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Temporality, temporariness and keystone actor capabilities in innovation ecosystems

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ABSTRACT

The last years have witnessed a growing scholarly interest in innovation ecosystems, including how keystone actors establish and orchestrate collaborative innovation. In parallel, temporary collaborative innovation efforts are becoming increasingly important to address societal problems. Temporary structures are also used to create a sense of urgency to prompt change. Thus, innovation ecosystems often incorporate temporary structures. However, while keystone actor capabilities to orchestrate an ecosystem over its lifecycle have been studied, the needs for capabilities to coordinate multiple parallel processes with different temporal logics have not been addressed. In this paper, we contribute to the literature on innovation ecosystems in industrial marketing research by examining the challenges and opportunities associated with temporary structures in an innovation ecosystem. Furthermore, we theorize on the implications for the keystone actor orchestration capabilities. The paper is based on a longitudinal case study of a construction project that was used by a keystone actor to gain momentum in its innovation work. Fourteen innovation projects, each involving external partners, were connected to the construction project. We conclude that temporary structures are powerful to enhance innovation, but that preparation is essential to enable the seizing of opportunities in a collaborative and transitory context. Specific orchestration capabilities relate to integrating a linear, time-bound logic with an iterative innovation logic, and to matching ambitions in at the temporary systems with capabilities at the level of the permanent organizations. An important aspect is to find a balance between temporary external resources and long-term internal resources.

1. Introduction

Organizations are increasingly establishing and engaging in fluid constellations where multiple actors cooperate to develop new knowledge, products and services (Adner & Kapoor, 2010; Järvi, Almpanopoulou, & Ritala, 2018; Kapoor & Lee, 2013). In recent decades, the concept of ecosystem has emerged as an attractive metaphor for such dynamic collectives both in the management field in general (Granstrand & Holgersson, 2020; Jacobides, Cennamo, & Gawer, 2018) and in marketing literature (Aarikka-Stenroos & Ritala, 2017; Möller & Halinen, 2017).

Today, we also see an increasing proliferation of temporary organizational structures in society at large, within firms as well as in interorganizational settings (Lundin et al., 2015; Schoper, Wald, Ingason, & Fridgeirsson, 2018). For example, following rising levels of public funding directed towards collaborative innovation and co-creation to meet societal challenges, ecosystems are often set up in fields that are connected with some kind of emergency, with the social and economic crisis due to the Covid-19 pandemic as one recent example (Chesbrough, 2020; Crick & Crick, 2020). This implies that private companies, governments, universities, funding, and philanthropic organizations join together in temporary structures of cooperation to search for innovative solutions (Appio, Lima, & Paroutis, 2019; Kalinauskaite et al., 2021). Such collaborative innovation and knowledge sharing is increasingly important also in traditional industries such as construction (Bossink, 2018; Gluch, Johansson, & Räisänen, 2013; Greco, Grimaldi, Locatelli, & Serafini, 2021).

Considering the central role that temporary collaborative networks

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and projects play in both business and society, it is important to examine more in-depth how aspects relating to temporariness influence processes where multiple stakeholders come together to jointly create new value. Although a temporal lens has been recognized as a powerful way to gain more perspective on organizational issues, such as group performance and organizational transformation (Ancona, Goodman, Lawrence, & Tushman, 2001), the temporary dimension has been largely absent on innovation ecosystems studies in marketing research (Palmer, Medway, & Warnaby, 2017). When temporality is considered, the focus has most often been on how ecosystems and networks evolve over a life cycle of phases and how innovation can be nourished and sustained over time (Aarikka-Stenroos, Jaakkola, Harrison, & Mäkitalo-Keinonen, 2017; Baker & Nenonen, 2020; Moore, 1993; Rabelo & Bernus, 2015; Sant'Ana, de Souza Bermejo, Moreira, & Boas de Souza, 2019). A few studies have highlighted the role that episodic social encounters, often taking place in connection to events such as trade fairs and conferences, play in Industrial Marketing (IM) settings (Hedaa & Törnroos, 2008; Palmer et al., 2017). In this paper, we add to existing knowledge on temporality and temporariness in innovation ecosystems by addressing challenges and opportunities arising in such structures that encompass a variety of parallel innovation and business processes with different temporal logics (Dille & Söderlund, 2011, 2013; Sergeeva & Roehrich, 2018).

Moreover, although innovation ecosystems may emerge and develop in an organic and serendipitous way, it is also common that such systems are purposefully established, orchestrated and sustained, often by a central keystone actor (Aarikka-Stenroos et al., 2017; Furr & Shipilov, 2018; Nenonen, Storbacka, & Windahl, 2019; Schepis, Purchase, & Butler, 2021). The aim of this paper is to investigate keystone actor capabilities to handle challenges and realize opportunities related to multiple temporal logics in an innovation ecosystem.

Our empirical case is situated in the construction sector. In this setting, temporary construction projects often provide the physical infrastructure for various innovation initiatives relating to technological, environmental or social challenges (Bossink, 2018). We study the role of the keystone actor in a construction project that involved multiple partners and innovation projects. The project functioned as a temporary innovation ecosystem but was also deliberately used as a vehicle to spur innovation within the keystone actor organization.

The remainder of this paper is structured as follows. The next section discusses definitions and types of innovation ecosystems and presents previous research on keystone actor capabilities in innovation ecosystems, as well as on aspects of temporality. Section 3 describes the research process and method used to gather and analyze the empirical material in this study. Section 4 presents key findings from the case study, leading to Section 5, which presents and discusses new theoretical insights on keystone actor capability needs. The paper ends with conclusions, limitations of the study and suggestions for future research.

