

Digitalization, innovation capabilities and absorptive capacity in the Swedish real estate ecosystem

Swedish real estate ecosystem

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Abstract

Purpose – The purpose of this paper is to increase the knowledge of real estate firms' capabilities to innovate and, consequently, their capacity to absorb new innovations and benefit from digital technologies in an ecosystem context.

Design/methodology/approach – The results are based on 32 interviews with representatives of Swedish real estate owners, real estate owner industry associations and suppliers of digital technology to real estate owners. The data are interpreted using theories on absorptive capacity (i.e. the capacity to absorb new innovations), innovation capabilities and innovation ecosystems.

Findings – The real estate owners, technology suppliers and real estate owner industry associations have expanded their innovation capabilities and reshaped their innovation ecosystem by initiating a number of different digitalization activities; for example, the development of new IT systems, digital platforms, services and business models. The absorptive capacity has been improved as the organizations have changed routines and structures related to innovation, and they have taken on new roles related to digitalization and innovation, making them better able to absorb new innovations. Also, this paper identifies several drivers and obstacles to digitalization in the real estate sector.

Research limitations/implications – The increased capabilities related to digitalization can lead to better absorptive capacity on an individual firm level, which can contribute to the overall development of these firms in a longer-term. Also, new capabilities may lead to better absorptive capacity in the real estate sector at large, as firms may benefit from each other's capabilities through collaboration. The limitations are that this study does not interview tenants or facility management firms and that the findings represent the context of the Swedish real estate market.

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Originality/value – This paper investigates innovation capabilities, absorptive capacity and innovation ecosystems of real estate owners, their technology suppliers and real estate owner industry associations on the organizational level and on the sector level, into which there is little previous research. Also, this paper highlights the novelty of digitalization as a phenomenon in the sector.

Keywords Digitalization, Facility management, Property technology, Real estate, Innovation, Absorptive capacity

Paper type Research paper

Introduction

Today, digitalization is recognized as a megatrend that has a fundamental impact on the daily lives of individuals and in society at large. For organizations, digitalization brings opportunities in the form of both digital technologies themselves and in the form of organizational improvements and innovations based on digital technologies (Yoo *et al.*, 2010). Therefore, this article defines digitalization as sociotechnical innovation processes of invention, development and implementation of new ideas, in which both technological and organizational aspects are considered (Kytömäki, 2020; Tilson *et al.*, 2010; Henfridsson and Bygstad, 2013; Garud *et al.*, 2013).

In the context of the real estate sector, the research literature has covered various aspects related to digitalization, such as the Internet of Things (IoT), artificial intelligence (AI) and building information management (Atkin and Bildsten, 2017; Bröchner *et al.*, 2019). Recently, real estate industry reports have increasingly associated digitalization with new technologies, sharing economy, tenant relationships and new services and business models (Westergren *et al.*, 2017; Fastighetsägarna Stockholm, 2018; FIBREE, 2021). The pressure for change is further amplified as companies from other industries enter the real estate sector with new offers based on digital technologies (Baum, 2017; Tagliaro *et al.*, 2020). Thus, digitalization in the real estate sector involves a wide range of companies and other actors together forming an ecosystem. Real estate firms, defined as an actor that owns, develops and rent real estate as their primary business, have key roles in this system.

To innovate and benefit from digital technologies in an ecosystem context, the individual real estate firm needs to develop new organizational capabilities. However, many recent studies of innovation in the real estate sector (Kumar *et al.*, 2017; Wofford *et al.*, 2020; Magdaniel *et al.*, 2018; Kytömäki and Kadefors, 2018; Bröchner *et al.*, 2019; Kytömäki, 2020; Ullah *et al.*, 2018; Carbonari *et al.*, 2018; Koch *et al.*, 2019) have identified a lack of research on real estate firms' innovation capabilities, especially relating to digitalization. The purpose of this article is to address this gap and increase the knowledge of real estate firms' capabilities to innovate, absorb innovations and benefit from digital technologies in an ecosystem context. This analysis also responds to a practice-related gap, as both real estate owners and technology suppliers new to the industry (Westergren *et al.*, 2017; Fastighetsägarna Stockholm, 2018; Baum, 2017; Tagliaro *et al.*, 2020) benefit from a deeper understanding of how capabilities are currently configured and how they can be further strengthened.

To achieve the purpose, the research reported here is based on two main studies: the first is an extensive structured literature review of research on real estate firms' innovation capabilities and absorptive capacity, and the second is a qualitative interview study focused on real estate owners, their suppliers and industry associations in the Swedish real estate sector. We first present a theoretical framework on organizational innovation capabilities, absorptive capacity and ecosystems. Second, we describe the methodology used for the literature review and the empirical qualitative study. Third, we present the results in two sections: first, the results of the literature review and then the results of the qualitative

empirical study. Finally, the discussion section outlines the impact of digitalization on the real estate sector innovation capabilities and absorptive capacity.

