The role of relational governance in innovation platform growth: the context of living labs

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Abstract
Purpose – This paper aims to investigate the role of relational governance in innovation platform development, specifically investigating the context of living labs.

Design/methodology/approach – Two longitudinal case studies are presented, derived from auto-ethnographic narratives, qualitative interviews and secondary documents, which cover the critical stages in the development of each living lab.

Findings – Empirical insights demonstrate the relevance of coordination activities based on joint planning and activities to support innovation platform development across different stages. The governance role of research actors as platform activators is also identified.

Practical implications – The paper offers a useful perspective for identifying collective goals between living lab actors and aligning joint activities across different stages of living lab development.

Social implications – The case provides insights into the challenges and opportunities for collaboration between academia, industry and users to support sustainable construction innovation.

Originality/value – A relational governance mode is identified, going beyond top down or bottom up approaches, which contributes a new understanding of how collective goals align within a relational space.

Keywords Sustainability, Circular economy, Inter-organizational relationships, Relational governance, Living lab, Innovation platform

Paper type Research paper

1. Introduction

The innovation platform perspective has been investigated across various domains, such as business strategy (Sawhney, 1998), new product development (Pekkarinen and Ulkuniemi, 2008) and open innovation (Isckia and Lescop, 2015). A key aspect within these perspectives is that the platform, considered a technology or medium, provides an environment “that companies can transfer knowledge to, and use the set of building blocks or subsystems and interfaces provided by the external partners to create complementary products or services” (Wang et al., 2021, p. 256). However, simply initiating or activating a platform is not enough to expect its development; attention must be given to relationships within the platform and to the forms of governance applied across its evolution. Governance within this context refers to “the manner in which the decisions in the innovation process are made” (Westerlund et al., 2018, p. 54). This paper examines the role of relational governance in the growth of living lab innovation platforms.

Living labs offer an ideal setting for considering how relational governance may impact on innovation platform development. Although there is an absence of one commonly accepted definition, we considered living labs as a sociotechnical platform that organizes its stakeholders into an innovation ecosystem (Westerlund et al., 2018). The combination of diverse stakeholders with sometimes divergent goals can make relational governance a difficult task within living labs. This aligns with debates about whether living labs can truly sustain innovation outcomes for all parties as intended or whether the interests of certain stakeholders may dominate (Hagy et al., 2017).

Previous studies suggest that lead or hub firms can orchestrate and control the participants, thereby defining the goals for the platform (Nambisan and Sawhney, 2011).

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Yet, control may be insufficient or ineffective in managing relationships between the platform’s actors, typically characterized by heterogeneous resources and goals (Håkansson et al., 2009). Alternative perspectives suggest the management of heterogeneous goals requires a more open approach, considering that “unilateral action by any firm to dominate a business network will disrupt the multilateral potential of that network” (Ballantyne and Williams, 2008, p. 98). Following this, the coordination of inter-organizational relationships can be achieved through relational governance involving norms and joint actions. In this context, we examine the following questions:

Q1. How do governance approaches influence the growth of innovation platforms?

Q2. Which activities characterize the relational governance approach of platform activators?

This paper investigates the development of two university-initiated living labs focusing on sustainability in the construction industry. Two longitudinal case studies are presented, derived from auto-ethnographic narratives, qualitative interviews and secondary documents, which cover the critical stages in the development of each living lab. Our findings demonstrate how the relational nature of the living lab innovation platform emerges, showing growth is founded on the co-ordination of inter-organizational relationships between key actor groups as follows: university, industry and users. The platforms’ evolution depends not on the initiating organization, but rather on joint activities, such as planning and problem-solving. Furthermore, the research characterizes a new form of coordination of innovation platform, a peer-to-peer approach, which supports the generation of collective goals and development of critical joint activities.

In the next section, we introduce the innovation platform perspective, focusing on management and governance modes. This is followed by an explanation of the research approach and a description of the cases and findings. Finally, we present the theoretical and managerial implications of our findings and directions for future research.

2. The innovation platform perspective

The platform concept has attracted the attention of several areas of innovation research. Pekkarinen and Ulkuniemi (2008) conceptualize the platform approach as a systematic way to develop and deliver customized solutions efficiently by reconfiguring different modules. Platform thinking was initially seen as a way to ensure that internal structures did not become overly complex, as well as offering products and services that could be easily modified (Sawhney, 1998). Innovation platforms can also be applied to inter-organizational networks, with the concept of platform-based ecosystems representing a place, whether physical or virtual, to build and orchestrate interactions among innovator groups (Isckia and Lescop, 2015). The main aim of these platforms is to stimulate a virtuous circle of innovation through the combined contributions of platform owners and ecosystem members (Isckia and Lescop, 2015).