2. Conceptual background

2.1. Innovation ecosystems

The concept of ecosystem has received increasing attention in various disciplines within management and organizational theory. It has been used to signify a variety of collaborative arrangements, and several, partly overlapping, types of ecosystems are mentioned in the literature. Valkokari (2015) differentiates between business, knowledge and innovation ecosystems and discusses how these differ in terms of their outcomes, interactions, logic of action and actor roles. While business ecosystems focus on customer value creation and primarily involve firms (Ritala, Agouridas, Assimakopoulos, & Gies, 2013), knowledge ecosystems focus on the generation of new knowledge, with research institutes and innovators as key actors (Valkokari, 2015). Innovation ecosystems, in turn, integrate knowledge ecosystems (for exploration) and business ecosystems (for exploitation) and typically involve innovation brokers and funding organizations (Clarysse, Wright, Bruneel, & Mahajan, 2014; Jacobides et al., 2018).

Definitions of the innovation ecosystem concept are manifold but generally emphasize the collective dimensions: actors in innovation ecosystems depend on each other to collaboratively produce value by sharing resources (and risks) and by pooling competences (Aarikka-Stenroos & Ritala, 2017; Adner & Kapoor, 2010; Möller & Halinen, 2017). Based on a literature review of research on innovation ecosystems, Granstrand and Holgersson (2020) arrived at the following definition: 'An innovation ecosystem is the evolving set of actors, activities, and artifacts, and the institutions and relations, including complementary and substitute relations, that are important for the innovative performance of an actor or a population of actors' (p. 3). Thus, Granstrand and Holgersson (2020) place emphasis not only on collaboration and complementarities but also on competition, substitutes, and artifacts (tangible and intangible resources such as products and services). Research on innovation ecosystems within IM is still at an early stage (Aarikka-Stenroos & Ritala, 2017; Möller & Halinen, 2017). In a recent special issue on managing business and innovation networks, Aarikka-Stenroos and Ritala (2017), however, noticed a shift in the conceptual focus of IM research from networks towards ecosystems, and argued that this development reflects 'increased connectivity, interdependence, and co-evolution of actors, technologies, and institutions' (p. 70).

2.2. Keystone actor capabilities in the orchestration of innovation ecosystems

Several studies have investigated the purposeful design and orchestration of innovation ecosystems (e.g. Aarikka-Stenroos et al., 2017; Baker & Nenonen, 2020; Furr & Shipilov, 2018; Hurmelinna-Laukkanen & Nätti, 2018; Schepis et al., 2021). The role that a keystone actor plays in shaping and sustaining the innovation ecosystem involves a variety of tasks, such as resourcing, goal setting, motivating, consolidating, coordinating, controlling and leveraging (Aarikka-Stenroos et al., 2017). As Iansiti and Levien (2004) put it, a keystone actor can be seen as regulating the health of the ecosystem. For dynamic environments, where the objectives are less well defined, keystone actors need to purposefully work to identify connections between partners and motivate them to work together to identify new opportunities (Furr & Shipilov, 2018). Similarly, Kodama (2018) emphasizes the need to integrate different knowledge spheres from multiple companies into the ecosystem to underpin a process of co-creation and co-evolution of new value.

However, engaging partners in an innovation ecosystem is not evident. Firms must recognize value before they are willing to openly collaborate while opportunities, typically, arise from active engagement over time (Schepis et al., 2021). Therefore, a keystone actor must establish a structure that, over time, ensures value appropriation for all ecosystem partners and, simultaneously, is able to attract new partners based on their specific needs (Möller, Nenonen, & Storbacka, 2020). Keystone actors have been found to take on different roles over time, which requires both a range of capabilities and adaptability to shift between roles and activities (Hurmelinna-Laukkanen & Nätti, 2018). Fischer, Gebauer, Gregory, Ren, and Fleisch (2010) and Paiola, Gebauer, and Edvardsson (2012) stress the importance of keystone actor abilities to make quick and timely decisions, and to redesign processes to achieve results. The need for more knowledge about the role and capabilities of orchestrators throughout the ecosystem life cycle has been highlighted in innovation ecosystem research (Heaton, Siegel, & Teece, 2019). Further, Bogers et al. (2017) see the need to to better understand characteristics of the innovation architecture, governance and management associated to the ecosystem.

2.3. Temporality and temporariness in industrial marketing research

Within the IM field, most research has focused on business networks that attempt to maintain relative stability in business exchanges and

relationships over time (e.g., Håkansson & Snehota, 1995; Roxenhall & Ghauri, 2004). Hedaa and Törnroos (2008) and Palmer et al. (2017), note that studies of both temporality and temporariness continue to be rare in IM research. These researchers further argue that the focus on mapping of networks in terms of activity links, actor bonds and resource ties has tended to over-emphasize structural and static properties of networks. Palmer et al. (2017) propose a shift towards incorporating ideas of motion and fluidity. Lifting temporariness in space and time, they distinguish between the *temporal*, which implies a notion of time as a continuum, and the *temporary*, referring to a bounded entity or occurrence with a start and end point.

In terms of temporality, ecosystems and networks have a life cycle of their own, evolving over time through various phases (Aarikka-Stenroos et al., 2017; Baker & Nenonen, 2020; Moore, 1993; Rabelo & Bernus, 2015; Sant'Ana et al., 2019). In IM research, features such as co-evolution, mutual adaptation and interdependencies are often emphasized and the evolutionary trajectories are seen as symbiotic (Andersen & Kumar, 2006; Håkansson & Snehota, 1995). Moreover, research on market shaping (Baker & Nenonen, 2020) highlights how collectives of market actors may join together to purposively drive change at the system level.