Theoretical framework: real estate firms' innovation capabilities and absorptive capacity in the context of digitalization in the real estate sector

Innovation research defines innovation as a process of turning opportunities into new ideas and of putting these into use in practice and proposes that innovation processes can be managed by organizations (Tidd *et al.*, 2005; Garud *et al.*, 2013; Yeow *et al.*, 2018). The key factors to manage innovations are routines and processes that aim at developing innovations in organizations, and these routines and processes are embedded in the firm as ongoing activities that are interlocked and interdependent in workflows (Cohen and Bacdayan, 1994; Hovee and Nieuwenhuis, 2006; Thompson *et al.*, 2017). Organizational routines and processes that guide the day-to-day activities of the organization collectively constitute organization's capabilities, and these capabilities may be more or less dynamic, meaning that they reflect an organization's ability to learn (Eisenhardt and Martin, 2000; Winter, 2003). Further, dynamic capabilities determine an organization's absorptive capacity, i.e. the capability to acquire and process new information for the development of new products and services (Cohen and Levinthal, 1990; Zahra and George, 2002), which is important in a situation where new technologies and actors change the operating environment. Thus, two key intra-organizational factors for innovation management are dynamic capabilities and absorptive capacity.

Today, as organizations rely on multiple partners and networks in their innovation activities, the routines and processes related to innovation are interorganizational by nature (Blankeburg Holm *et al.*, 1999). In a broader context, these routines and processes form innovation ecosystems (Adner and Kapoor, 2010) that are defined as complex systems of workflows that contribute toward common system-level innovation goals (Eriksson *et al.*, 2019). In traditional industries, firms often have low levels of inhouse absorptive capacity and are, therefore, particularly dependent on collaboration and complementary activities related to search, transformation and storage of knowledge (Spithoven *et al.*, 2010). In such contexts, various organizations act as innovation intermediaries (Howells, 2006), which have an important function to organize absorptive capacity collectively at a sectoral level (Spithoven *et al.*, 2010).

To conclude, we present a theoretical framework (Figure 1) that we use as the basis for the structured literature review and empirical study. As stated in the introduction, digitalization in real estate means that more actors, such as digital service providers, enter the ecosystem. The real estate firm then needs to have dynamic capabilities to meet the changing supply of services, to assimilate new technologies into the organization and to apply technologies to commercial ends, meaning that they need a capacity to absorb the changes. The dynamic capabilities and absorptive capacity are internal organizational factors within the real estate firm, and these internal factors are linked to the wider ecosystem through the business relationships that the real estate firm has with other firms and organizations, meaning that the internal organizational dynamic capabilities and absorptive capacity are interdependent with the surrounding ecosystem.

Methodology used for the literature review and the empirical qualitative study

As mentioned earlier, this study contains both a literature review and an empirical study. We here present the methods for both and start with the literature review methodology.

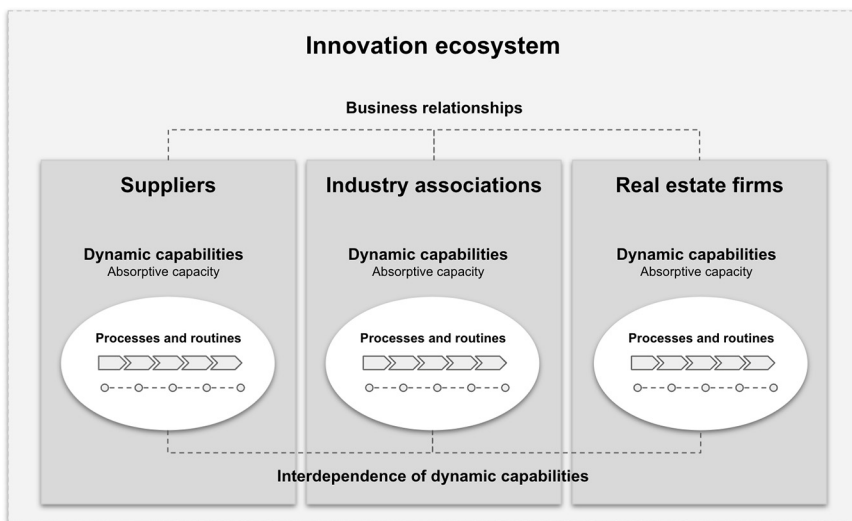


Figure 1.
Interdependence of dynamic capabilities and absorptive capacity in an innovation ecosystem

Literature review method

The benefits of a structured literature review method are that it can include a wide search and selection of scientific literature on a given topic, that the step-by-step search and selection procedure increases the transparency of research, and that the results can be presented based on several methods of analysis. Thereby, a structured review can create a firm foundation for advancing knowledge (Webster and Watson, 2002).

The purpose of this review is to systematically identify and analyze the research literature concerning digitalization in the real estate sector, focusing on the organizational and managerial perspectives on technology adoption and innovation capabilities. Following the PRISMA guidelines for systematic reviews and meta-analyses (Moher et al., 2009), this literature review is a structured confirmatory review, aiming at clarifying the literature and concepts that are central to the topic.

We conducted several initial searches in Google Scholar, Web of Science and Scopus databases with several theoretically motivated search terms. After evaluating the searches, we selected the Scopus database as our main source, as it generally includes a broad range of articles from organizational and managerial research in the context of the built environment, including conference articles and other publication types. After evaluating the initial searches, we also selected search terms that best fit the purpose of the review. We decided to include search terms that capture a broad selection of literature on the research topic. The search terms, search results, selection criteria and final sample are presented in Figure 2.

After the searches, we had a sample of 521 articles, from which we removed duplicate values (17), articles that did not have author name or abstract available (52), articles other than the English language (27), articles with a document type other than Article, Conference Paper, Review or Data Paper (30) and articles that appeared in journals that do not fall into the following Scopus topic areas: "Business, Management and Accounting", "Computer Science", "Decision Sciences", "Energy", "Architecture", "Building and Construction" and "Civil and Structural Engineering" (256).