Open innovation platforms are understood to be virtual environments that allow the transfer of innovation-related knowledge (Hallerstede, 2013) that can match innovation supply and demand (Holzmann et al., 2014). Multi-sided open innovation platforms are established in a manner, which provides value to different organizations with heterogeneous interests (Loux et al., 2020). This serves as an approach to systematically attract, facilitate and orchestrate innovation with external actors (Patrucco, 2011). The goal is to develop solutions to the platform owners’ problems and needs while also delivering value to other contributors (Ojasalo and Kauppinen, 2016). This requires the coordination of relationships between independent actors that can co-create, co-deliver and capture value in open platform environments (Ferraris et al., 2020). Within living lab platforms, the management approach taken by driving actors is considered to influence the novelty of innovation (Leminen et al., 2016). For value to be realized, we must consider the management and governance structures, which are crucial to the development of innovation platforms (Boudreau and Hagiu, 2009).

2.1 Platform management and governance

Traditionally, platform owners manage the partners hosted on platforms (coordination process) and maintain the control and cohesion of platform members (governance process) (Isckia and Lescop, 2015). Two main orientations adopted to manage such relationships are hierarchical and relational. By adopting a hierarchical governance approach, relationships are managed in a mechanic mode, where one actor assumes the leading role in establishing the rules of interactions between parties (Colombelli et al., 2019). Adopting this top down perspective, the lead firm develops architectures to support new offering systems and coordinates network actors (Eloranta and Turunen, 2016). Lead firms, as platform owners, orchestrate their inter-organizational networks and purposefully influence and manage the development of the platform value network (Laczko et al., 2019). Moreover, platform owners can increase the depth of a platform to creating new functionalities (exploitation), and expand the breadth of a platform to search for new sources of value and creating new communities (exploration) (Evans and Schmalensee, 2007).

In contrast, from a bottom up perspective, platforms can be co-created with the involvement of users (Eloranta and Turunen, 2016; Perks et al., 2017). This focuses on the networking capabilities of actors, which enable them to influence networks to achieve collective goals (Mitrega et al., 2017). This aligns with a perspective that interdependent actors in the relationship influence each other on the basis of the resources possessed and activities performed (Ford et al., 2008). Nyström et al. (2014) suggest that greater openness in living labs increases the complexity of orchestration. Within this context, relational governance may be considered more appropriate than formal management approaches, however, its practical application in platform settings must be further explored (Yu et al., 2006). As Leminen et al. (2016) highlight, more attention needs to be paid to the nature of relationships between actors in living labs.
2.1.1 Mechanisms of relational governance: coordination of inter-organizational relationships

Generally, governance refers to organizational or structural arrangements designed to determine and influence the behavior of network members (Das and Teng, 1998). Through governance mechanisms, firms can influence interorganizational exchange and reduce opportunistic behaviors (Jap and Ganesan, 2000). Typically, contractual (formal) governance is used simultaneously with relational governance. The latter can be considered the less formal or prescriptive approach, founded in implicit understandings, shared cooperative norms and informal routines that are mutually defined and adjusted by the parties (Gibbons and Henderson, 2012; Poppo et al., 2008).

Relational norms can be considered to constitute the normative element of relational governance while collaborative activities represent the behavioral aspect (Poppo et al., 2008; Claro et al., 2003). Combining these two concepts, Zhou et al. (2015) define relational governance as comprising both relational norms and collaborative activities. Relational norms are founded on trust, commitment and cooperation (Ivens, 2002). Collaborative activities can include routines, programs and tactics jointly carried out to achieve organizational goals (Heide, 1994). Collaborative activities involve coordination and cooperation, relying on joint planning and problem-solving (Claro et al., 2003). Joint planning helps establish mutual expectations and specifies cooperative efforts at the start of a relationship. Following on, joint problem-solving involves the resolution of disagreements with a partner, through the efforts of both parties (Claro et al., 2003). This process facilitates relationship maintenance and growth, generating mutually satisfactory solutions (Zhou et al., 2015).

The two mechanisms of relational governance (relational norms and joint actions) are crucial to maintain business relationships based on common goals. From a network perspective the mutual alignment of goals involves the recognition of the self-interest and collective interest, which coexist in relationships (Medlin et al., 2002). As stated by the actors, resources and activities (ARA) model, actors share resources and develop activities through interconnected relationships (Håkansson et al., 2009). Joint actions are, thus, associated to relational activities (Håkansson et al., 2009) that involve processes of combining, developing, exchanging or creating resources through other resources (Aarikka-Stenroos and Jaakkola, 2012). Individual activities are embedded in the activity structures of firms that, in turn, are embedded in wider activity patterns (Håkansson and Snehota, 1995).

An important, yet little understood concept relevant to relational governance is the notion of atmosphere. The previously described joint actions both simultaneously influence and are influenced by the atmosphere encompassing the relationships. From this perspective, the atmosphere can be loosely equated with the rules governing the relationship and the emotional setting within which interactions occur (Hallén and Sandström, 1991). The relational atmosphere is viewed, as both a product of the relationship and a factor contributing to future relationship development (Håkansson et al., 2009; Hallén and Sandström, 1991). It should be noted that perceptions of the atmosphere are likely to differ between partners, and therefore, no static representation of atmosphere is possible (Sutton-Brady, 2001). There have, however, been attempts at defining dimensions of relational atmosphere, for instance – cooperation conflict, power/dependence, trust/opportunism, closeness/distance and expectations (Sutton-Brady, 2001). Given its dynamism, the relational atmosphere can, therefore, represent a central concept in understanding how governance approaches shape the growth of innovation platforms.

