2020)	Facilitating ideation and knowledge sharing in workplaces: The design and use of gamification in virtual platforms	*7th International Conference on Human-Computer Interaction*	IS
Iqbal et al. (2020)	Servant leadership and employee innovative behaviour: exploring psychological pathways	*Leadership and Organization Development Journal*	IM
Badewi et al. (2020)	ERP system as an enabler for bottom-up innovations	*Scandinavian Journal of Information Systems*	IS
Reibenspiess et al. (2020)	Tapping into the wealth of employees' ideas: Design principles for a digital intrapreneurship platform	*Information and Management*	IS
Westerski et al. (2013)	Classifying and comparing community innovation in Idea Management Systems	*Decision Support Systems*	IS
Sedera et al. (2016)	Innovating with enterprise systems and digital platforms: A contingent resource-based theory view	*Information and Management*	IS
Zimmerling et al. (2016)	Increasing the Creative Output at the Fuzzy Front End of Innovation - A Concept for a Gamified Internal Enterprise Ideation Platform	*Hawaii International Conference on System Sciences*	IS
Hossain and Islam (2015)	Generating Ideas on Online Platforms: A Case Study of "My Starbucks Idea"	*Arab Economic and Business Journal*	IS
Buech et al. (2010)	Suggestion systems in organizations: what motivates employees to submit suggestions?	*European Journal of Innovation Management*	IS

Table B
Supplementary material – dimensions of the analysis in relation to primary studies.

