Evaluating the Value of Emerging Digital Platform Ecosystems: Lessons from the Construction Industry

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EVALUATING THE VALUE OF EMERGING DIGITAL PLATFORM ECOSYSTEMS: LESSONS FROM THE CONSTRUCTION INDUSTRY

Research Paper

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Abstract

Despite previous research on well-established digital platforms aimed at business-to-consumer markets, there is a limited understanding of how smaller actors of project-based industries create new business-to-business digital platform ecosystems. This paper explores how incumbent actors evaluate business value as they transition towards an emerging ecosystem. Based on two cases of construction companies in Finland and Norway, we describe how the actors’ perception of value changes during the early stages of their digital transformation process. We present a non-exhaustive list of criteria different than costs and revenue, which the actors relied upon to evaluate or measure the value of their emerging platform. From a theoretical perspective, we expand previous studies on digital platform ecosystems and value creation. From a practical perspective, we discuss how to adapt existing business models and manage new partnerships for an emerging ecosystem.

Keywords: Digital platforms, emerging ecosystems, value creation, business-to-business, construction

1 Introduction

Digital platforms have become ubiquitous and permeated different areas of society. In the fields of strategic management and Information Systems (IS), several authors have explored the definition and components of digital platforms (de Reuver, Sørensen, & Basole, 2018; Hein, 2020; Rolland, Mathiassen, & Rai, 2018), the relationships between platform owners and complementors (Ghazawneh & Henfridsson, 2013), as well as the market and network effects generated by such platforms (Gawer & Cusumano, 2014). Despite the significant research contributions analysing industry platforms managed by well-established tech companies (Gawer & Cusumano, 2014; Ghazawneh & Henfridsson, 2013; Selander, Henfridsson, & Svahn, 2013), we have a limited understanding of how smaller incumbent actors articulate their efforts or attain the required capabilities to create new ecosystems (de Reuver et al., 2018; Hein et al., 2019, 2020).

Recent IS literature has called for more research on emerging industry platforms (Gawer & Cusumano, 2014) and how new value creation practices are established between partner firms in a business-to-business (B2B) context, whose needs differ from those covered by the existing platforms in business-to-consumer (B2C) markets (Hein et al., 2019). There is also limited research on how incumbent industry actors transform their traditional goods-dominant (G-D) supply chains into service-dominant (S-D) ecosystems (Hein, 2020). Previous contributions have mostly relied on historical case studies (Ghazawneh & Henfridsson, 2013; Selander et al., 2013), but the real-time observation of changing platform dynamics over time is still lacking, especially in cross-case studies offering an insider’s view of the actors’ discourses and motivations (de Reuver et al., 2018).

Digital transformation strategies often entail finding new value propositions or redefining the networks of participants involved in value creation (Matt, Hess, & Benlian, 2015; Vial, 2019). IS literature has
widely explored the economic perspective of so-called network effects or network externalities in B2C platforms, which generate a positive reinforcement loop where actors see more value in the ecosystem as the existing user base expands (de Reuver et al., 2018; Gawer, 2014; Gawer & Cusumano, 2014). However, emerging B2B platforms governed at the level of consortium are often driven by strategic goals different than expanding the member firms’ installed base. There is a need for exploring how these incumbents find the incentives and common vision to reorganize themselves around a digital platform, especially in the absence of an ecosystem champion or “keystone” actor that can compel others to join (Dattée, Alexy, & Autio, 2018).

We contribute to previous studies, by exploring the actors’ changing perception of value during the early stages of their digital transformation. Our study focuses on the construction sector, which has been described in project management and innovation literature as the archetype of a project-based or networked industry (Gann & Salter, 2000; Kamara, Augenbroe, Anumba, & Carrillo, 2002). This term refers to a loosely coupled set of firms collaborating to execute specialized work for mutual gain. Unlike traditional supply chains of buy-sell relationships, such as those found in manufacturing processes, project-based industries usually lack a focal actor, their interfirm linkages are temporary, and the entire network reconfigures for each project instance (Alin, Maunula, Taylor, & Smeds, 2013; Dubois & Gadde, 2002; Gann & Salter, 2000; Taylor & Levitt, 2007).

To address the identified research gaps, our paper aims at answering the following research question (RQ): How do the incumbent actors of a project-based industry evaluate the business value of an emerging digital platform ecosystem? Through the qualitative analysis of semi-structured interviews, participant observations and review of documentation from two consortia of firms specialized in the construction industry, we identified a non-exhaustive list of criteria that actors used to evaluate or measure business value. We also found that the incumbent actors’ understanding of value changed if they adopted the perspective of a project-based industry or the perspective of a digital platform ecosystem, which facilitates the development of new service business models in their industry.

From a theoretical point of view, this paper connects previous studies about digital platform ecosystems and value creation. We contribute to these streams of IS research as follows: First, we explore how different actors of a project-based industry approach the implementation of new digital platforms, which are jointly owned and managed by a consortium of partner firms in a B2B context. Second, we identify some of the criteria that incumbent actors rely upon to evaluate the business value of such platforms, looking at other aspects different than the financial benefits, revenue generation, or costs. Third, we note how the transition toward an emerging ecosystem influences the actors’ control over key resources, their desired levels of autonomy, and other strategic decisions concerning their interdependencies.