### 3. Research methodology

The study combines elements of researcher auto-ethnography (Ellis et al., 2011) with qualitative interviews and document analysis, to develop an understanding of governance approaches in innovation platform growth. This approach enabled an in-depth, longitudinal view of the phenomenon, drawing upon multiple, cross-disciplinary perspectives from researchers with varying levels of involvement with the cases (Table 1). The combination of research perspectives enabled the research team to scrutinize both the theoretical and practical aspects of living labs and relational governance, comparing both insider and outsider views.

| Researchers | Relationship to cases | Research role |
|-------------|----------------------|---------------|
| R1 Perspective: sustainable design and construction | R1 was active during the development of both cases | Developed auto-ethnography based on reflections of involvement in both cases |
| | Proposed the initial concept of both SLL and CLL and attracted funding for their development. Facilitated the creation of a consortium of industry partners in both cases | |
| R2 Perspective: sustainable design and construction | R2 was active during the development of the CLL and visited the SLL once in operation | Developed auto-ethnography based on reflections of involvement in CLL |
| | Proposed the initial concept of the CLL and was involved in its construction | Interviewed other participants in the SLL case |
| | Compiled notes of workshops and meetings relating to the development of both cases | Co-developed timeline of activities relating to the development of both cases |
| R3 and R4 Perspective: business-to-business marketing | Both R3 and R4 are independent from the cases and had no involvement in their development | Interviewed R1 and R2 |
| | | Interviewed other participants in the SLL case |
| | | Co-developed timeline of activities relating to the development of both cases |

Table 1 Researchers activities and roles in the conceptualization, production and investigation of the two case studies
3.1 Case study design
The research applies a comparative multi-case study design based on two similar living lab projects. Case studies were appropriate for our research focus as they allow for a richness of data to be considered within a complex changing context (Yin, 2009). Through this approach, we seek to explore commonalities and differences in the chosen settings, as a way to derive an understanding of governance dynamics over time within the respective living labs. Furthermore, purposive sampling was used to identify two embedded cases with overlapping participants, so as to partly reduce contextual diversity and enhance our ability to develop a detailed understanding of processes (Harrison and Easton, 2004). Leminen et al. (2016) specifically call for qualitative approaches to exploring innovation in living labs across countries and time. The cases were developed based on an auto-ethnographic approach, complemented by participant interviews and secondary data analysis. Auto-ethnography is a research approach that describes and systematically analyzes personal experience to understand complex social phenomena (Ellis et al., 2011). This aligns with the broader category of ethnographic research designs, considered valuable in business and innovation research (Hoholm and Araujo, 2011), as they diminish the “relevance gap” and allow for “thicker descriptions of organizational reality and richer representations of companies’ lived experience” (Visconti, 2010, p. 25). Our auto-ethnographic approach stems from the active involvement of two of the research team in the case study phenomenon, combined with two additional non-participant researchers.

Data was primarily collected as part of a broader participatory research project involving the design and management of living labs oriented toward sustainable construction. Researchers 1 and 2 were intimately involved at various stages of living lab design and development in both cases, as representatives of the university (Table 1). Through this involvement, self-narratives were developed based on reflections of personal experiences, proceedings from steering group meetings and notes taken throughout the design, development and implementation of the living labs. Regarding the first case site, R1 and a group of architects, masters’ students and stakeholders participated in weekly brainstorming meetings over three years (2012–2015). These meetings covered a range of topics from defining the initial project scope, to discussing construction and management. In relation to the second case, R1 and R2 participated in more than 20 stakeholder meetings and weekly field work observation over four years (2017–2020). Meetings lasted between 30 min and 2 h and involved building design, project planning, partner goal discussions and resourcing activities.

To include other perspectives of relational governance, 14 semi-structured interviews were also conducted with key informants involved in the cases (six from the Sustainable Living Lab (SLL) case and eight from the Circular Living Lab (CLL) case; the two cases are defined in Section 3.3 below). The key informants were, in addition to the living lab creators, researchers from both the participating universities and facility managers. The interviews lasted between 40 min and 1 h and were held locally or through online video-calls. Questions focused upon the conceptualization of living labs, main stages of living lab development, key activities and resources shared within living labs and challenges arising in the development and operation of living labs. Furthermore, a relational focus was taken to explore participant thoughts on the role of different actors, examples of interactions between actors and perceptions of the coordination of inter-organizational relationships. Responses were recorded and transcribed for analysis. Secondary data was also collected from multiple sources to triangulate the insights gained auto-ethnographic narratives and participant interviews. This included internal documents such as minutes of meetings, external publications and media coverage across the study timeframe.

3.2 Analysis approach
In line with the case study design, we adopted an iterative analytical approach (Ployhart and Bartunek, 2019). A multi-stage coding process was used to inductively develop theoretical descriptions of the contexts of the phenomena investigated (Gioia et al., 2013). We started to build our theory by categorizing the data based on the governance challenges the key informants were talking about (first-order concepts) (Table 2).