After removals, we read through the titles and abstracts of the remaining 139 articles and selected articles that fit our research topic. We used two exclusion criteria. First, we selected

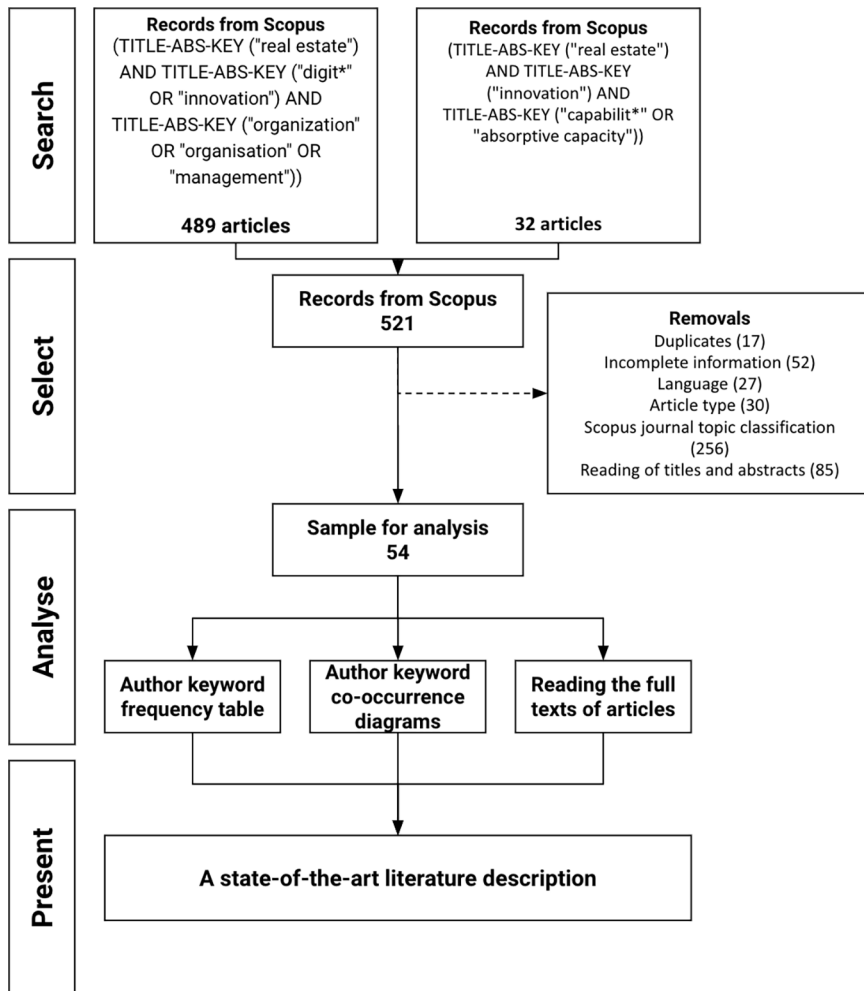


Figure 2.
Literature search and selection

articles that primarily focus on organizational and managerial aspects of digitalization in the real estate sector organizations. With this selection, the articles that are primarily focusing on specific technical aspects of digital technologies and did not concerning the organizational or managerial implications of these technologies were left out of the sample. Similarly, articles that are focusing on real estate investments or real estate markets were left out of the sample. These topics are relevant for digitalization in the sector, but they do not address the issue of how real estate owners develop their businesses in practice. Second, articles that were not primarily focusing on the implications in the real estate sector context were left out of the sample. The real estate sector context is here limited to the perspective of real estate owner organizations and their partners in digitalization. This leaves out perspectives of building users, firms' that handle day-to-day operations of maintenance and service delivery in the built environment, public authorities and organizations that are

mainly focusing on construction projects. This selection was informed by the interview results. With this selection process, we excluded 85 articles, after which we had a sample of 54 articles.

The 54 articles were first analyzed by compiling the results into author keyword frequency tables and author keyword co-occurrence diagrams. Second, we read the 54 articles and combined the analysis into a state-of-the-art literature description, which motivates the gaps in literature we base this research on.

Empirical qualitative research method

This study focuses on the context of digital development in the Swedish real estate sector. A real estate owner is defined as an actor that owns, develops and rents real estate as their primary business, and here, we mainly focus on real estate owners that own a large property portfolio. The empirical data are based on semi-structured interviews (32 interviews), industry media and reports (7 reports) and participant observations in industry seminars (9 seminars). A qualitative research approach was chosen for three reasons. First, digitalization is a topic that is currently in rapid development and high on the industry agenda. For such emergent topics, a phenomenon-driven research (PDR) approach is particularly useful (Von Krogh *et al.*, 2012). In a PDR logic, the selection of research methods and theory is driven by the evolving understanding and development of the phenomenon (Schwarz and Stensaker, 2016), and several PDR researchers advocate a pragmatic, instrumental mixed-methods approach, which proceeds from qualitative methods to more formal methods as the understanding of the phenomenon matures. Second, a qualitative approach allows for interviewees to introduce new aspects to digitalization, and it takes into account the context in which organizational change occurs (Galletta, 2013). Third, a semi-structured interview method allows for asking follow-up questions, which is an important part of a study of organizational change.