Linking temporal and temporary dimensions, Hedaa and Törnroos (2008) studied how networks of actors interact over time with networks of events, which may be outcomes of human activity or be caused by nature. Network relationships, then, are influenced by actors' past experiences of previous interactions as well as by their expectations about possible future events (Hedaa & Törnroos, 2008). Building on work in the field of economic geography, Palmer et al. (2017) further propose that IM research should look to research on temporary spatial clusters (TSCs), to incorporate dimensions of fluidity, change and space. TSCs are distinct, mobile social spaces, often situated within specific physical, spatial surroundings. Examples are presentations, exhibitions, meetings, conferences, workshops and trade fairs, although TSCs may also be informal and unplanned encounters. However, while TSCs are episodic, they happen within "the context of an ongoing temporal continuum of passing time, like beads on a string" (Palmer et al., 2017, p. 106). Our study builds on this notion of interacting layers of overlapping processes with varying durations.

2.4. Managing multiple temporal logics

Innovation ecosystems are nested within multiple parallel organizational structures and processes with different temporal logics. Such structures involve the permanent organizations of the keystone actor and other partners, including their long-term relationships. However, within the context of such longer time frames, both business activities (Lundin et al., 2015) and research and development activities (Bossink, 2018; Hoholm & Olsen, 2012; Stjerne, Söderlund, & Minbaeva, 2019) are frequently conducted in the form of temporary interorganizational projects. Thus, it may be necessary for a keystone actor to align and coordinate activities not only between temporary and non-temporary organizational structures (Sergeeva & Roehrich, 2018); Söderlund & Pemsel, 2021) but also between several parallel temporary structures. Below, we outline principles and challenges related to the governance of such temporary settings.

Intentionally temporary organizations, often labelled projects, are typically initiated by the commitment to a certain task and terminated at its completion, by the attainment of a particular state, or by reaching a predetermined timeline (Grabher, 2002; Manning & Sydow, 2011). Projects are often associated with creativity and innovation (Jensen, Thuesen, & Geraldi, 2016) and may also be designed specifically to facilitate innovation (Appio et al., 2019; Kalinauskaite et al., 2021). In effect, projects are frequently used to enhance organizational change by creating a bracketed temporary zone and a sense of urgency (Ancona et al., 2001; Jensen et al., 2016; Söderlund & Pemsel, 2021).

The 'iron triangle', referring to the typical project goals of time, cost, and quality, shape the culture in many projects (Ogunlana, 2010). Project processes are transitory and sequential, often governed by formal stage-gates. The linearity implies that project management strives to minimize the occurrence of iterations, especially between stages. Since each phase in a project is experienced only once by each unique project organization, there is a tendency towards satisficing (settling for 'good enough' processes) when handling new organizing needs (Eriksson & Kadefors, 2017). To enhance efficiency, temporary organizations are often characterized by high degrees of standardization. Hence, project management routines typically follow processes formalized by bodies such as the Project Management Institute (Lundin et al., 2015). Roles and routines that are institutionalized on a sector level provide predictability and coordination of tasks in project-based industries (Bechky, 2006; Kadefors, 1995). These stable institutional structures (Biesenthal, Clegg, Mahalingam, & Sankaran, 2018) are related to strong temporal norms (Dille & Söderlund, 2011). The task and time orientation typical for professionalized project management, then, is challenging to reconcile with long-term, but slower, organization-level learning, as well as with an iterative and explorative innovation logic (Eriksson, 2013; Hoholm & Olsen, 2012; Perlow, Okhuysen, & Repenning, 2002; van Berkel, Ferguson, & Groenewegen, 2016). If a project involves organizations and actors with contradictory expectations relating to time and timing, these potential conflicts will have to be managed to avoid temporal mismatches (Dille & Söderlund, 2013; 2011). Various project management techniques, such as schedules, milestones and meetings, are used to coordinate and mediate among conflicting temporalities. However, tensions are common (Dille & Söderlund, 2013) and the need for boundary-spanning roles has been emphasized (Stjerne et al., 2019).

Another important dimension of temporality is that of organizational and individual learning over time. Especially in regard to implementing new practices, active brokering may be needed to render the novel phenomenon meaningful to different groups (Reinecke & Ansari, 2015). Agndal and Nilsson (2019) discuss the need for 'entrainment' when designing management interventions to transform interorganizational relationships. This implies that such interventions are adapted to the evolving capabilities and motivations of partners and individuals, 'pacing a change initiative to not overwhelm organizational members while still maintaining change momentum' (Agndal & Nilsson, 2019, p. 18).We suggest that the need to synchronize long-term change processes within permanent organizations with innovation projects and, often, fast-paced business projects is a central aspect to consider when establishing and orchestrating interorganizational innovation ecosystems.

2.5. Implications for the research focus

Various aspects related to temporality have received attention in previous work on innovation ecosystems and networks. Thus, the idea of phases in the perspective of life cycle processes explain how innovation ecosystems may emerge, develop and dissolve (Aarikka-Stenroos et al., 2017; Moore, 1993; Rabelo & Bernus, 2015; Sant'Ana et al., 2019). As outlined above, this perspective encompasses the role and capabilities of keystone actors. Long-term emerging processes of coordinated collective action have also been examined in studies of market shaping, with Baker and Nenonen (2020) as an example. Temporariness has received less attention, but an important stream of research focuses on temporary events and encounters, or temporary spatial clusters (TSCs), including the role these play in long term processes (Hedaa & Törnroos, 2008; Palmer et al., 2017).

Our focus in this paper relates to TSCs that are more extended in time than the episodic events studied by Palmer et al. (2017) and Hedaa and Törnroos (2008), but which are still intentionally temporary and bracketed in time. The opportunities and challenges associated with such temporary and dynamic clusters of actor relationships differ substantially from those in stable structures of exchange (Eriksson & Kadefors, 2017; Sergeeva & Roehrich, 2018). In particular, we

acknowledge that several temporary clusters may co-exist, creating parallel relational spaces which interact, both between themselves and with more long-term relationships and organizational structures, sometimes presenting actors with contradictory expectations and goals (Hoholm & Olsen, 2012). More specifically, the paper shows how multiple temporal logics affect keystone actors' capabilities to effectively orchestrate an innovation ecosystem. These include selecting members and influencing their interactions (Furr & Shipilov, 2018; Helfat & Raubitschek, 2018), as well as handling the specific temporal properties of the intertwined processes and organizational structures of the partners involved in the innovation ecosystem (Dille & Söderlund, 2011, 2013).