Broader themes were then created based on our interpretations of the experiences expressed by respondents. The second-order themes were platform stagnation/growth, activities and resource contributions, failure of top down perspective/limitations of a bottom up perspective, misalignment of goals, generation of collective goal. We also conducted a literature review to inform our organization of thematic categories, particularly around the concepts of innovation platforms and relational governance. We articulated these second-order themes into aggregate dimensions as follows: Platform evolution, relational platform, drivers of relational governance, joint activities/joint goals.

The development processes of the living labs were organized in accordance with the main stages of their evolution, as identified during the analysis. These stages related to importance changes in dynamics within the platforms’ evolution: from platform idea to conceptualization, from platform conceptualization to launch, from platform launch to growth. To further examine the relational governance perspective as described in the Industrial Network literature, in each stage we investigated the main actors providing resources, their goals and the main activities developed. Through this approach, we are able to take into account multiple actor perspectives as a way to understand evolving network structures and processes, focusing in particular on joint activities.

3.3 Case contexts
The cases selected shared several similarities, which offer a good basis for comparison. In both cases, the initial idea for establishing a living lab started from the university. Both platforms can be considered to have reached some degree of maturity considering the number of projects and activities taking place within them. Moreover, both living labs focus on studying innovation in the context of sustainable construction, broadly defined as minimizing the consumption of resources and maximizing the re-utilization of resources (Cruza et al., 2019).

3.3.1 Sustainable Living Lab
The SLL is a multi-story, modular building based in Sweden, composed of 44 steel frame modules, hosting 29 student
The industry

Students at the beginning considered the living lab for its sustainable nature but then they
The university wanted to develop applied research at the living lab but it had no possibility
The aim of National HC was to improve the commercial nature of living lab for its purposes
This orientation generated confusion
This approach reduced the commitment of the partners
At the beginning the point of view of the users was not considered
Now the project group has the responsibility for the project
The university at the beginning depicted the rules, then the lead role was undertaken by
At the beginning the point of view of the users was not considered
This approach reduced the commitment of the partners
This orientation generated confusion
The aim of National HC was to improve the commercial nature of living lab for its purposes
The university wanted to develop applied research at the living lab but it had no possibility
Students at the beginning considered the living lab for its sustainable nature but then they
became interested in comfort dimensions
The industry firms focused only on their own goals
Nowadays our living lab is a community

aptments. The facility opened in 2015 as a collaborative
project between a Swedish university and a National Housing
Cooperative (HC), which sought to create a space that would
help researchers explore the home-human relationship: how
people use their dwellings, and how the dwellings can improve
people’s lives. It is equipped with more than 2,000 sensors that
test thermal performance (internal temperature changes
relative to external climate), energy and water consumption
and air quality. It features interchangeable façade panels
that allow industry and researchers to test new building
products and materials in an operationally functional
facility, thereby creating multiple potential formats for
future use of the space.

3.3.2 The Circular Living Lab
The CLL is a research facility developed with the intention of
fostering circular economy principles in building construction.
It is situated in new Australian housing development and is
fully owned by a local university. The project leaders include
academics who were active participants in the SLL case, who
sought to further develop the living lab methodology based on
their prior experiences. The living lab is an example of a
reusable, movable and adaptable construction, designed with
the application of circular economy principles (reduce, reuse
and recycle – the 3R’s concept) to diminish the waste created
during the construction, utilization and demolition phase of
buildings. It is composed of eight steel modules, salvaged from
a previous project, and is entirely disassembled and planned for
relocation in three years. It is equipped with sensors to test the
thermal performance, electricity, water consumption and air
quality. The living lab is intended to foster innovation networks
by hosting industry partners and researchers working in the
field of building sustainability, and startup designed products
which can be tested in the facility.

4. Findings
The analysis of the two cases enabled us to develop a deep
understanding of the evolution of the innovation platform up
until maturity. We observed innovation processes taking place
through inter-organizational relationships, which enable
resource sharing, primarily knowledge, between key actors
(university, business partners, users). Moreover, platform
evolution from one stage to another was founded on the
coordination of inter-organizational relationships, and thus a
relational governance approach. Findings are presented in line
with the main development stages identified in the analysis.

4.1 Case one: sustainable living lab
4.1.1 From platform idea to concept (2012–2013)
The original idea for the SLL was born via a fortuitous post-
conference meeting in 2012 between a university academic and
a manager from an adjacent Science Park (SP) in which they
shared their mutual interest in European living labs. Following
this encounter, the SP engaged one of their major business
partners, the National HC, which expressed interest in
developing a modular student housing design. Over the course of
several interactions, the HC and University began to identify
areas of mutual interest between their available expertise and
resources that could be put toward a new living lab to be
located at the SP.

Each actor provided resources (R) and developed activities (A)
to collaboratively ideate the platform concept, with each
pursuing the own goals. For example, the University provided
technical knowledge (R) and defined the living lab approach
(A) aimed at creating knowledge on sustainability topics. The
HC provided access to its network of industry partners (R) and
collaborated with the SP in creating a wider network of
accessory providers (A). HC aimed at promoting its brand
image as an innovator. The SP provided its technology transfer
expertise (R) and facilitated the activation of relationship between the University and the HC (A). Its goal was technical innovation (Appendix 1).