Three categories of organizations that were selected for interviews (Table 1) are as follows:

- (1) real estate owners;
- (2) technology suppliers to real estate owners; and
- (3) real estate industry associations.

The real estate owner category is defined as private and public owners of commercial and residential real estate. The real estate owners (18 interviews) represent commercial property owners (5), including hotels, retail facilities and offices; residential building owners (five private and five public); and community service building owners (3), including education and health care facilities. Most of the real estate owners are large firms, which have resources to be at the forefront of adopting innovations in the sector, but also some smaller firms are included. Second, the suppliers (11) were selected based on their existing collaborations with the interviewed real estate owners. Six of the suppliers are newly founded property technology (PropTech) startup firms, whereas the five others are long-established in the industry. Third, three of the interviewees are representatives of real estate owner industry associations, which have a central role in industry development in Sweden. All interviewees were managers or senior managers responsible for digital development in their organizations.

In accordance with the PDR logic, the interview guidelines were developed as the research progressed and adapted to the role of interviewees, but all interviews included the same themes. In particular, the interview guidelines were based on theories pertaining to a firm's innovation capabilities (Cohen and Levinthal, 1990; Zahra and George, 2002; Winter, 2003). The three main topics were (1) perceived drivers and obstacles to digitalization,

Table 1. Interviewees

Organization	Size	Public/private	Interviewee role	Date	Length
<i>Real estate owners</i>					
Commercial property owner 1	400,000 m ²	Private	IT manager	12.12.2017	49 min
Commercial property owner 2	1,070,000 m ²	Private	Head of digital development and sustainability	8.3.2019	1 h 31 min
Commercial property owner 3	4,200,000 m ²	Private	Strategic Initiative Project Manager	24.1.2019	47 min
Commercial property owner 4	200,000 m ²	Private	Vice President	2.10.2017	1 h 16 min
Commercial property owner 5	1,400 buildings	Private	Head of Business Development and IT	29.5.2019	1 h 7 min
Community service property owner 1	383 buildings	Private	Head of Property Management	16.1.2018	1 h 16 min
Community service property owner 2	3,000,000 m ²	Public	Head of Innovation and Sustainable Development	13.6.2018	1 h 20 min
Community service property owner 3	600 buildings	Public	Operations Manager	8.2.2019	1 h 7 min
Residential property owner 1	3,000 apartments	Private	CEO	18.12.2017	1 h 33 min
Residential property owner 2	500,000 resident members	Private	Business Area Manager	21.11.2018	47 min
Residential property owner 3	24 buildings	Private	CEO	21.12.2018	2 h 6 min
Residential property owner 4	500,000 residents	Private	Business Development Manager	31.8.2017	1 h 27 min
Residential property owner 5	2,200,000 m ²	Private	Business Development Manager	11.9.2017	1 h 1 min
Residential property owner 6	1,200,000 m ²	Private	IT and Innovation Manager	4.6.2018	1 h 12 min
Residential property owner 7	392 buildings	Public	Head of Expert Support	5.6.2019	1 h 25 min
Residential property owner 8	26,000 apartments	Public	Chief Digital Officer	19.11.2018	1 h 1 min
Residential property owner 9	22,000 apartments	Public	Digitalization Strategist	6.11.2018	1 h 26 min
Residential property owner 10	2,000,000 m ²	Public	IT Manager	18.8.2017	1 h 3 min
<i>Suppliers</i>					
New technology supplier 1	-	Private	Co-Founder	28.1.2019	1 h 2 min
New technology supplier 2	-	Private	Co-Founder	11.6.2018	1 h 11 min
New technology supplier 3	-	Private	Co-Founder	14.1.2019	1 h 23 min
New technology supplier 4	-	Private	Co-Founder	23.1.2019	57 min
New technology supplier 5	-	Private	Founder	3.11.2017	1 h 6 min
New technology supplier 6	-	Private	Chief Operating Officer	24.1.2019	1 h 24 min
Established technology supplier 1	-	Private	Head of Strategic Marketing	11.1.2019	1 h 32 min
Established technology supplier 2	-	Private	Country Division Lead	6.2.2019	1 h 40 min
Established technology supplier 3	-	Private	R&D Manager	31.5.2018	49 min
Established technology supplier 4	-	Private	Senior Consultant	17.9.2018	52 min
Established technology supplier 5	-	Private	Head of Business Development	15.1.2019	48 min
<i>Industry associations</i>					
Industry association 1	-	-	Senior Consultant	11.1.2018	44 min
Industry association 2	-	-	Chief Digital Officer	6.12.2017	49 min
Industry association 3	-	-	Digitalization Expert	1.11.2018	2 h 18 min

(2) actions that their organization has planned or have taken, (3) impacts of these activities on the organization's routines, structures, roles and collaborations.

The interview transcripts were systematically analyzed using NVIVO 12 software by first reading the transcripts and highlighting excerpts that described changes relevant to the research questions. Then, the excerpts were imported to an Excel spreadsheet. The excerpts were thematically categorized according to the three interview topics. Within these categories, the excerpts were thematically grouped as *digitalization themes*, following the method refined by Gioia *et al.* (2013), in which theoretical themes emerge from analyzing the interview excerpts. Finally, for each digitalization theme, *representative quotes*, meaning that the quotes represent a perspective that is occurring in many of the interviewed organizations, were selected to illustrate digitalization themes in the results section.