3. Methodology

With the aim of generating contextualized explanations (Welch, Piekkari, Plakoyiannaki, & Paavilainen-Mantymaki, 2011) and unfolding the 'black box' of *how* a keystone actor orchestrates collaborative innovation in an ecosystem encompassing processes with multiple temporal durations and logics, a qualitative research approach (Silverman, 2019) was chosen. A single case study (Dyer Jr & Wilkins, 1991; Ridder, 2017) was deemed relevant to provide a critical and illustrative case that constitutes a powerful example (Siggelkow, 2007). The case was selected as it was likely to generate a wealth of information on the development of an innovation ecosystem, bringing forward the temporality and temporariness aspects, and also because it was available for the researchers to follow in real time (Miles & Huberman, 1994). Illustrative cases with a contextualized explanatory approach are useful when developing existing theory, not by discovery but by conceptualization and making suggestions for further research (Ridder, 2017; Welch et al., 2011).

3.1. Case description

The research is based on a three-year real-time longitudinal study of a construction project for an office building situated within a science park in Sweden. The owner and construction client of the building is Akademiska Hus (AH), a state-owned company that builds and manages properties for universities. AH is one of Sweden's largest construction clients. The construction industry is a project-based industry where development and production are conducted in construction projects, with temporary multidisciplinary organizations, one-off products and on-site production, causing difficulties driving strategic programs for innovation (Bresnen, Goussevskaia, & Swan, 2004; Sergeeva & Roehrich, 2018). Thus, the industry is suitable for studying temporality.

A few years earlier, AH had begun a process to develop its innovation capabilities, but this process had lost momentum. The previous individual-based innovation processes initiated at local levels had been discontinued but not yet replaced by any strategic initiatives. About a year after AH's innovation strategy was in place, although not yet operationalized into any noteworthy innovation activities, both top management and the central functions within AH experienced a sense of urgency. To put the strategy into practice, it was decided to attach several innovation projects to a large construction project. Also, the innovation projects should be related to the innovation areas outlined in the strategy and conducted in collaboration with external partners. The construction of an office building, later named A Working Lab (AWL), was identified as a suitable project. The building was to be used by AH employees, which provided a larger degree of freedom than 'normal' construction projects would have. In addition, its location in a science park offered not only proximity to expertise knowledge but also a space that signaled novelty and innovation.

Moreover, in its innovation strategy, AH stated the aim of working in a collaborative way with strategic partners, which differed from earlier, internally driven development work. Within the work of defining an innovation strategy, AH had formed partnerships with selected external organizations for closer collaboration. This created a set of actors that was useful for developing an innovation ecosystem that different innovation projects could tap into.

3.2. Data collection

Data were collected between 2017 and 2019, and to increase the validity and transferability of the research results (Flick, 2014), multiple sources of empirical material were used. The empirical material was collected on multiple organizational levels, with semi-structured, in-depth interviews (Kvale, 2008) as a primary source, supported with observations from meetings, documentation of project documents and notes, and data from a digital logbook where a set of participants provided reflections on the process. The data collection methods are listed in Table 1.

To create an understanding of the causal dynamics in a specific contextual setting (Welch et al., 2011) and to capture various stages of the process (Langley, Smallman, Tsoukas, & Van de Ven, 2013) the interviews were conducted on three occasions: before construction started, during construction, and after the project was completed. A first set of 14 interviews was performed in 2017. A second round in 2018 and final follow-up interviews after the project's completion and official end were conducted in 2019. Logbook responses were collected between interview round one and two to follow the process.

The interviewees were either employees of AH or of their partners. Interviewees from AH were selected in order to obtain perspectives from different levels within the organization as well as different functions. Among the partners, interviewees comprised a selection of people from strategic partners and experts from other participating firms, including two innovation consultants who facilitated and organized the collaborative set-up. The interviews were performed on three levels: top management, central functions and project (Table 2).

30 interviews, ranging between 60 and 90 min in duration, were conducted by three of the researchers. All interviews were recorded and transcribed. The semi-structured format allowed for open-ended questions allowing for prompting and probing to elicit further reflections from the interviewees (Kvale, 2008). A semi-structured interview protocol was used where the questions were related to how organizational processes in the innovation projects, construction project, and the central organization of AH were established, interacted and evolved over time. The interview protocol was customized depending on the role and perspective of the interviewee and was pretested on a contact within AH. The interviewees had several opportunities to offer their feedback during later rounds of interviews, at a workshop and on different presentations of preliminary findings.

3.3. Data analysis

We approached the data analysis in multiple ways. Following an abductive qualitative research approach, moving back and forth between data and theory (Dubois & Gadde, 2014), the analysis builds on the concepts of innovation ecosystems, temporality, temporariness and keystone's capabilities, which provide a multidimensional perspective on organizational activities in innovation ecosystems. We started by reviewing the data to develop a comprehensive description of the empirical setting. The analysis was data-driven, and the empirical

Table 1
Data sources.

Interviews	30
Meeting observations	15 h – Strategic AH meetings 20 h – Innovation project meetings 5 h – Construction project meetings
Reflective logbook	8 participants filled in a short digital logbook at 12 different occasions over a period of 32 weeks.

Table 2
Interviews on different organizational levels.

Level	Number of people interviewed, (number of external actors)	Interviews 2017	Interviews 2018	Interviews 2019	Total number of interviews
Top management	3 (0)	2	1	1	4
Central functions	6 (2)	4	4	2	10
Project	11 (7)	8	6	2	16
Total	20 (9)	14	11	5	30

material was organized into meaningful groups, forming the basis of the coding scheme. The codes were collated into broader themes, and then reviewed to consolidate and identify the most salient themes relevant to the research questions (Silverman, 2019). Next, the themes were labelled and refined by returning to the literature.