The university planned regular meetings (twice a week) with HC and the SP, the main partners began the process of developing the Living Lab. As a starting point, the University provided expertise on the living lab methodology and how to drive research activity within the space, as well as access to Swedish and European Union research funding (R). The SP shared its expertise to support the involvement of business partners (A). HC brought financial resources and the involvement of additional business partners (R), coordinating their interactions with the University (A). HC also provided access to the rest of the value chain needed for developing the platform through their existing business relationships and the expertise to manage the facility. Industry partners provided accessories (R) for use in the facility and monitored their installation (A) (Appendix 1).

At this time, the university was focused on driving research interest within the space while the SP aimed at expanding its network through the increase in activity on their site. Similarly, the HC aimed to both create and consolidate relationships with industry stakeholders and establish an industry research fund while most industry partners were focused on testing their products and integrating the living lab into their innovation processes. HC initiated several meetings and workshops with university and industry partners, to establish a suitable platform business model (Appendix 2). Platform ownership was determined to be a joint venture between industry partners but led by HC.

A new HC manager and University Academic responsible for the initial conceptualization collaborated to present the living lab proposal to industry partners. Public interest was also attracted through promotion at national meetings, using existing HC connections. The industry engagement process was used to collect contributions in the form of funding, in-kind resources and knowledge to inform living lab design and activities. A consortium model was established whereby companies paid an annual fee of approximately €4,000 to become official members. The coordination of the consortium was the responsibility mainly of the HC, with support from the University. HC also planned to offset the greater proportion of the cost of the building through rental income generated from accommodation provided to users renting rooms in the living lab. During this stage, the University was limited in sharing its knowledge about living lab planning (R) and carried out only few workshops aimed at developing the platform around the idea of sustainable living (A). HC aimed to supervise the living lab and managed partners during the construction stages (A), as well as bringing in financial resources and project management capabilities (R).

4.1.3 From platform launch to stagnation (2016–2017)

As soon as the living lab was built, it experienced some initial success with a full occupancy rate for rooms, due in part to the convenient location and shortage of student accommodation. Despite this success, the number of research projects taking place in the living lab was limited and the facility struggled for recognition as a university asset. Industry partners, such as architects, shared technical knowledge while other providers brought in whitegoods, technical expertise, energy and interior decorating capabilities (R). Industry some partners tested their new products with students, providing usable products (R) to undertake household tasks (A) (Appendix 1).

Activities within the facility were dominated by more applied industry research and development, as well as commercially focused events. An example of this is the company hiring the space for product demonstrations rather than testing and prototyping. This conflicted with the original ideas of using the living lab for collaborative research with academics and for innovative sustainability projects. Some researchers have found that industry partnerships were limited to mostly in-kind contributions of material or products, with a limited corporate appetite for riskier radical projects. Therefore, during this period, the commercial goal of HC and industry partners prevailed over research goals. Few research projects were carried out in this period and the facility was mainly used as a marketing exercise for industry partners (Appendix 2). This was exemplified by one project idea that involved testing new windows and other façade elements, which one respondent suggested was canceled because of the perceived risk of adding new elements, which could disrupt the normal operations of the facility.

4.1.4 Platform growth (2018–2020)

After this period of stagnation, the Living Lab began to experience a large increase in the number of projects carried out. After some of the facility managers were substituted with new personals appointed by the University, which meanwhile provided research capacity and capability (R) to develop a portfolio of research projects (A). The SP acted as an intermediary to broker new relationships across the city (R), using collaborative activities within the living lab to strengthen their own network. The HC focused on the continuing development of innovation (A) projects and provided management capability (R) to support. The industry partners brought in products, technology and financial support (R) for testing their solutions prior to market launch (A). This was supported by users who tested products (A) and shared their experiences (R), aligning with the common living lab goal of living more sustainably and contribute to knowledge creation (Appendix 1).

The realignment of goals was set in motion when facility managers were substituted and workshops were held focusing on the purpose of the living lab (Appendix 2). This was also encouraged by new industry partners introduced by the University and HC. Outcomes of this joint planning were new innovation projects involving several actors. This interaction supported the realignment of goals, leading to a re-birth of the platform and an increase in collaborative activity between
users, researchers and industry. This re-birth was referred to by
University researchers as “a space where actors are active in co-
creation, innovation and experimentation. The Living Lab, at
the moment, is very active, with more than 20 big projects”.

This represented a shift in priorities within the living lab, as
indicated by one of the researchers involved “during the years
there have been different markers of living lab success. At
the beginning, the number of partners, then the fact that the living
lab was running. Later, the SLL measured its success only
through the financial dimensions. Now, the growth concerns
the income generated at the SLL and the number of projects
per year”. The additional traction resulted in the development
of applied research projects through a project group made up
by the university, HC, technology company, architectural firm
and builder, as well as several equipment suppliers.