This study also poses some practical implications for industry professionals. We describe the early stages in the transition of a project-based industry towards a new business ecosystem. Rather than relying on accounts of historical cases documented by third parties, our findings are grounded on direct observations and testimonials from the industry practitioners themselves. The construction industry is organized as a loosely coupled project-based network (Dubois & Gadde, 2002; Gann & Salter, 2000) with a long-standing record of fragmentation issues (Howard, Levitt, Paulson, Pohl, & Tatum, 1989). Therefore, the two consortia of construction firms presented in this paper provide an ideal context to analyse how incumbent actors adapt their existing business models, evaluate the value of new digital platforms, and manage relationships with other partners of their emerging ecosystem.

This paper has the following structure: Section 2 summarizes the background literature from two IS research streams that are relevant to our study, namely digital platform ecosystems and the co-creation of value in S-D logic. Section 3 explains our research methods and gives an overview of the entire process. Section 4 describes the within-case and cross-case findings from two emerging digital platform ecosystems in Finland and Norway. In Section 5, we compare our findings to the extant literature about digital platform ecosystems, S-D logic, and value creation. Finally, Section 6 recaps our main conclusions and proposes new opportunities for research.
2 Background

2.1 Digital platforms and ecosystems

The existing literature on digital platforms is extensive and originates from multiple research streams (Bazarhanova, 2020; Hein et al., 2020). Previous studies in the fields of strategic management, economics, engineering, and IS conceptualize digital platforms under different assumptions about their constitutive elements and evolution (Rolland et al., 2018). The technological or engineering perspective has its roots in physical product and software product development (Rolland et al., 2018). It approaches digital platforms as technical artifacts (de Reuver et al., 2018) or extensible codebases of purposefully designed software architecture (Gawer, 2014), which provide a core functionality and interfaces to integrate complementary modules. The economic perspective equates digital platforms to “two-sided” or “multi-sided” markets (de Reuver et al., 2018; Gawer, 2014). It emphasizes the so-called network effects between different groups of consumers, whose interactions are mediated by the platform and who otherwise would be unable to transact with each other (Gawer, 2014). This paper draws upon the organizational perspective on digital platforms in IS research (Rolland et al., 2018). This approach emphasizes the innovation practices of different actors, who loosely organize themselves around the same technical assets and commonly agreed social arrangements, to develop complementary products or services (Bazarhanova, 2020; Rolland et al., 2018). We concur with the calls for a better integration of platform research contributions under this perspective and adopt the sociotechnical definition of digital platforms as “a collection of technical elements, comprising both hardware and software, together with their associated organizational practices and standards” (de Reuver et al., 2018).

Our research focuses on two cases of industry-wide platforms, which enable one or more firms to create innovative products, technologies, or services. These platforms have a different scope and intent than company-specific or product platforms, which are used by a single firm to organize its own resources and develop derivative products (Gawer & Cusumano, 2014). Existing literature has extensively discussed different mechanisms of platform ownership and governance (de Reuver et al., 2018; Saadatmand, Lindgren, & Schultze, 2019). Eisenmann (2008) identifies two roles among companies involved in platform development: Sponsors, who control the technology and participation rights; and providers, who mediate the interactions between users. Either role can be served by one or multiple firms. Similarly, Gawer (2014) classifies the agents interacting with the platform into a (single focal) leader and (multiple peripheral) complementors. We discuss in later sections how these existing categories might not fully portray new B2B platforms managed by a consortium of project-based firms.

The concept of ecosystems is intrinsically linked to digital platforms (de Reuver et al., 2018). In IS literature, the word ecosystem is a useful metaphor to portray companies as entities that evolve over time. It generally refers to a group of firms that are interlinked by common interests and depend on each other’s activities (Jacobides, Cennamo, & Gawer, 2018; Selander et al., 2013). Multiple examples and types of ecosystems have been proposed, such as knowledge, business, and innovation ecosystems. Our study approaches business ecosystems and more specifically, innovation ecosystems as a network of companies that cooperate with the goal of jointly creating (“co-creating”) new value for their customers (Aksenova, Kiviniemi, Kocaturk, & Lejeune, 2019; Guggenberger, Möller, Haarhaus, Gür, & Otto, 2020). When these actors organize themselves around shared digital platforms, it is said they have constituted a digital business ecosystem (Senyo, Liu, & Effah, 2019) or digital platform ecosystem (Hein et al., 2020). This encompassing concept brings attention to the evolution of the digital artifacts as well as to the changes experienced by the actors around them, turning both into a single and more captivating object of inquiry than just the platform alone (Bazarhanova, 2020).