To ensure the validity and quality of the analysis, two types of triangulation (Denzin & Lincoln, 2008) were performed: (a) method triangulation, where field material compiled from different types of sources was compared to ensure the consistency of findings using different data collection methods, and (b) data triangulation, where the empirical material collected from different people at different times around the same phenomenon was compared. Here, different sets of the empirical material were analyzed separately. By triangulating, conclusions are likely to be more reliable, particularly if the data have been collected by multiple methods, which is an advantage in a qualitative study (Denzin & Lincoln, 2008).

4. Findings

As depicted in the case description, AH selected a construction project as a platform for initiating and enhancing collaborative innovation. AH's size, its sound financial resources and its good reputation as a respectable partner known for high-quality standards and skilled and competent employees, together with the company's focus on innovation and sustainability, attracted several collaborative partners to participate in the project. A total of seven partner organizations were involved in the innovation projects, including research institutes, expert firms in specific fields and engineering consultancy firms. Below, the process of starting the collaboration and how processes and structures evolved over time are described.

4.1. Identifying and starting up innovation projects

Supported by AH's top management, an initial group within AH drove the idea to have multiple innovation projects in one construction project. In line with areas defined in the innovation strategy, suggested innovation projects related to both current technological strengths within AH, such as energy technology and novel building material, and future challenges, such as digital infrastructure, future learning and working environments and campus development. Workshops were organized with people from various internal departments at AH as well as external partners, who comprised members of academia, research institutes and experts from other firms. The existing strategic partnerships were now activated in relation to the innovation projects in the AWL project and included important contributors for activating the innovation ecosystem, as expressed by manager 1, central function AH:

> *During the earlier strategy work, we had already been in contact with several actors as we were interested in working more collaboratively in new areas and advancing our knowledge. So, at the workshops we connected to earlier discussions and started to carve out potential [innovation] projects of mutual interests.*

Based on ideas from workshops with partners and responding to the urgency of defining innovation projects, interorganizational teams were formed quickly in order to conduct brief prestudies and project plans. The plans served as the base for deciding which innovation ideas to select for further development. The engagement from invited firms was strong, and as many as 18 prestudies were conducted. In forming the teams, people were identified not only internally within AH and from the strategic partners in the AWL project but also through a wider network of experts and researchers. In the words of project manager 5, AH:

> *Teams expanded as we involved new people from our networks of researchers, engineering experts and contractors to develop the ideas further. Based on what knowledge and expertise we needed, we tried to find people to engage through our contacts. … At a certain point, we also realized that we could do so much more, rather than relying on having competence available inhouse.*

Manager 9, central function AH, recalled:

> *As we went on, we soon realized that we had to rely on external competence more than on internal [competence]. Two challenges became evident: We had to secure that we involved internal competence enough to secure knowledge transfer, and that we could make use of this external expertise. Second, we needed to balance the [externals'] lack of understanding of internal processes and way of working, but at the same time have trust in the knowledge and expertise they had, also in how to work together.*

AH had as part of the earlier innovation strategy work established an internal Innovation Council that consisted of members from the top-management team and internal experts representing various technology areas. In this council, innovation projects were discussed and approved based on strategic importance and feasibility. Technologically oriented innovation projects (e.g. energy, building material) came in at a fairly steady pace, while other projects, such as a learning lab and new forms of co-working concepts took longer to develop. Although the innovation projects differed in many respects, basic templates and other standard models were developed to reduce complexity and provide a common basis for AH to decide about approval.

In all, 14 collaborative innovation sub-projects were developed using the ecosystem and attached to the AH construction project, AWL. Of these, 12 were started during winter 2016, and two more began in early spring 2017 (see Table 3). In parallel with developing innovation ideas and project plans, the demand for structures for decision-making and coordination became evident; we describe this in the next section.

4.2. Developing structures for decision-making and coordination

The need for structures, processes and routines to manage the 14 innovation projects in relation to AH's internal departments and management, partners and, not least, the AWL construction project to which the innovation projects were to be integrated increased over time.

Two innovation management consultants who had been involved in AH's earlier strategy development work were engaged by AH early in the process to facilitate the innovation projects. One of them was assigned the overall responsibility of leading a group in charge of managing and coordinating the multiple innovation projects in the construction project, while the other supported AH's internal strategy work. Together with the initiating team at AH, they formed an innovation project group that led the work to establish structures and routines for meetings and processes for documentation and decision-making. Time pressure was high, and the workload for the innovation project group and the AWL construction project leader increased in intensity.

Table 3
Innovation projects and areas.

Innovation area	Project	Product or Process	Innovation project leader
Digital infrastructure	BIM (Building Information Modelling) in building life-cycle management	Product	Partner firm
	Data infrastructure	Product	Research institute
	Visualization	Product & Process	Partner firm
Energy and resource effective building	Fossil-free energy district	Product	AH
	CO2 emission	Product	AH
	Acoustics in wood-frame buildings	Product	Research institute
	PCM cooling system	Product	Research institute
	DC micro grid for solar cell system	Product	Partner firm
	Weather protection during construction	Product	AH
Future learning environments	Active learning WS room	Product	AH
	Multifunctional lecture halls	Product	AH
	Future workplaces	Product & Process	AH
Connecting meeting places	Electricity	Product	AH
Working processes	Learning leading innovation	Process	Partner firm

In relation to each innovation project, innovation teams were established. Seven of the innovation projects were led by project leaders from partner organizations and seven by project leaders from AH. Relying on partners as project leaders was, initially, regarded within AH as a risk; however, as innovation projects proceeded, these external project leaders were rather seen as an invaluable resource for AH. Manager 11, central function AH, explained:

> *We did not have the right or enough competence available to have all innovation projects led by our own people. The idea with having an innovation project in collaboration with partners is also to gain and develop new knowledge. We had to rely on it working to have project leaders from external partners that were highly competent regarding the subject but had less experience managing construction projects and our internal decision and work processes. Everybody was on their toes and really committed to support it, to make it work*.