4.2 Case two: a circular living lab
4.2.1 From platform idea to concept (2017–2018)
The idea for the CLL stemmed from a team of three Australian
University researchers working in the area of the circular
economy. Based on some of the team’s previous involvement
in the SLL, the researchers decided on several new approaches to
achieve sustainability innovation outcomes through a living lab
platform. As one researcher suggested, the original motivation
was to improve waste reduction in a challenging context: “In
Australia, the construction industry is responsible for about
30% or 20.4 million tons of annual waste. Although it’s a
significant and largely ignored issue, this is also an
opportunity”. At this stage, the University, through its project
team, provided technical knowledge (R) to develop the initial
conceptualization of the CLL (A).

Alongside the University contributions, a state government
agency agreed to provide financial support and a lease for the
required land (R), as well as promoting the project to a network
of potential partners (A). The focus on circular economy
innovation was a key determinant in the founders’ strategic
choices of selecting the industry partners. These partners,
identified as “knowledge contributors” (R), brought in their
competencies relating to circular economy products to support
the development of the concept (A) (Appendix 1).

On the basis of their experience with the SLL, goal alignment
was sought through several strategizing meetings that allowed
for discussion around the purpose, responsibilities and
expectations (Appendix 2). This led to three complementary
aims for the key stakeholders as follows: the university was
aiming to develop a modern research facility based on an
overarching theme; industry partners were interesting in
commercializing new products; and the state government was
motivated to support new construction practices and improve
its image.

The outcome of this collective action was the establishment
of long-term plans for the project. The university and its
researchers were to assume ownership and be responsible for
the coordination of activities. All actors agreed upon the
conceptualization, including features in line with a new
generation of the living lab. In an effort to avoid the initial
stagnant period of the SLL, a guiding principle was adopted for
the CLL that the space should maintain a research focus that
achieved academic, commercial and social outcomes. In
addition, the living lab would place emphasis on becoming a

collaborative space to work on practical circular economy
projects.

4.2.2 From platform concept to launch (2019 – early 2020)
A formal partnership was signed with a state government
agency that agreed to provide a block of land (R) in a new
housing development for a minimum period of two years and
AUD $100,000 funding toward construction. The government
agency needed a functioning building on their development site
to host meetings and to use as a sale office for the upcoming
construction site (A). Companies were recruited to become
involved in the project based on their interest in circular
construction practices. These industry partners provided their
products, labor and expertise (R), which served to test their
innovative solutions in practice (A). The university team
provided management capability (R) and focused on attracting
new partnerships (A) (Appendix 1).

The University also sought to align partners toward the
committed goal and coordinate research projects. The state
government agency intended to use the facility as an office and
showcase space for events, bringing in an established network
of partners from other projects. The industry partners aimed
to use their involvement for promotional purposes and increase
exposure for their circular economy products and practices. In
addition, smaller companies became tenants (users), also
contributing financial support, knowledge (R) and links to new
industry partners (A). These users were interested in accessing
the network of interested firms, and in the use of the platform
both as an office and for testing new products. To build upon
previous living lab management experiences, all actors were
involved in regular meetings to align the goals and the priorities
(Appendix 2).

A decision was made to run the living lab platform primarily
as a research asset, with its main source of income being
research funds from government or industry project grants
rather than rental income. As such, more strategic uses could
be pursued, such as providing free space to start-ups, which
would better align with the innovation aims of the living lab.
This focus also determined business partner and projects
selection. Through this strategic research focus, the CLL was
designed to be an active and vibrant space for collaboration. A
Gantt chart was implemented to schedule the different steps of
living lab development, coordinating the tasks and inputs for
each actor. In line with circular economy principles, the
foundation steel frames were salvaged and sound absorbent
ceiling panels were made from recycled plastic bottles. As
stated by one of the university researchers: “The carpet is from
a near-new office space that was being renovated and it was due
to be thrown away before we repurposed it. It’s secured with a
double-sided contact pad, rather than glue, meaning it can
potentially even be reused again in the future”.

4.2.3 The platform growth (early 2020–late 2020)
In the early months of 2020, the CLL grew both in the number
of users and innovation projects initiated. The university with
its team provided the applied research skills (R) to coordinate
projects with the partners, which started to bring in new
products and services (R) for testing their innovative solutions
(A). This is exemplified by a manufacturer (an initial industry
partner), which planned to test the quality of their new double-
glazed windows by monitoring the electricity expenditure in the
building before and after their installation. Another manufacturer became a new industry partner by donating automatic blinds and used energy consumption data to measure performance. New partnerships were attracted with a mining company interested in building a worker village using the CLL as a blueprint for sustainable construction (Appendix 2).

Additionally, the CLL was used to support the local community (A) by providing a space for precinct meetings and local events. Community events were held every 4–6 weeks while the space was also used for conferences to raise community members’ awareness of sustainable construction and circular economy in the building sector. The need for the living lab to maintain openness to new actors was exemplified by one start-up manager’s perspective: “a crucial aspect is that the circular living lab is open to the public during its testing phase, ensuring people can learn about circular economy and experience first-hand the future possibilities of modular living”. Meanwhile, the government agency provided additional financial resources (R) to promote activities (A), generating media coverage of the living lab. The user firms initiated applied innovation projects (R), collaborating with the university researchers (A) (Appendix 1). In its operation stage, the living lab provides a meeting and co-working place for researchers, society and industry, with the facility being used to host regular showcases on building design and construction.