2.2 Value co-creation

Since the economic value of services started exceeding other sectors during the 1970s, marketing researchers questioned the traditional characterization of products and services as mutually exclusive categories or counterparts of one another (Kimbell, 2009, 2010). Early discussions focused on the IHIP model, named after four attributes (i.e. Intangibility, Heterogeneity, Inseparability and Perishability)
that were said to differentiate products from services (Zeithaml, Parasuraman, & Berry, 1985). This Goods-Dominant (G-D) logic was the prevailing scholarly view until Vargo and Lusch (2004) proposed that service provision rather than goods is the base of all economic exchange, and that any tangible outputs or physical products are simply conduits of the value generated during that process of service provision. This new perspective or Service-Dominant (S-D) logic differentiates between operand and operant resources (Lusch & Nambisan, 2015; Vargo & Lusch, 2004, 2011). Operant resources are usually static, limited, or tangible resources that resemble commodities, which merely serve as input for value creation processes. Operant resources are the intangible or dynamic resources derived from human intellect and knowledge, which are applied by the actors on the operand resources to produce an effect. Due to their differentiating nature, operant resources play a more prominent role in value creation and can be considered a strategic source of competitive advantage.

Value co-creation refers to the process in which different actors of a digital platform ecosystem engage to jointly create new business value (Hein et al., 2019) for the benefit of others or for themselves (Lusch & Nambisan, 2015). The roles adopted by these actors can vary or overlap and therefore, are not bound to the traditional “producer-consumer” dichotomy (Vargo & Lusch, 2011). Under S-D logic, all actors perform essentially the same two functions: (1) integrating resources and (2) engaging in service exchange (Vargo & Lusch, 2016). Consequently, the generic denomination of “actor” is used to indistinctively describe any of the parties involved in value co-creation, whereas the whole ecosystem can be characterized as a non-linear “actor-to-actor” (A2A) network (Vargo & Lusch, 2011) with simultaneous presence of complementarities and interdependencies between the actors (Kapoor, 2018).

3 Methodology

This paper summarizes the observations of two exploratory case studies carried out in Finland (C1) and Norway (C2). Case study research is an appropriate method to answer “how” questions (Yin, 2018) like the one proposed in this paper, where the boundaries between the real-life phenomenon under study (i.e. evaluating value in emerging digital ecosystems) and its context (i.e. the construction industry) may not be clearly evident. In both of our cases, the unit of analysis was a consortium of partner organizations from the construction industry. The actors involved in these consortia were working on similar projects aimed at developing and implementing within the next 3-5 years a digital platform for the exchange of requirement and information about the construction, management, and operation of built assets. Table 1 below lists the commonalities and differences between both cases.

<table>
<thead>
<tr>
<th>Methodological component</th>
<th>Finland (C1)</th>
<th>Norway (C2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case unit of analysis</td>
<td>Consortia of incumbent actors of the construction industry, aiming at implementing a digital platform within 3-5 years</td>
<td></td>
</tr>
<tr>
<td>Primary data collection method(s)</td>
<td>Semi-structured interviews</td>
<td>Semi-structured interviews, participant observation</td>
</tr>
<tr>
<td>Tertiary data collection method(s)</td>
<td>Documentation analysis</td>
<td></td>
</tr>
<tr>
<td>Number and type of interviews</td>
<td>14 individual interviews + 2 group interviews (total number of participants: 18)</td>
<td>21 individual interviews (total number of participants: 16)</td>
</tr>
</tbody>
</table>

Table 1. Comparison of the study cases

1 S-D logic literature prominently refers to “service ecosystems”, which are defined as “relatively self-contained, self-adjusting [...] A2A structures that loosely coupled actors create and recreate through their effectual actions and which offer an organizing logic for the actors to co-create value through service exchange” (Lusch & Nambisan, 2015). In this paper, we use the terms “digital platform ecosystem” and “service ecosystem” interchangeably, given that both concepts share a socio-technical nature and have the main purpose of value co-creation. However, we give preference to the former term to emphasize that such co-creation of value is facilitated by the technical artifacts of a digital platform.
We adopted an interpretive research approach (Orlikowski & Baroudi, 1991; Walsham, 1995) inspired by “mode 3” of grounded theory method collaboration in IS research (Pekkola, Hekkala, Rossi, & Smolander, 2019), which consisted of individual data partitioning and coding, followed by collaborative refinement of theory and reporting. Our findings draw upon the qualitative analysis of data collected from three data sources: Semi-structured interviews (Runeson & Höst, 2009; Seaman, 1999), participant observation (Lethbridge, Sim, & Singer, 2005; Seaman, 1999), and documents like industry- and project-specific reports. This triangulation of data collection methods provided a stronger base to support our findings and strengthen the grounding of the theoretical framework discussed in Section 4 (Eisenhardt, 1989; Eisenhardt & Graebner, 2007). An overview of the entire research process is shown on Figure 1. The following subsections explain in detail each step.

3.1 Semi-structured interviews (C1 and C2)

During their initial meetings, the first two co-authors of this paper discussed their common research interests and prepared together a shared interview protocol with the same set of open-ended questions, allowing for deeper exploration of the study phenomenon and inviting a broader range of possibly unforeseen answers (Runeson & Höst, 2009; Seaman, 1999). This interview protocol was then revised by the third co-author of the paper, to confirm that the proposed questions were unambiguous and relevant to the research topic (Easterbrook, Singer, Storey, & Damian, 2008). Using the adjusted interview protocol, co-author one and co-author two collected the primary data concerning each one of their cases separately. To minimize distractions and facilitate notetaking, all the interviews were recorded under consent of the participants. The recordings and transcripts of the interviews were kept in separate databases for C1 and C2, due to the importance of maintaining the privacy of the participants and ensuring an ethical handling of strategic information. Interview transcripts were coded by the same researcher who performed the interview, for purposes of including contextual notes, clarifying meanings and capturing more precise details such as non-verbal feedback (Runeson & Höst, 2009; Saldaña, 2016).