Results: Structured literature review

The innovativeness of real estate owners has primarily been addressed in research on the role of construction project clients in driving innovation. These studies have often emphasized that while owners may potentially act as enablers of innovation in the construction phase (Kulatunga *et al.*, 2011), they are often conservative by nature (Engström and Hedgren, 2012). Only a few studies have taken the innovation processes of real estate owners as a subject of research. As such, Kumar *et al.* (2017) analyze interactions between technological and human resources innovation capabilities in Indian real estate firms. They find that these innovation capabilities have previously been regarded as less important factors shaping the competitiveness of real estate firms and suggest that these capabilities today should be regarded as central for real estate firms to cope with a changing environment. In a conceptual article, Wofford *et al.* (2020) argue that commercial real estate business environments are facing rapid changes and that firms, therefore, need to manage the paradox of simultaneously exploiting existing business models and exploring new business opportunities. Based on two case studies, Magdaniel *et al.* (2018) suggest that campus real estate development processes can act as a catalyst to stimulate innovation. Also, based on interviews with real estate owners, Kytömäki and Kedefors (2018) point out that further research is needed, as recent developments in digitalization may affect innovation processes in multiple organizations in real estate sector. In all these articles, authors observe that literature on innovation in the real estate sector is scarce. Altogether, literature on innovation in real estate owner organizations points to a lack of research on real estate owner innovation capabilities.

Research that directly concerns the adoption of digital technologies in real estate owner organizations or in their networks is also limited, for research on digitalization has mainly focused on the facility management (FM) sector at large. Atkin and Bildsten (2017) note that although digital technologies, such as IoT and AI, are potentially disruptive to the FM sector, developments in these fields have primarily been debated by practitioners. Also, recent reviews acknowledge digitalization as a major shaping force in FM. Bröchner *et al.* (2019) identify digitalization and sustainability as two major forces shaping the future of FM and property management and categorize the effects of digitalization into (1) technologies as support for work in workplaces, (2) new ways of designing buildings and (3) methods of performance measurement. In a structured literature review, Kytömäki (2020) finds that literature on digitalization and innovation in FM mainly focuses on (1) development of systems and methods, (2) technology adoption and (3) organization and management, but that this research lacks the perspective of real estate owners. Further, Ullah *et al.* (2018) argue that the number of research publications on the adoption of smart real estate technologies has remained low because the real estate sector has been slow to adopt new

digital technologies. Recently, authors such as [Carbonari et al. \(2018\)](#) have suggested that to implement digital technologies in building management practices; more attention should be paid to the organizational tasks and processes, where new technologies are to be introduced. In a similar vein, [Koch et al. \(2019\)](#) point out that to advance digitalization, “a process of creating hybrid practices of combined digital technologies, competences, organization and management has to be developed”.

To conclude, there is a want for research that explicitly takes real estate owners’ processes and organizations related to innovation and digitalization as a subject of empirical research. Furthermore, previous research has given little attention to the importance of the wider ecosystem.

Results: Qualitative empirical study of real estate owners in Sweden

The results are structured according to the main categories and interview themes (1) drivers and obstacles to digitalization, (2) performed digitalization activities and (3) new routines, structures and roles. Within each category, the digitalization themes identified in the analysis phase are discussed.

Drivers and obstacles of digitalization

All interviewed actors perceived digitalization as a phenomenon that currently affects the development of the sector and report that their views on digitalization had changed in recent years. Also, each of the interviewees had recognized various drivers and obstacles related to digitalization ([Figure 3](#)).

Most interviewees had identified new business opportunities related to digitalization. An interviewee representing a commercial property owner (organization 2, [Table 1](#)) says that:

We see a lot of potential in this work [on digitalization], both to increase growth for the company and to find new business models. We also want to develop our brand, and our people who work here, they should have new systems and new ways to work.

Also, several of the interviewees mentioned new digital technologies that are creating these business opportunities. For example, a representative of a new supplier (3) mentions that:

“I started in September 2014. That is when, you could say, low power wide area network technologies [Sigfox, Lorawan and NBIOT] commercially were born”.

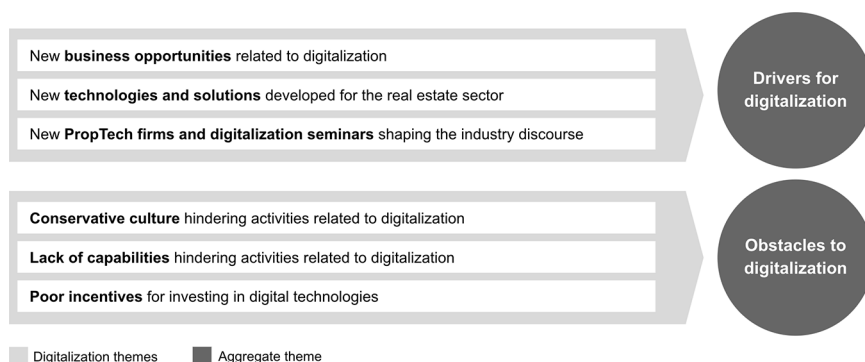


Figure 3.
Drivers and obstacles of digitalization

The main sources of information about these opportunities were industry media and seminars, as well as PropTech firms that had promoted new solutions in the sector. As a representative of an industry association (1) puts it:

“During this year [2018] PropTech has become something very important”.