5. Discussion

5.1 The relational nature of living lab platforms

The cases offer examples of how living labs function as innovation platforms, in stimulating a virtuous circle of innovation between multiple diverse parties (Ischia and Lescop, 2015). In both the SLL and CLL, stakeholders including university researchers, industry partners and users, maintained individual motivations for participation while recognizing the benefits of networking with other members to achieve innovation outcomes and identify previously unconsidered collaboration opportunities. The living lab is, therefore, not generated in a vacuum but depends on a network of actors that combine resources and develop a constellation of activities oriented to innovation. As emphasized in both cases, the platform includes not only the physical space but also the relational space to support the ideation, development and commercialization of innovation. For the living lab to serve as a functioning innovation platform, consideration should be given to the nature of the relational atmosphere, which develops and functions as a platform. As emphasized in both cases, the platform includes not only the physical space but also the relational space to support the ideation, development and commercialization of innovation. For the living lab to serve as a functioning innovation platform, consideration should be given to the nature of the relational atmosphere, which develops and functions as a platform. As emphasized in both cases, the platform includes not only the physical space but also the relational space to support the ideation, development and commercialization of innovation. For the living lab to serve as a functioning innovation platform, consideration should be given to the nature of the relational atmosphere, which develops and functions as a platform. As emphasized in both cases, the platform includes not only the physical space but also the relational space to support the ideation, development and commercialization of innovation. For the living lab to serve as a functioning innovation platform, consideration should be given to the nature of the relational atmosphere, which develops and functions as a platform. As emphasized in both cases, the platform includes not only the physical space but also the relational space to support the ideation, development and commercialization of innovation. For the living lab to serve as a functioning innovation platform, consideration should be given to the nature of the relational atmosphere, which develops and functions as a platform. As emphasized in both cases, the platform includes not only the physical space but also the relational space to support the ideation, development and commercialization of innovation. For the living lab to serve as a functioning innovation platform, consideration should be given to the nature of the relational atmosphere, which develops and functions as a platform. As emphasized in both cases, the platform includes not only the physical space but also the relational space to support the ideation, development and commercialization of innovation. For the living lab to serve as a functioning innovation platform, consideration should be given to the nature of the relational atmosphere, which develops and functions as a platform. As emphasized in both cases, the platform includes not only the physical space but also the relational space to support the ideation, development and commercialization of innovation. For the living lab to serve as a functioning innovation platform, consideration should be given to the nature of the relational atmosphere, which develops and function
identified across both cases was the generation of collective goal. We identify key joint activities for each stage of platform evolution, in particular those initiated by the university as platform activator.

The first stage (from platform idea to conceptualization) involves the co-creation of a vision, mission and values between the key actors of the living lab. Subsequent key activity is the co-creation of a platform model to satisfy the value proposition. At the second stage (from platform conceptualization to launch) the key joint activities identified are the co-creation of platform configuration and development of criteria to select projects, planning of activities, organizing of processes. The key activities for the platform activator are the identification of industry partners to create the platform and the co-ordination of activities within the living lab. At the third stage (platform growth) the key joint activities relate the co-creation of research and business goals for each project, coordination of contributions and tracking of project results and key performance indicators. The platform activator should be involved in the fostering of a living lab community and eliciting industry partner and user feedback. Joint action can be facilitated through business coaching activities developed by the platform activator, in each stage of platform development, to support the sharing of goals and to improve the commitment and the engagement of the actors involved.

6. Conclusions

6.1 Theoretical implications

As depicted Isckia and Lescop (2015), the main aim of the platform is to stimulate a virtuous circle of innovation. Although the platform concept has traditionally been technology and product-based, they are shifting toward a value and network-centric focus established on the joint actions of network actors rather than on the features of products (Perks et al., 2017). In this context, living labs can be considered a sociotechnical platform that organizes its stakeholders into an innovation ecosystem (Westerlund et al., 2018). We perceive a living lab as primarily a relational platform where three main participants, universities, industry partners and users, work together to foster co-creation and open innovation outcomes within a broad agenda.

While network perspectives has previously been adopted in investigating living labs (Westerlund et al., 2018; Leminen et al., 2016; Nyström et al., 2014), this paper focuses specifically on the nature of relationships and their governance over the course of living lab development. Through inter-organizational relationships, the key actor groups share the tangible and intangible resources required to develop joint activities for collective and individual innovation processes. A key challenge for living lab platforms is to develop an effective way to coordinate interactions and maintain alignment between the nexus of goals of all parties (Leminen et al., 2016).

Insights from both cases show that relational governance relies on cooperation to co-ordinate relationships (Claro et al., 2003) and is crucial to support the transition from initial platform idea to growth. Formal governance considerations may refer to specific interactions, such as institutional relationships between consortium members, intellectual property and research output; however, these mechanisms are
not sufficient to support platform growth (Gibbons and Henderson, 2012; Poppo et al., 2008). While other studies have examined top-down governance approaches of living lab platforms, orchestrated by a lead firm, this paper demonstrates the bases for a relational approach. In line with the industrial network approach (Håkansson and Snehota, 1995), governance is facilitated through inter-firm relationships.