3.2 Participant observation (C2)

Participant observation (Jorgensen, 1989) was conducted in C2 from November 2018 to December 2019 by the second co-author, who was granted access to the offices and IT network of one of the companies participating in the consortium. She spent 3-4 days per week at the company premises, for a total of 54 days between November 2018 and April 2019. Afterwards, the frequency of visits reduced to approximately 1-2 days every two weeks. The second co-author was able to build trust with the company informants (Lethbridge et al., 2005), due to her extensive presence in the field, her observation of daily activities and project meetings, and her privileged access to different workshops, seminars and informal discussions. This deep onsite engagement generated a snowballing effect, which allowed the second co-author to identify subsequent interviewees among the various informants in the company. The primary data from the observations was collected in a field notes journal (Fetterman, 2020; Seaman, 1999).

3.3 Documentation analysis (C1 and C2)

The first two co-authors of this paper analysed reports and presentations related to the Nordic construction industry, as well as to the C1 and C2 project consortia. Rather than directly contributing to the findings of this paper, the documental analysis (Easterbrook et al., 2008; Lethbridge et al., 2005) was specifically aimed at corroborating and augmenting the information from the other two direct sources originally intended to inform the case study research, i.e. the semi-structured interviews and participant observation (Runeson & Höst, 2009; Yin, 2018). The market reports and whitepapers were also used to gain a deeper understanding about the current business models and technical terms used in the construction industry, thus facilitating the dialog between the study participants and the co-authors.

3.4 Qualitative analysis and theory refinement

Co-author one and co-author two individually conducted a first round of qualitative analysis and open coding per each case, after which they discussed their interpretations and compared their higher-level
code categories across cases (Eisenhardt, 1989). Based on this discussion, the two researchers agreed on a common theoretical framework and devised a shared coding schema to help answer the proposed research question. The schema comprised the following dimensions: (1) Value evaluation criteria, (2) the incumbent actors’ strategy under the perspective of a project-based industry, and (3) the incumbent actors’ strategy under the perspective of a digital platform ecosystem.

The S-D logic approach was used during the analysis as a sense-making lens to observe all actors of the emerging digital ecosystem at the same level. For this reason, all the interviewees and observed informants were generically labelled as “actors”, unless there was a need for explaining how different domains of practice or stakeholder categories work in the construction industry. We also adopted the concept of operant resources from S-D logic theory to describe some of the dimensions of value observed in our case studies.

After agreeing on the common schema, the first two co-authors performed another round of qualitative analysis and coding of the primary data, to seek evidence for or against the framework. Based on this evidence, all three researchers who co-authored this paper discussed again their individual observations and refined together the final theoretical model. Lastly, the review of existing IS literature in digital platform ecosystems and value co-creation provided a base for the discussion presented in this paper and allowed to contextualize the main theoretical contributions summarized in Table 2, while keeping such theory grounded on the original case data (and complemented by the previous studies rather than only being deduced from them).

Figure 1. Research process overview

4 Findings

4.1 The Finnish case (C1)

All the organizations participating in the C1 consortium belong to different domains of practice within the construction industry and collaborate under a publicly funded research project. These firms include: A vendor of Building Information Modelling (BIM) software, a property manager of public offices, an owner of commercial premises, and a construction contractor. Their aim is to implement a so-called digital twin of built assets, or in other words, a digital representation of real-life physical buildings, along with their geometrical and operational specifications that are automatically updated across the whole life cycle of the building. The functional requirements and components of the digital twin are still under discussion, but the consortium firms agree that the resulting artifact will be a shared data platform. The actors believe that the platform will help address some of their ongoing issues related to information management, like the duplicity of systems and data, or the poor information exchange between the consortium members and their partners.
C1 actors struggled to understand their share of value capture and value creation in the context of the emerging ecosystem. On one hand, interviewees acknowledged that the digital platform could enhance their operational efficiency and bring additional new benefits that were not immediately quantifiable in monetary terms, such as improved customer satisfaction or better coordination with partners and suppliers. On the other hand, interviewees argued that it was difficult to get buy-in from the upper managers, because the expected financial returns for their organization were not always clear:

"we had actually 3 workshops about the topic [... and even] with that professional expertise around, we weren’t able to find too many solutions or end results where we can use [the digital platform]" – Property Manager, Building Owner

For C1 interviewees, it was also difficult to persuade decision-makers about the value of the platform, because they lacked a holistic understanding about new collaboration opportunities at industry level. Clarifying the requirements and expected results of the project demanded technical skills that were scattered among different actors, such as architects, engineers, or property managers. We observed the platform project was helping to reduce those knowledge gaps between domains of practice. Actors were gradually breaking their silos thanks to an increasing mutual understanding and standardization.