Author	Methodology	Sector origin	Level of analysis	Intention for publication	Case origin	Conceptualization
Bäckström and Lindberg (2019)	Qualitative	Private	Organization	Efficiency	Europe	Both
Ciriello and Richter (2019)	Qualitative	Private	Organization	Product/service improvements	Europe	Digital tools
Bäckström and Lindberg (2018)	Qualitative	Private	Individual	Product/service improvements	Global	Employee-driven digital innovation
Ciriello et al. (2015)	Qualitative	Private	Organization	Product/service improvements	Europe	Digital tools
Laviolette et al. (2016)	Qualitative	Private	Industry/market	Product/service improvements	Europe	Both
Kesting et al. (2016)	Quantitative	Both	Industry/market	Unclear	Asia	Employee-driven digital innovation
Benbya and Leidner (2018)	Qualitative	Private	Multilevel	Efficiency	Europe	Both
Mueller and Renken (2017)	Qualitative	Private	Individual	Unclear	Europe	Both
Orso et al. (2018)	Qualitative	Private	Individual	Product/service improvements	Europe	Employee-driven digital innovation
Lahtinen et al. (2017)	Qualitative	Public	Individual	Product/service improvements	Europe	Digital tools
Ciriello et al. (2016)	Qualitative	Private	Organization	Product/service improvements	Europe	Digital tools
Gressgård et al. (2014)	Qualitative	Both	Industry/market	Unclear	Europe	Digital tools
Reibenspiess et al. (2019)	Qualitative	Private	Individual	Unclear	Europe	Both
Stieglitz and Hassannia (2016)	Quantitative	Private	Individual	Product/service improvements	Europe	Both
Tirabeni and Soderquist (2019)	Qualitative	Private	Organization	Unclear	Global	Both
Arvidsson and Mønstad (2018)	Qualitative	Private	Individual	Efficiency	Europe	Employee-driven digital innovation
van Zyl et al. (2019)	Quantitative	Private	Individual	Unclear	Europe	Employee-driven digital innovation
Köffer et al. (2015)	Quantitative	Private	Individual	Product/service improvements	Europe	Employee-driven digital innovation
Wei and Yan (2010)	Quantitative	Private	Organization	Efficiency	Asia	Employee-driven digital innovation
Ruan et al. (2010)	Quantitative	Private	Organization	Efficiency	Asia	Employee-driven digital innovation
Sutthijakra and Ubon (2010)	Qualitative	Private	Organization	Product/service improvements	Global	Both
Schaarschmidt et al. (2011)	Mixed	Private	Industry/market	Efficiency	Europe	Both
Mourmant et al. (2013)	Qualitative	Private	Individual	Product/service improvements	Global	Employee-driven digital innovation
Muller et al. (2013)	Mixed	Private	Multilevel	Efficiency	Global	Both
El-Ella et al. (2013)	Qualitative	Private	Organization	Efficiency	Europe	Both
Rosell et al. (2014)	Quantitative	Private	Individual	Product/service improvements	North America	Both
Elerud-Tryde and Hooge (2014)	Mixed	Private	Organization	Product/service improvements	Europe	Both
Aziz and Rizkallah (2015)	Quantitative	Private	Multilevel	Product/service improvements	Africa	Employee-driven digital innovation
Wang et al. (2015)	Quantitative	Private	Organization	Efficiency	Asia	Employee-driven digital innovation
Vel and Park (2018)	Quantitative	Private	Individual	Unclear	North America	Both
Beretta et al. (2017)	Qualitative	Private	Organization	Efficiency	Europe	Both
Yan et al. (2018)	Quantitative	Private	Industry/market	Product/service improvements	North America	Both
Chasanidou et al. (2018)	Mixed	Private	Organization	Unclear	Europe	Both
Beretta (2018)	Quantitative	Private	Individual	Product/service improvements	Europe	Both
Uddin et al. (2019)	Quantitative	Private	Individual	Product/service improvements	Asia	Employee-driven digital innovation
Gode et al. (2019)	Qualitative	Private	Individual	Efficiency	Europe	Both
Chen et al. (2019)	Quantitative	Private	Organization	Efficiency	Europe	Both
Nicolajsen et al. (2019)	Qualitative	Private	Organization	Efficiency	Europe	Both
Ciriello et al. (2014)	Qualitative	Private	Individual	Product/service improvements	Europe	Employee-driven digital innovation
Huesig and Endres (2019)	Quantitative	Private	Industry/market	Efficiency	Europe	Digital tools
Ciriello and Richter (2015)	Qualitative	Private	Individual	Efficiency	Europe	Digital tools
Tirabeni et al. (2016)	Qualitative	Private	Individual	Product/service improvements	Global	Employee-driven digital innovation
Reibenspiess et al. (2019)	Qualitative	Public	Organization	Product/service improvements	Europe	Employee-driven digital innovation
Miao and Ji (2020)	Qualitative	Public	Industry/market	Efficiency	Asia	Digital tools
Campos-Blázquez et al. (2020)	Qualitative	Both	Industry/market	Efficiency	Europe	Digital tools
Shafti et al. (2020)	Quantitative	Public	Organization	Unclear	Asia	Employee-driven digital innovation
Wan et al. (2020)	Quantitative	Private	Organization	Unclear	Asia	Employee-driven digital innovation
Iqbal et al. (2020)	Quantitative	Private	Organization	Efficiency	Asia	Employee-driven digital innovation
Yu and Liu (2020)	Quantitative	Private	Individual	Product/service improvements	North America	Both
Viberg et al. (2020)	Mixed	Private	Individual	Product/service improvements	Europe	Digital tools
Iqbal et al. (2020)	Quantitative	Private	Organization	Efficiency	Asia	Employee-driven digital innovation
Badewi et al. (2020)	Quantitative	Private	Organization	Efficiency	Global	Digital tools
Reibenspiess et al. (2020)	Qualitative	Private	Organization	Efficiency	Europe	Both
Westerski et al. (2013)	Quantitative	Private	Organization	Efficiency	Global	Both
Sedera et al. (2016)	Quantitative	Private	Organization	Efficiency	Global	Digital tools
Zimmerling et al. (2016)	Qualitative	Private	Individual	Product/service improvements	Europe	Both
Hossain and Islam (2015)	Quantitative	Private	Organization	Product/service improvements	Global	Digital tools
Buech et al. (2010)	Quantitative	Private	Organization	Product/service improvements	Europe	Digital tools

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