These project leadership roles were open and adaptable to the needs of the innovation project and the competence of the individual project leaders. As external project manager 7 remarked:

> *When I was asked to be project leader for the innovation project BIM in operations and maintenance, I did not know exactly what that meant. I didn't have the experience or knowledge of the internal processes,* etc. *in AH or knew what to expect in terms of managing these kinds of projects. However, I and the small firm I work for are very much involved in driving the development of technology and solutions in the field of BIM, and knowing AH to be a competent actor, I was thrilled to take on this challenge. I also had a good network of competent people and firms that I could draw on here.*

Organizing the innovation work in itself, required significant time, and many meetings were set up for the sole purpose of deciding on the meeting structure. In addition, the innovation management consultants had knowledge about innovation management but no authority to change or introduce new organizational structures and processes within AWL. The result was a complex and heavy structure. As innovation project manager 2, AH, recalled:

> *New processes, structures and roles were put on top of already existing ones. At one point in time, guidelines, decisions, and answers to questions were not made or communicated, and people had to make the best of it. And they did.*

Manager 13, central function AH, mentioned:

> *It became a structure with a lot of meetings, and we realized that we would have needed a different approach than just adding on. However, it was too late, so we just had to muddle through.*

There was a common perception that decisions from the central innovation management group in AH were always behind in the time schedule, which created a lot of frustration not only between the site management of the AWL construction project and the different innovation project leaders, but also between the AWL innovation organization and the central functions in AH. According to innovation management consultant 3, external:

> *We need support in terms of decisions, guidance on priorities, risks, financial matters* etc. *Now! But we don't hear a thing, no matter how loud we shout. We have now made decisions on our own.*

An aspect that contributed to the difficulties experienced in finding and implementing efficient structures for coordination and decision-making was that the implications of adding a set of innovation projects to an established structure and processes of a construction project were poorly understood. The construction project manager 5, AH, reflected:

> *We are used to having reliable, flexible and good processes in place, and [we] did not really understand that those would not be enough to manage what we now had started. Even if we are used to collaborating with external parties in all construction projects, this is different since we did not have a ready specification of the content in the innovation projects. The whole thing with innovation was new to us.*

A manager at a strategic partner organization, manager 6, pointed out:

> *As a strategic partner, we had discussions on high managerial levels regarding focus in the innovation projects and financing, with a high commitment. However, we were not really involved in the operational organization but understood late in the process that we might have needed to be. Our focus was more on how we learn from this and whether we can deepen our collaboration for the future.*

According to the project leader for AWL, the main construction project, this was due to different process logics. This is revealed in the following statement from innovation project manager 14 at AH:

> *When I then came in and started to understand what the innovation projects were accomplishing, how they worked and progressed in relation to the AWL project, I first got worried. It seemed like a mess, and the coordination between the construction project and individual innovation projects did not work at all. After a while, I understood that the reason was because they worked very differently – the innovation projects were more iterative, and the construction project followed a linear stage-gate process. When I and people in the [innovation] projects got help to understand how to manage those different ways of working, it became much better*.

Moreover, the innovation project manager 4 (external) recognized:

> *For us in the innovation projects, it became evident that we needed to take a greater responsibility also for the integration with the construction project as well as connection to the internal departments at AH. Even if we did not have the decisions we needed, we continued to do the best according to our knowledge and coordinate with the main project leader of the construction project.*

To facilitate coordination and to build trust, it was decided that each innovation project team should include two representatives from the construction project. These came to serve as a link between the construction project and the innovation projects, bridging between their different practices.

4.3. Integration of innovation projects and the construction project

As previously mentioned, AH experienced coordination problems between top management and various internal departments, with a lack of learning between different units. A new Strategy and Innovation Department was, therefore, established centrally in AH. Even if this gave the project leaders, both internal and external, the message that a solution was being worked on, it was in relation to needed support perceived as not arriving fast enough. The construction project manager, AH, expressed:

> *We heard about this new department 'Strategy and Innovation', and we asked them for help several times but heard nothing back. We just had to make decisions in the construction project to the best of our ability.*

On the same topic, project manager 2, AH, said:

> *Even if it was decided to set up a new central coordination function – since it was an experienced need for coordinating between projects, between projects and central management, and also with external partners and actors – the function was not in place fast enough. And when it was in place, they had a different understanding of focus and responsibility. So, in reality, the need we had for support was not met.*

When the AWL project was up and running, discussions began on how to utilize the experience of managing a project of this kind and learning from it when going into other construction projects. There was a growing awareness of the risk that the innovation management knowledge would not reach the organization but rather stay with the innovation consultant. Experiences from AWL were to be developed further to enable collaborative innovation projects attached to regular construction projects, also for the future, even if these would not be as many as in the AWL project. Project manager 10 at AH stated:

> *It has been a mess, from start to end, but it showed that we now can organize and prepare better for the future. If we had understood what we started, I don't think we would have done it, not with so many projects. Do we regret it? No, absolutely not. We learned a lot, and I hope we will have more innovation projects in collaboration with partners in future building projects but not that many at the same time.*

As they neared the completion of the construction project, several of the partners stated that they wanted to continue to work in a similar way for new innovation projects. As a result of the innovation projects, new development projects related to some of the innovation projects, notably digitalization, construction material and the AWL science park concept, have been further elaborated since the AWL project. The central support function for innovation has continued to develop and now has a defined role in relation to top management, the different central departments and construction projects. Specific processes to manage innovation projects connected to construction projects have also been developed based on the learnings from the AWL project. However, AH has not initiated any temporary innovation ecosystems similar to the AWL project.