When asked about the importance of their current software solutions for designing or managing built assets, interviewees answered that these tools did not offer additional business value besides what was necessary to complete their share of work. C1 actors struggled to rationalize if these tools allowed them to build synergies with others. In comparison with the new digital platform, current software solutions were simply perceived as “commodities” that could be easily purchased or replaced anytime:

“Solutions are not important, data is important [...] There is no unique software. They are all commercial software [that] everyone can buy” – Senior Expert, Property Management

On the other hand, the digital platform was frequently described as a complex solution that would deliver benefits to the consortium members in the long term. These recurring arguments suggested that C1 actors did not only quantify the value of the platform in monetary terms. However, when pressed for clarifications, interviewees struggled to explain how they would measure value in other ways different than costs or revenue. These difficulties appeared to be linked to two uncertainties: (1) The uncertainty about the vast amounts of data available to share through the platform and (2) the uncertainty about all the possible combinations of actors involved in sharing those data. To deal with these uncertainties, the actors aimed at sharing only the most essential data required to achieve some level of complementarity. By limiting their integration scope, they could gradually enable the provision of new services, one use case at a time. At the same time, they aimed at maximizing the endpoints or interfaces to other actors. By leveraging these interdependencies, wanted to increase the opportunities for “win-win” value co-creation, or at distributing the future costs of implementation and operation of the platform:

“In my opinion, the best way is to solve one problem at a time [...] You have to focus on small but important things [for the whole network]” – Senior Expert, Property Management

4.2 The Norwegian case (C2)

The C2 actors include operators, main contractors, sub-contractors, and vendors. Their multifaceted interactions are enabled by exchanging a checklist of facilities’ requirements, which are based on governmental regulations as well as national and international standards for construction, covering aspects such as the safety and the reliability of facilities or equipment. These requirements are managed with digital tools but remain scattered across many documents (usually around 10,000 .pdf files) that must pass throughout the different actors involved in each construction project. The companies
participating in the consortium argue in a 2016 report that their requirement handling processes are inefficient, time-consuming, and a bottleneck for reducing and controlling costs. These deficiencies are mainly attributed to the lack of a standardized language to share requirements and technical information. Furthermore, each actor has adopted their own requirements management system (RMS), which could be either a custom-built software solution or an off-the-shelf commercial product tailored to their needs. For these reasons, the actors decided to replace their disparate and partially overlapping RMS with a data-centric digital platform. They believe that this integrated software solution will improve their handling of requirements.

The recognition of the business value in the emergent digital ecosystem unfolded in different ways among C2 actors. Some of them struggled to recognize the value for their individual organizations during the early stages of the platform development. Uncertainties over what information should be shared and by whom, prevented this group of actors from evaluating how they could operationalize the shared value of the digital platform into their own specific business context:

“If we deliver too much information they will be as competitors to us. We need to be cautious about what we are offering to them.” – Developer, Software Vendor

On the other hand, all actors acknowledged that standardization activities could provide financial and non-financial benefits, such as agreeing more easily upon requirements, developing a common language for collaboration, or enabling a continuous thread of information along the life cycle of built assets. The actors also highlighted the value of implementing machine-readable requirements, which could be automatically verified and validated by the new digital platform:

“Sharing the requirements requires to be supported by the standards. Without standards, it is too costly and expensive. Simplification, standardization and removing the duplicates are what we all need.” – Senior Manager, Operator

Some of the actors expressed interest in maintaining their own RMS, even after the introduction of the new platform. Their aim was to build upon the digital platform, to incrementally deliver new value that would not directly translate into monetary gains. Improved traceability and more dynamic management of information were mentioned as two examples of these future unquantifiable benefits:

“In our company, we are [already] using a tool for our requirement management in which we can create specifications to have the traceability of the requirements. (...) The [new] tool that is developing here [digital platform] would then communicate with the system we are using now” – Project Engineer, Contractor

C2 actors often acknowledged that their industry has traditionally experienced a high level of inter-organizational dependency, as shown by the numerous requirements and regulations demanding a deep knowledge of activities carried out in different stages of a construction project. With the implementation of the new digital platform, actors aimed at reducing the burden of knowing and applying those complex rules from other domains. In other words, they intended to co-create value through a better integration of systems and data, but at the same time they wanted to decouple their ongoing tight collaborations with other actors of the ecosystem. While some participants were sceptical that these goals could be reached, we observed that other members of the C2 consortium had a better understanding of the importance of transparency and openness towards their ecosystem partners. Our observations suggest that the latter group of actors was more willing to adapt their work processes. They had also identified new opportunities for long-term value co-creation, based on the exchange of essential knowledge:

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2 The co-authors have intentionally omitted this report reference to keep the anonymity of the participating companies.
“Sharing of resources and knowledges that the industry has in common can open up the automated engineering, letting the computers to do the tedious work and freeing up our mind to find better solutions” – Senior Manager, Contractor

4.3 Summary of cross-case findings

In this section, we present the results from the qualitative analysis across the two case studies. Table 2 contains a summary of our findings and represents the main theoretical contribution of this paper. As mentioned in Section 3, the first step for building our shared coding schema was to identify the dimensions on which the actors relied to evaluate the value of their novel digital platform ecosystems. Those dimensions are listed on the column “Criterion” of Table 2. It is worth emphasizing that we do not claim the list to be fully exhaustive, but it rather represents the similarities found across both cases.