Nevertheless, interviewees also reported on obstacles that hinder digitalization processes in the interviewed organizations and in the sector at large. Most concerns were related to the conservative culture, lack of capabilities and poor incentives for investments in digital technologies. A representative of a commercial property owner (1) described cultural obstacles in their organization in the following way:

“[the biggest challenge] is the ways of working. I think because some people are so conservative [...] Even the views of management have been scattered”.

In effect, most interviewees reported that a major obstacle to digitalization was the lack of capabilities in the real estate owner organizations and in the sector at large. Especially the representatives of suppliers and industry associations criticized the real estate owners for lack of capabilities related to digitalization. A representative of an established supplier (4) said that:

The real estate sector has been pretty good at being on their own, deciding everything from their point of view [...]. And now they can't do that anymore [in relation to digitalization], because they don't have the knowledge. It's too complicated. And it's gone too far for them to build it up internally.

Further, a representative of an industry association (1) brings up obstacles related to incentives:

The real estate has been very high profiled in the revenues more than costs. [...] If they [real estate owners] have succeeded in cutting their maintenance cost by 20% or 30%, [there is no real economic benefit from it], as the property valuation firms don't see that. I think there is generally something wrong in how you value property, and that is making this [digitalization] change not happening as fast as it could.

Performed digitalization activities

All interviewees reported that their organizations have had activities related to digitalization (Figure 4). Most of these activities were related to information technology (IT) system development projects, but many of the actors had also developed new services and business models. Furthermore, industry associations had initiated digitalization programs aimed at promoting digitalization throughout the industry.

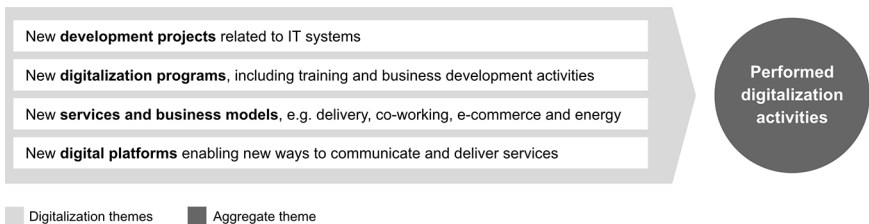


Figure 4.
Performed
digitalization
activities

Most of the actions in the real estate owner organizations were related to the incremental development of existing IT systems, such as business administration and building management systems. These investments mainly focused on increasing operational efficiency and tenant satisfaction, for example, in energy optimization, facility maintenance and customer service processes. Still, many of the owners had implemented IT systems with an aim to radically change the way the organizations operate. A representative of a community service property owner (3) explains how they were able to completely change the building management operating logic by automating information flows between buildings, suppliers and building management processes:

“We got a breakthrough when they put an automation server in each building, so we could connect the existing systems in the buildings into one system”.

Further, many of the real estate owners had developed new services and business models aiming at establishing new business areas, such as smart building access control and delivery of goods and services to tenants, co-working services, e-commerce platforms and services related to energy management. Experimenting with new business models has not been customary for real estate owners. A representative of a residential property owner (9) describes how they had developed a new revenue stream for the firm:

“It turns out that we can be in the energy sector as well [. . .]. We can sell energy back to the energy companies or cut their peaks in the energy use”.

Most of the service and business model initiatives were launched as in-house innovation projects, and in a few cases, the real estate owners founded new firms, either as wholly owned subsidiaries or owned together with competitors, suppliers and industry associations.

Many of these developments are based on digital platforms that enable new ways of connecting people, resources and services in the built environment. A representative of a new supplier (4) explains the logic of these platforms:

We are building a multisided [communication] platform for neighborhoods. [. . .] On one side we have the people living there [. . .] and [on the other] we have the real estate owners, municipalities, and a lot of partners, which could benefit greatly, if they communicate and work together.

Similarly, industry associations had launched digital open platforms to integrate building and location data with services related to access control and delivery of goods. These platforms cross organizational boundaries, which is uncommon to the industry, where IT systems have traditionally served the needs of individual organizations.

In general, the industry associations had expanded their activities in relation to digitalization. For example, they had actively promoted certain digital solutions and actors to the real estate owners, coordinated common procurement documents and policies, published reports and organized events related to digitalization. A representative of an industry association (3) explains that the goal of their new digital initiative program is to

“strengthen and accelerate the member companies’ digitization [processes]”.

Also, all the interviewed suppliers had developed new services or business models based on the new opportunities brought by digitalization. The suppliers were trying to find persuasive strategies for how to sell these solutions to the real estate owners, which they found challenging as they perceived the real estate sector to be a conservative and fragmented market.

New routines, structures and roles

The interviewees reported that many of the digitalization activities had led to changes in routines, structures and roles both within their organizations and in interorganizational collaborations (Figure 5).

In the real estate owner organizations, digitalization activities have impacted on routines for innovation and sustainability, which both are business development routines within these organizations. For example, a representative of a community service property owner (2) says that:

“If we talk about digitalization, it’s very much interlinked with our innovation process. Not all of our innovation projects are digitalization projects, but more than half of them are”.

Also, general management routines, such as strategy processes, had changed in several owner organizations. In fewer cases, the changes were related to operational processes. This is partly explained by the fact that many of the changes directly concern support functions or new services and then only have an indirect effect on the current operational activities. On the other hand, changing existing operational processes were seen as challenging and time-consuming and such activities were, therefore, expected to continue long after the initial decisions related to digital development.