5. Discussion

Keystone actor capabilities include identifying participant members and influencing their interactions (Helfat & Raubitschek, 2018), as well as managing the specific temporal properties of the intertwined processes and organizational structures of the partners involved in the innovation ecosystem (Dille & Söderlund, 2011, 2013). In this section, the empirical findings are discussed in connection to the keystone actor capabilities to handle challenges and realize opportunities related to multiple temporal logics in an innovation ecosystem.

5.1. Temporary processes and collaborative innovation

Temporary organizations may be conducive to enhance innovation, and projects organizations are often used to drive change (Ancona et al., 2001; Jensen et al., 2016; Söderlund & Pemsel, 2021). The AWL case was a result of such intentions. In effect, the entire AWL project was a way to prompt innovation action within the keystone actor organization and 'get out of the starting blocks'. In many respects these ambitions were fulfilled, since the strict goal orientation and transitory logic (Grabher, 2002; Manning & Sydow, 2011) of the construction project created a valuable and desired sense of urgency that incited action.

As emphasized by previous research (Aarikka-Stenroos & Ritala, 2017; Baker & Nenonen, 2020; Möller & Halinen, 2017), the empirical case illustrates the value of collaborative innovation processes where knowledge and resources of many organizations may be shared and combined to shape an innovation ecosystem. As a basis for exploring new knowledge and ideas for innovation projects, AH acting as a keystone actor, purposefully put efforts to attract multiple actors with diverse skills and resources (cf. Kodama, 2018; Schepis et al., 2021). The temporary nature of the AWL project, with its limited windows of opportunity, had important implications for establishing such collaboration.

Clearly, existing business relationships with strategic partners were valuable, since these could be quickly restarted and mobilized. This is in line with earlier research showing that sleeping relationships maintained during the latency period between projects can be reactivated when a need arises (Bengtson, Havila, & Åberg, 2018; Poblete & Bengtson, 2020). These strategic partners subsequently contributed to the development of the innovation ecosystem by identifying additional knowledge resources and potential actors to be invited. AH's high level of legitimacy and attractiveness as an innovation partner and keystone actor facilitated the process of enrolling new actors within a short time.

Further, the presence of an innovation strategy, stating specific areas for innovation, provided some direction in terms of focus, while, at the same time, allowing for modifications and additions based on partners' specific knowledge. In this search process, the keystone actor's own needs were balanced with the corresponding needs of the collaborative partners (Möller et al., 2020; Schepis et al., 2021). However, since the strategy was fairly open, without specification on what type of information top management required to make decisions about the approval of innovation projects, some innovation projects were approved without strong connection to long-term strategies of AH.

The high number of approved projects was in itself a major challenge for the keystone actor. Thus, in line with previous studies (Palmer et al., 2017), our findings show the importance of strategies, established relationships to key partners, high legitimacy, routines and other resources already present when deciding to use a temporary project as an arena for innovation. Temporariness prompts action, but also poses higher requirements on upfront preparation and planning than emergent innovation ecosystems without such time constraints.

5.2. Coordinating processes with different temporal logics

As highlighted in research on long-term relationships (e.g., Aarikka-Stenroos et al., 2017; Möller et al., 2020; Schepis et al., 2021), the keystone actor AH played an important role in attracting members and managing co-creation over time. However, while literature has focused on different roles and capabilities of keystone actors in relation to lifecycle processes (Baker & Nenonen, 2020; Hurmelinna-Laukkanen & Nätti, 2018) and dynamic coordination in general (Fischer et al., 2010; Paiola et al., 2012), our empirical findings demonstrate how the keystone actor struggles to continuously synchronize processes on

multiple levels.

First, there was a need to develop new temporary structures and resources to *manage temporarity in the innovation ecosystem*. An important decision that AH made in an early stage was to involve external consultants to coordinate tasks related to innovation leadership and management. In addition, several new roles relating to innovation management were created, which implied that participants often needed to adjust to new role expectations. Routines for decision-making and driving innovation work within the AWL project were also developed, as well as templates and models to support those routines. Initially, most innovation management tasks landed on the innovation management consultants, but the innovation project leaders and the construction project manager could partly take over as they, over time, developed capabilities of their own. Still, in line with earlier studies on temporary organizations (Eriksson & Kadefors, 2017), there was little time and not sufficient incentives within the AWL project to invest in fine-tuning organizational structures and processes for orchestrating the temporary ecosystem to fully enable seizing of opportunities.

Second, new structures had to be coordinated with activities and roles within the *temporary construction project*. Initially, the decision to use AWL as an innovation arena was to gain momentum (see Section 5.1). However, the construction project and the innovation projects had fundamentally different logics, as the iterative innovation projects could not be predicted and planned in the same way as regular construction activities. This produced substantial tensions (cf. Dille & Söderlund, 2013; Matinheikki, Aaltonen, & Walker, 2019) and a need for boundary-spanning roles (Reinecke & Ansari, 2015; Stjerne et al., 2019) to bridge between the innovation projects and the construction project. Nevertheless, a strong commitment to innovation developed over time within the AWL project organization. As such, the construction project partners were willing to make efforts to adapt to innovation needs when given some guidance and explanation.

Third, new structures had to align with long-term development in the *keystone actor's permanent organization*. Attaching innovation projects to AWL was a local initiative, although supported by top management, and central levels at AH were not prepared to handle all emerging requests for decisions and support structures. Echoing previous research on innovation in project-based organizations (Bresnen et al., 2004; Dubois & Gadde, 2002; Sergeeva & Roehrich, 2018), the relationship between structures at the permanent organizational level and at the project level was weak. Thus, while the AWL project was fairly successful in reconciling the temporal tensions between the innovation project and the construction project, the demands for organizational changes at higher, central levels within the AH organization presented additional difficulties. For example, there was an entrainment challenge (Agndal & Nilsson, 2019) to align capability development within the keystone actor with the needs of the AWL project.