<table>
<thead>
<tr>
<th>Category</th>
<th>Criterion</th>
<th>How do incumbent actors evaluate value?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distribution and control of operant resources</td>
<td>Diversity of operant resources</td>
<td>Perspective of project-based industry</td>
</tr>
<tr>
<td></td>
<td>Ownership of operant resources</td>
<td>Perspective of emerging ecosystem</td>
</tr>
<tr>
<td>Process of value co-creation</td>
<td>Orchestration of transactions</td>
<td>Specializing and diverging</td>
</tr>
<tr>
<td></td>
<td>Perception of value sharing</td>
<td>Standardizing and converging</td>
</tr>
<tr>
<td></td>
<td>Frequency of innovation</td>
<td>“Useful minimum” sharing</td>
</tr>
<tr>
<td>Autonomy and relationship between actors</td>
<td>Scope of actor involvement</td>
<td>Distributing complexity</td>
</tr>
<tr>
<td></td>
<td>Degree of actor complementarity</td>
<td>Striving for simplicity</td>
</tr>
<tr>
<td></td>
<td>Degree of actor interdependency</td>
<td>Quantifiable and limited, value-in-exchange</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Unquantifiable and unlimited, value-in-use</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Continuous</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Undetermined or variable</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Increasing</td>
</tr>
</tbody>
</table>

Table 2. Criteria used to evaluate value in a project-based industry and an emerging ecosystem

We also observed that the business strategy of the incumbent actors varied depending on whether they adopted the traditional perspective of a project-based industry or the perspective of an emerging digital platform ecosystem, respectively. The two last columns on the right side of Table 2 summarize how the actors assessed each value criterion under these different contexts. At the time of writing this paper, the actors were still switching from the strategy shown in one column to the other.

Finally, we grouped the value evaluation criteria into higher-level categories of related themes, which played an important role in shaping the actors’ understanding of business value: The distribution and control of operant resources, the process of value co-creation, and the autonomy and relationship between actors. These categories are shown on the leftmost column of Table 2. The following subsections explain each category and its value evaluation criteria in detail.

4.3.1 Criteria related to the distribution and control of operant resources

These value evaluation criteria relate to the distribution of strategic information and the centralization of power between the actors of the emerging digital platform ecosystem. We focused on the operant resources, which are arguably difficult to replicate and therefore, have a more prominent role in shaping the actors’ strategic decisions than the operand resources. In terms of “diversity of operant resources”, we observed that incumbent actors had traditionally organized themselves as a highly specialized network under G-D logic, where operant resources like the technical skills were distributed into silos for each domain of practice, e.g., design, engineering, or operations. To reorganize themselves around the emerging digital platform ecosystem, C1/C2 actors were gradually decreasing their organizational barriers and converging into multidisciplinary competence networks (Vial, 2019), through the increased
standardization at the technical level (e.g., software solutions, data structures) and business level (e.g., processes, language, ontology).

“[traditionally] on one side, there was the artist architect and on the other side, there was the BIM [tech] specialist” – Architect and BIM Manager, Designer, C1

The next criterion influencing the distribution of power and control of the novel ecosystem is the “ownership of operant resources”. As part of a project-based industry, incumbent actors considered that their specialized knowledge was a key asset that should be accumulated and preserved to create value. The plans of implementing a novel digital platform reinforced most of the actors’ stance that such expertise was indeed a strategic resource. At the same time, they were aware that the information about buildings can deliver more value when shared across organizational boundaries. Not all C1/C2 actors were likely to develop this same awareness about the need for resource integration. Thus, to balance the protection of the own resources with the opportunity to leverage the use of resources from others, the participants of C1/C2 consortia seemed likely to limit their data sharing to the most essential (“useful minimum”) cases that could improve existing business collaborations or enable new services.

4.3.2 Criteria related to the process of value co-creation

These criteria refer to the process in which the actors of the emerging ecosystem engage to create value together (hence “co-create”), by using the novel digital platform as an intermediary. We adopted the term “orchestration of transactions” to describe the actors’ rationale for bringing their specific contributions to the rest of the ecosystem. Under the traditional view of a project-based industry, the incumbent actors’ strategy focused on distributing their tasks as much as possible between different specialists. Following this approach, each actor got involved in value generating processes each time their individual skills or knowledge were needed. In the context of the novel platform implementation, we observed that C1/C2 actors were becoming more tightly coupled in planning and designing common business processes, joint operations, or new services based on the digital platform. To facilitate the orchestration of these shared processes, incumbent actors aimed at keeping the future platform infrastructure, interfaces, and interaction mechanisms as simple as possible.

The “perception of value sharing” criterion describes the actors’ understanding of the future distribution of value that is co-created within their industry or ecosystem. This comprises both the mechanisms of transaction (i.e., locating resources and agreeing on value exchange) and innovation (i.e., building new contributions on top of the platform) alike. Under the traditional perspective of a project-based industry, actors focused on the quantifiable financial returns they could capture as the result of their own individual work or contribution. This aligns with a G-D logic where value is delivered through the exchange of specific goods or services (i.e., value-in-exchange). In contrast, under the perspective of a digital platform ecosystem, actors acknowledged that value was not something that could be directly measured in terms of revenue, because it comprises new operations or services that might be enabled through the digital platform. This is consistent with a S-D logic view of the industry, where the value is not fully known in advance but rather co-created when the platform is utilized (i.e., value-in-use).