Routines within supplier organizations and industry associations had to some extent been affected by the changes in the real estate owner organizations. More importantly, however, these actors had actively introduced new routines in the real estate sector, which, in turn, had set new requirements for the capabilities of the real estate owner organizations. A representative of a new supplier (1) explains how their development process differs from traditional industry practices:

“You have to have this agile approach [in product development]. This ‘minimum viable product approach’”.

In a similar vein, a representative of an industry association (2) explains what requirements they impose on real estate owners in their development projects:

“We are choosing the companies [partners] that have the [required] capabilities. And those that are interesting”.

Also, all organizations had implemented changes in their internal structures related to digitalization. Real estate owners saw new demands and higher workloads in their IT and business development functions, and many of them had hired managers with responsibilities specifically on digitalization, thereby acting as innovation managers. A representative of a commercial property owner (2) described changes in their innovation and sustainability function:

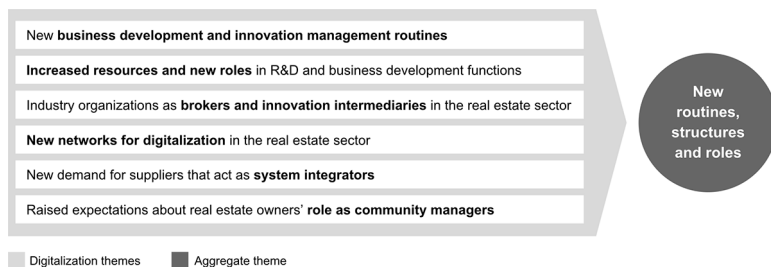


Figure 5.
New routines, structures and roles

One and a half years ago I got this wider [new role] as the head of digital development and sustainability. [...] We started a learning process about digging into digitalization [...] we have worked a lot with innovation in the whole company.

Similarly, many real estate owners had established new organizational units for innovation management, which had not been common practice in the sector previously. A representative of a commercial property owner (3) says that:

We have built, you can say, an R&D department [called “Innovation lab”]. [...] I work with it and we have a new CDO [Chief Digital Officer] coming in. Otherwise we engage other people in our organization.

All of the interviewees reported changes in their collaborations related to digitalization. Most of the interviewed real estate owners had sought new collaborations with various suppliers, competitors, research institutes and industry associations, and many had participated in various regional development projects or PropTech accelerator programs. Several new interorganizational networks had been founded specifically around the themes of digitalization and PropTech, and many of the interviewees participated in the activities of these networks. Still, only a few of the real estate owners had initiated digitalization-related collaborations with tenants, FM operators or building project phase organizations.

The industry associations had assumed new roles as innovation brokers and innovation intermediaries between the real estate owners, suppliers and other actors in the sector. A representative of industry associations (2) states that:

If you look today at an event, where they talk about digitalization of real estate [...] It is very hard for a property owner today to know what is in this for me. [...] I think that there we can be like a trusted partner for the market. [...] Right now, I think we have to be a bridge between these two ecosystems [i.e. real estate owners and PropTech startups].

They have also actively influenced the prioritization of different innovation activities in various collaborations. Further, they have acted as experts in digitalization, advising other actors in the sector and as facilitators of collaborations on digitalization work between these actors.

Similarly, many of the suppliers had assumed the role of a system integrator. These actors state that digital technologies can be used to integrate people, processes and information in the fragmented sector, and they have initiated various new services and IT projects, for example, related to IoT services, access systems and management dashboards. As a new supplier (3) states:

We act as a [IOT] systems integrator. [...] From a real estate owners’ perspective, [...] he would have been forced to talk to 8 different [IOT] suppliers and each of them would offer their own application. [...] Then you would have 8 different logins to different apps. We help this kind of customer to put all of the data [...] into one application.

Finally, the real estate owners’ investments in digital communication platforms had raised the expectations about their role as community managers. Such a role has not traditionally been associated with the responsibilities of real estate owners. Still, suppliers of these communication platforms point out that community management is a complex organizational challenge, which requires collaboration between real estate owners and platform providers.

Discussion

This section discusses the empirical findings in relation to the theoretical framework and the literature. First, organizational innovation capabilities and absorptive capacity are discussed, and then developments on the ecosystem level.

Impact of digitalization on organizational innovation capabilities and absorptive capacity

Digitalization has become an important part of business development functions in the real estate owners' organizations, and resources and capabilities have been added to handle digitalization issues, indicating an increase in firm-level innovation capabilities (Winter, 2003). As most of the firms have prioritized investments related to their current business activities, the increase in innovation capabilities relates to incremental digitization of their current processes, such as energy optimization, facility maintenance and customer service processes. On the other hand, a few of the companies have gone further by investing in new digital platforms and firms, and this indicates that they have developed innovation capabilities that also cover new business areas. Also, these new capabilities may complement work on, for example, sustainability, which is often organized in the same development functions as digitalization in real estate owners' organizations. Further, these new capabilities suggest an increase in firm-level absorptive capacity (Cohen and Levinthal, 1990; Zahra and George, 2002), which may help these firms to process and act on new information related to digitalization in the future.