Fourth, alignment was needed with temporary and permanent structures also within the *innovation partner organizations*. Several of them suffered from a lack of long-term innovation strategies and a clear agenda for what they wanted to gain from their role as partners to AH and their participation in AWL. To this regard, needs for entrainment involves also activities directed towards the wider market (Baker & Nenonen, 2020).

5.3. Implications of temporariness for keystone actors and innovation ecosystems

In line with previous research (Baker & Nenonen, 2020; Furr & Shipilov, 2018; Gastaldi & Corso, 2016), our empirical results reveal how AH purposefully took on the role as the orchestrating keystone actor, successively developing its abilities to integrate, build and reconfigure the knowledge and competence within the innovation ecosystem. The case was however extreme in the sense that a large number of innovation projects were introduced at a fairly late stage in a highly time-bound construction process. This intense innovation activity at the project level required considerable management knowledge and capacity from AH as a keystone actor. Clearly, the high but temporary demand for resources presented the keystone actor with a dilemma.

Competence for coordinating and leading innovation was not available inhouse. The company, therefore, hired consultants to perform such tasks. This was valuable since these external parties brought new knowledge and networks to the project. Still, consultants generally lack knowledge of the internal processes and priorities of their clients and, perhaps more importantly, the power to influence and change such aspects. In this case, the mismatch between task and power resulted in an overload of project meetings and 'muddling through' with improvised interventions and workarounds. Further, even if efforts were made during the later phases to transfer knowledge, much innovation management knowledge stayed with the consultants. Thus, our findings powerfully illustrate the importance of keystone actors' capabilities to set their ambitions at a level that allows them to achieve a viable balance between temporary initiatives and long-term resources.

Further, relationships of various temporal duration complement and overlap in connecting actors for the purpose of collective innovation. Keystone actors engage in market level activities such as conferences, trade fairs, exhibitions and workshops (Hedaa & Törnroos, 2008; Palmer et al., 2017). They may act upon contacts established in such fora to establish temporary relationships of longer duration, entailing higher stakes but also a higher potential for joint value creation. Such longer-lasting but still temporary bracketed zones may spur action, and it can also be easier for both keystone actors and partners to engage in collaborative endevours that do not require long-term commitments.

6. Conclusions

The ecosystem concept has received increasing attention in marketing research in recent years (e.g. Aarikka-Stenroos et al., 2017; Möller & Halinen, 2017). Adopting a temporal lens has been recognized as a powerful way to view organizational phenomena (Ancona et al., 2001) and capabilities of keystone actors in relation to life-cycle processes in ecosystems has been addressed in IM research (Baker & Nenonen, 2020; Hurmelinna-Laukkanen & Nätti, 2018). However, few studies have systematically explored the role of temporary structures in business relationships in general (Palmer et al., 2017), and temporariness has been largely absent also in research on innovation ecosystems. Based on insights from an in-depth case study of an innovation ecosystem established in conjunction with a construction project, this paper addresses this gap by investigating keystone actor's capabilities to handle challenges and realize opportunities related to multiple, parallel temporal logics in an innovation ecosystem.

A keystone actor needs the capability to engage in collective actions through orchestrated strategies and initiatives to shape the ecosystem exchange over time (Baker & Nenonen, 2020; Nenonen et al., 2019). The empirical case illustrates how a keystone actor purposefully can use a temporary project as a way to prompt innovation. The time pressure, limited windows of opportunity and fixed end date created a sense of urgency. Thus, temporary structures can play an important role in enhancing innovation and facilitating seizing of opportunities.

Our findings also suggest that introducing temporary structures to drive innovation has consequences for the management capabilities required from the keystone actor. In a temporally bounded and transient context, where time pressure is high, orchestration capabilities present in early stages substantially affects the chances to realize the potential for joint value creation. Thus, keystone actors are helped by their preparatory investments in reputation, partner relationships, innovation strategies, resources and routines relating to management of collaboration and innovation.

Further, the keystone actor needs to skillfully integrate and balance between different temporal institutional logics (Dille & Söderlund, 2011, 2013; Sergeeva & Roehrich, 2018). As the analysis of our empirical material revealed, there was the iterative logic of the

innovation projects, the transitory and strongly time-bound logic of the building project, and the long-term change processes within the keystone actor and other permanent organizations involved. Integrating such parallel processes is a challenge, especially when temporary structures to drive innovation require more innovation management capacity than a keystone actor can sustain on a long-term basis. Then, consultants may be engaged to fill this need and bring in additional knowledge and relationships.

However, permanent resources in the keystone actor's organization are still required to provide direction, manage change processes within the permanent organization, and plan for wider dissemination of innovations. Thus, a core capability of a keystone actor, when deliberately using a temporally bounded structure to incite innovation, is the ability to find a viable balance between, on the one hand, innovation ambitions and resource needs at the temporary level and, on the other, long-term strategies and resources within the permanent organizational units. Previous research on temporality in the the IM field has either focused on episodic temporary events and encounters in relation to long-term processes (cf. Hedaa & Törnroos, 2008; Palmer et al., 2017) or on orchestrated collective collaboration to drive innovation processes (cf. Baker & Nenonen, 2020). The results of our study add to these research streams.

6.1. Limitations and future research

Although the use of a single longitudinal case study has revealed in-depth insights, additional data collection in multiple cases is called for. In the studied case the temporary system was a construction project, but it can also be, for example, a testbed or a publicly funded collaborative research project. Further research is needed on how multiple temporal logics play out in other contexts. Also, perspectives of other actors in the ecosystem should be explored more in depth.

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