Across C1 and C2, we observed that some actors struggled more than others to overcome inertia (Vial, 2019) and understand what value they would get in return for their contributions to the digital platform ecosystem. This uncertainty or scepticism could be attributed to the C1/C2 actors’ awareness that the platform boundary resources and shared data could be leveraged by anyone in the ecosystem, regardless of their share of participation in the technical infrastructure or data flows. Thus, we argue that the “frequency of innovation” criterion was understood as something continuous and less cost-dependent under the perspective of the emerging digital platform ecosystem, because the common technical artifacts and shared data would be available for anyone in the ecosystem. The uncertainty about these future opportunities for continuous innovation also suggest that frictions might arise in the mid- or long-term if some actors take disproportionally less or more advantage of the available platform resources:
“The tool we are using is not a competitor, but it is a facilitator providing dynamic information administration. We would use the engine [digital platform] that comes out of this project to build on our system” – Project Engineer, Operator, C2

4.3.3 Criteria related to the autonomy and relationship between actors

These criteria refer to the individual freedom and the expected relationship with other actors in the emerging ecosystem. Under the traditional perspective of a project-based industry, inter-organizational collaboration and partnerships were mostly managed through contractual or formal agreements. In this case, the “scope of actor involvement” was generally bound to the time duration or work tasks defined in such contracts. As the industry reconfigures around the digital platform, it is likely that the participation of the different actors in the C1/C2 consortia will depend less on formal agreements and more on how well they can leverage the platform boundary resources, to develop new contributions that others in the ecosystem might have not previously foreseen. This additional flexibility to innovate on top of the platform was reflected in the actors’ concerns about having less clarity upfront about the scope or the duration of each partner’s engagement.

“Everyone is doing everything nowadays, the challenge is to find the value network” – Founder and CEO, Software Vendor, C1

On one hand, “degree of actor complementarity” describes the actors’ intent to incrementally innovate or create new value offerings by building upon others’ contributions (“divergent thinking”). On the other hand, “degree of actor interdependency” refers to the actors’ need to maintain a close integration with specific actors in the ecosystem (“convergent thinking”). Our observations of the incumbent actors’ strategies suggest they did not aim at simultaneously increasing their economical complementarities and structural interdependencies, even if the digital platform can augment both conditions. The ideal levels of complementarity and interdependency seemed to be rather inversely proportional or paradoxical: Actors considered that it was valuable to increase their opportunities of building on top of others’ contributions, but they also thought it was valuable to decrease their existing dependencies to others.

5 Discussion

After covering all dimensions of the shared coding schema, we compare in this section the findings of our cross-case qualitative analysis with previous studies about digital platform ecosystems and value creation. We observed that the higher-level categories used to group our value evaluation criteria are strongly related to three prominent characteristics or “building blocks” of digital platform ecosystems (Hein et al., 2020): Platform ownership, value-creating mechanisms, and complementor autonomy. However, we adopt different terms and adjust their interpretation to account for the particularities of emerging ecosystems, where the governance of the future platform will be shared among multiple firms.

In contrast to the “platform ownership” block from Hein et al. (2020), we argue that the evaluation of value in an emerging digital platform ecosystem requires addressing unresolved issues of power and control, as well as responding to the uncertainties about the future ownership of the strategic information to be shared through the platform. For this reason, we propose analysing not only the centralization or governance of operant resources, but also the actors’ possibilities to diversify such resources in the future. Our observations regarding the “diversity of operant resources” criterion align with previous studies highlighting the need for a shared worldview, which can be achieved e.g., by adopting industry standards or a common institutional logic, to reduce the cognitive gaps between ecosystem actors (Hein et al., 2019; Lusch & Nambisan, 2015). In this context, the gradual integration of the domains of practice in the construction industry aligns well with the S-D logic lens: Any difference in the actors’ roles becomes secondary since all of them are essentially resource integrators (Lusch & Nambisan, 2015).

The evaluation of value in emerging ecosystems strongly relies on subjective aspects because there is not yet a fully operational platform where the mechanisms of transaction and innovation can be observed in action. For this reason, instead of “value-creating mechanisms” we use the broader category “process of value co-creation”, which accounts for the actors’ expectations about the future value distribution.
Within this category, the “perception of value sharing” criterion suggests that the mechanisms of transaction and innovation should be observed at two states: Expected/planned and operationalized. If the comparison results in a mismatch, it is likely that tensions between the actors will emerge during the “operationalized” phase, e.g., if one actor believes that they are giving more resources than receiving benefits, or if one actor feels that another actor is exploiting the platform for the own benefit.