For the suppliers, digitalization has opened new possibilities to develop services based on digital technologies. This is reflected in the emergence of new PropTech companies in the sector (Baum, 2017; Tagliaro *et al.*, 2020), but also the suppliers that are long-established in the sector have launched new services. Thus, recent developments in digitalization have accelerated innovation activities also in supplier organizations. For some of these firms, the changing needs of the real estate owners' have acted as a catalyst for this development. This indicates that the suppliers are increasingly willing to commit to the real estate sector-specific needs and therefore have increased their sector-specific absorptive capacity.

For the industry associations, digitalization has broadened their traditional mandate, and they have taken on new responsibilities and roles in this area. This indicates an increase in the absorptive capacity in these organizations in the areas of digitalization expertise and innovation facilitation. The increased organizational level absorptive capacity (Cohen and Levinthal, 1990; Zahra and George, 2002) relating to digitalization means that the organizations have developed routines and practices for recognizing new business opportunities, assimilating ideas into their organization and applying them for the development of their own business. Interestingly, the interviewees did not provide examples where digitalization would have influenced their traditional tasks, such as lobbying or legal services. Rather, digitalization develops absorptive capacity that expands the scope of the organization into new services for the member organizations and for the suppliers.

Impact of digitalization on ecosystem-level innovation capabilities

The results of this study show that real estate owners, their technology suppliers and real estate owner industry associations involved the wider ecosystem of the real estate sector in innovations. For example, real estate owner industry associations and technology suppliers actively contributed to the activities on digitalization in the wider real estate sector and advised real estate owners on digitalization strategies. This implies that real estate owner organizations and technology suppliers act as innovation intermediaries and innovation brokers (Howells, 2006) and complement the lack of capabilities in the real estate firms. For example, the industry associations act as trust producers by promoting selected suppliers and as facilitators of the learning processes in the innovation networks. Also, many of the suppliers have assumed the role of a system integrator, which shows how real estate sector actors are working together to develop new digital platforms in the industry. In

the long term, this may help the real estate industry to solve problems related to siloed IT systems.

The real estate owners' experiences from implementing digital technologies in practice may provide proofs-of-concept that are valuable for other members of the innovation ecosystem. Also, the new absorptive capacity in the real estate owner firms makes it possible for the suppliers to sell their services in the sector, as the owners as potential buyers may have a better understanding of these services. However, the finding that real estate owners are not actively collaborating on digitalization with FM operators, tenants and building users may limit the outcomes of innovation activities related to value co-creation in FM, business model innovation and user acceptance of new digital innovations and related services. Nevertheless, these added resources and capabilities can have a long-term positive influence on the innovativeness of the real estate and construction sector as a whole and provide conditions for discontinuous innovation that requires actions in multiple organizations (Pulkka and Junnila, 2015; Engström and Hedgren, 2012).

Conclusion

Digitalization creates opportunities for innovation in the real estate sector, and this article increases the knowledge of the internal organizational capabilities of real estate owners and their surrounding ecosystem. We identify that real estate owners develop innovation capabilities, and among those, an absorptive capacity that makes it possible for real estate owners to assimilate innovations and turn them into new business.

Our results suggest that real estate owners can benefit from the management of their innovation capabilities and absorptive capacity, meaning that digitalization has direct practical implications for the real estate owners and their partners. First, with more business opportunities related to digitalization, there is an increased need for digitalization strategies (Yeow *et al.*, 2018), and innovation capabilities and absorptive capacity can then be helpful. Second, the use of digital technologies imposes additional competence requirements for the employees working in the real estate sector, and therefore, organizations involved in these processes should reevaluate their capabilities. Third, as digitalization processes cross organizational boundaries, organizations should develop capabilities for collaborating with partners in digitalization. Fourth, there is a need to build organizational routines that absorb external innovative ideas and practices and use them to develop innovations internally in the real estate firm.

This research identifies the important role played by industry-level collaboration and various intermediaries, suggesting that research on ecosystems could provide a useful lens for understanding digitalization in the real estate sector. Specifically, digitalization changes the workflows, routines and relationships between actors in the ecosystem, and this is similar to changes that digitalization has brought about in other industries. For instance, in the IT industry, internal organizational innovation management and supply chain ecosystems are integral to the performance of firms (Viswanadham and Samvedi, 2013). Based on insights from these other industries, we can expect that the management of relationships with other actors in the ecosystem will be an increasingly important success factor. Digitalization has the effect that it standardizes information and workflows, thereby facilitating easier coordination in the ecosystem. Digitalization essentially becomes a "system integrator" because it makes it easier for actors in the ecosystem to coordinate to benefit from system-level business opportunities.

Future research could benefit from including other actor groups in studies of the role of digitalization in the real estate ecosystem. For instance, tenants, regulators, financiers, etc., would be very interesting to include to get a more complete ecosystem. Second, this study focuses on the Swedish real estate market, and other studies could apply our findings to

markets in other countries. Third, future research could also include digital maturity models into this kind of research as tools to identify needs for innovation capabilities and absorptive capacity. Fourth, further analysis could delve deeper into the various digitalization contexts, for example, by analyzing differences in digitalization drivers and obstacles and responses to digitalization between categories of property owners.

Finally, as the awareness of the opportunities related to digitalization in the real estate sector is growing, and there is an increased inflow of PropTech entrepreneurs and funding to the sector, there are new opportunities for research on digitalization in the future. We hope to have provided new ideas for research on digitalization from an organizational and managerial perspective.

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