Our two case studies focused on new B2B platforms that will be managed, owned, and utilized by a consortium of partner firms. These platforms differ from supply-chain and industry platforms (Gawer, 2014) due to the project-based nature of the construction industry: Ownership does not fall upon one single firm, and every firm in the emerging ecosystem can act as owner and complementor at the same time. The uncertainties we observed regarding the non-monetary benefits (“perception of value sharing” criterion) and the new value offerings that will be developed from shared data (“frequency of innovation” criterion) suggest that neither of our cases featured a “keystone” actor championing the vision of the future ecosystem (Dattée et al., 2018). Therefore, these emerging B2B platforms governed by consortia do not align with the categories from Gawer (2014), which assume the existence of a focal actor (i.e., “assembler” in supply chain platforms, or “platform leader” in industry platforms). Furthermore, the terms "supply chain” and “assembler” wrongly imply that the platform interfaces or interfirm linkages are bound to predefined production pipelines, which do not exist in our cases as the whole construction network might reconfigure for each project. We consider that the A2A approach from S-D logic is a suitable lens to explain how business value is evaluated among peers in the construction industry. Hence, our value evaluation criteria refer to “actors” instead of “complementors”.

The B2B platforms featured in our cases may look like shared platforms (i.e., multiple sponsors, multiple providers). However, we noticed two important differences from the original conceptualization proposed by Eisenmann (2008). First, the roles of sponsor and provider in shared platforms are clearly distributed between different firms. In the AEC/FM consortia, those roles are indistinctively fulfilled by the same firms. Second, the sponsors of shared platforms might collaborate on R&D efforts, but their strategy is to become competitors and provide differentiated offerings. The companies participating in our cases cannot compete, because they belong to different domains of practice within the construction industry. Thus, it is worth considering if this phenomenon deserves its own category, e.g.: co-creative shared platforms, collaborative B2B platforms, or consortium platforms.

Previous studies have characterized platform ecosystems as markets where both complementarities and interdependencies can be found (Kapoor, 2018), and described how the growth in the platform’s installed base leads to positive network externalities or network effects for the whole ecosystem (Gawer, 2014). Those self-reinforcing feedback loops of same-side or cross-side network effects seemed to be less clear in our cases of B2B digital platforms. At least during the early stages of the digital platform ecosystem, it is likely that benefits can be measured up to some extent only, e.g., by forecasting operational efficiency gains. In many other cases, such as the establishment of new strategic partnerships reliant on shared data, the definition of value might depend more on the trust between the involved parties than on specific evaluation criteria like the ones presented in this paper.

Our findings relied on the interpretive analysis of empirical data across two cases of consortia in the construction industry. However, we acknowledge some limitations of this paper. For instance, we looked at the phenomenon of emerging digital platform ecosystems by relying primarily on the perspective of the involved actors and without a minimum viable product of the platforms in production, which could have allowed us to verify our observations in an operational environment. Furthermore, the scope of our research was purposely limited to B2B platforms owned and managed by a consortium of partner companies. Therefore, it is possible that our findings might not be fully transferable to the context of platforms aimed at B2C markets, or platforms characterized by the clearer presence of a dominant actor. To mitigate these limitations and strengthen the trustworthiness of our results, we applied researcher triangulation, relied on multiple data sources and informants, and used different data collection methods (Easterbrook et al., 2008; Guba, 1981; Shenton, 2004). We have also justified our choice of research methods and provided a “thick description” of each step along the process (Creswell & Poth, 2018), thus enabling an audit trail and facilitating the replication of similar research in future studies. Finally, our
within-case and cross-case analysis (Eisenhardt, 1989; Eisenhardt & Graebner, 2007), comparing two similar consortia in the Nordic construction market, provides a more robust theoretical contribution and gives us greater confidence that there were no material misinterpretations in our findings.

6 Conclusions and future outlook

The paper proposed the research question “How do the incumbent actors of a project-based industry evaluate the business value of an emerging digital platform ecosystem?”. Based on our qualitative analysis of two cases of construction companies trying to establish a digital platform within 3-5 years in Finland and Norway, we observed that the incumbent actors’ perception of business value changed as they transition towards a digital platform ecosystem. We identified a non-exhaustive list of criteria that explain the different strategies adopted by the incumbent actors to evaluate the value of their current business model in a project-based industry, as well as the value of their emerging digital platform ecosystem. We categorized these value evaluation criteria into three relevant themes that play a prominent role in value evaluation: The distribution and control of operant resources, the process of value co-creation, and the autonomy and relationship between actors. Finally, we compared our value evaluation criteria and higher-level categories with existing literature on S-D logic, and discussed why emerging B2B digital platform ecosystems demand a different approach to evaluate value, by “zooming in” or “zooming out” from the scope and the terminology covered in previous studies, e.g.: by looking into more detail into the operant resources instead of the platform as a whole, or by analysing the process of value co-creation as opposed to just the mechanisms of transaction and innovation, respectively. This paper offers interesting opportunities for future research. Subsequent studies should explore how actors respond to unexpected contributions, in those cases where the platform ownership is shared among different members of an industrial consortium including the complementor company itself. Follow-up research is also needed to re-evaluate our theoretical contributions after the platforms are implemented, to determine if the same value evaluation criteria apply or if new ones can be identified. In that context, one of the pending questions concerns the frictions that could arise if any of the B2B ecosystem actors takes disproportionally less or more advantage of the available platform resources. This could be achieved by comparing the expected business value of the platform project vs. the benefits obtained when that same platform is operational.

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