Platform growth is, thus founded on the generation of a collective goal through a process of interaction that simultaneously influences and is influenced by joint activities. Joint actions have been considered to refer to proactive and bilateral goal setting (Ivens, 2002). This process can start with the identification of needs and covers management of conflicts, organizing processes and resources (Aarikka-Stenroos and Jaakkola, 2012). As depicted in the findings, a critical joint problem-solving activity relates to maintaining commitment toward collective living lab goals, which remain within an acceptable nexus between the individual interests of key actors (university, business partners and users). This process should not only inform the first stage of platform development but also each subsequent stage and take into account the shifting relational atmosphere in which it exists (Sutton-Brady, 2001).

This paper has offered an insight into the role of platform activators, in this case University actors that bring a research agenda to the governance of living labs. It follows that platform evolution is founded not only on the key activities developed by the activator but also by joint activities developed by all actors (Leminen et al., 2016). Key joint activities include the sharing of vision, mission and values of the innovation platform, the co-configuration of the platform, the identification of project selection criteria, as well as the sharing of the results. In particular, these key joint activities depict the relevance of collective perspective related to the determinant stages of the platform evolution.

6.2 Managerial implications
Innovation platforms must bring together diverse players through their common interest in innovation and deliver outcomes for all actors involved. Our findings indicate that a relational governance approach constituted by groups of actors supports research activity and outcomes.

It also suggests that the platform activator should embrace research proposals coming from industry partners while at the same time using the living lab space to involve the community in the co-creation and knowledge sharing processes. This requires the platform activator to support, a continuous process of alignment and re-alignment of actors’ goals, maintaining a collective goal. In addition, a degree of equilibrium between university, business partners and users is required to manage the complexity of combining research, commercial or usage goals.

The coordination of inter-organizational relationships involves joint planning and problem-solving across each stage of platform evolution. The management of innovation outcomes from a relational governance approach draws in all stakeholders for important decisions and continues to adapt platform format as required. An aspiration of living labs should be the meaningful engagement of all actors in truly collaborative research activities, rather than only using the space for their own purposes. Living lab platform growth should not only be considered by the number of innovative projects but also the number of interactions and relationships developed between actors. Attention should be paid to the relational atmosphere, which encompassing the activities within the living lab and how that can be supported over the stages of platform development. Our evolutionary perspective highlights the dynamic nature of these relationships, suggesting that living lab development cannot be considered complete once it officially opens its doors, but must be maintained to be considered “living.”

6.3 Limitations and future research
This paper has explored two interrelated innovation platforms with a focus on identifying the main stages of development and better understanding the relational governance role of universities. Future research has the potential to go into greater depth in other living lab cases, particularly by investigating different perspectives of individual and collective goals and how they change while developing the platform. Similarly, relational governance needs to be better understood, for instance by identifying specific mechanisms, which activating actors use to coordinate activities within living labs and the related influence on relational atmosphere within the platform.

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| Platform stages               | Key actors          | Key resources provided                                      | Key activities performed                                      | Key actors          | Key resources provided                                      | Key activities performed                                      |
|------------------------------|---------------------|-------------------------------------------------------------|--------------------------------------------------------------|---------------------|-------------------------------------------------------------|--------------------------------------------------------------|
| From platform idea to concept| University          | Technical construction guidelines                           | Ideation of living lab approach and focus                    | University          | Technical construction guidelines                           | Initial conceptualization                                      |
|                              | SP                  | Technology transfer expertise                               | Facilitation of relationship between University and HC        | State Gov. Agency   | Financial support                                           | Promoting the project to business partners                    |
|                              | Housing Coop.       | Business relationships with construction companies          | Introducing new industry partners                            | Industry partners   | Circular economy technologies                              | Support conceptualization                                      |
|                              |                     |                                                             |                                                               |                     |                                                             |                                                               |
| From platform concept to launch | University          | Expertise on living lab methodology                         | Outlining of background research                             | University          | Management capability                                       | Carrying out research, establishing new partnerships          |
|                              | SP                  | Applied research and business partnering expertise          | Involvement of business partners                              | State Gov. Agency   | Land lease                                                  | Construction site activation                                  |
|                              | Housing Coop.       | Financial resource and access to new business partners      | Coordination of relationships between business partners and university | Industry partners   | Products, labor, experience                                | Facility construction                                          |
|                              | Industry partners   | Whitegoods, energy and interior decorating capabilities     | Monitoring of installation                                   | User Firms          | Financial support, knowledge                               | Participation in living lab workshops                          |
|                              | Users               | Product experience                                          |                                                               |                     |                                                             |                                                               |
| From platform launch to stagnation | University          | Knowledge on living lab planning                            | Small number of workshops                                    | University          | Applied research skills                                     | Coordination of projects with partners                         |
|                              | Housing Coop.       | Financial resources, project management                     | Management of facility                                        | State Gov. Agency   | Financial and marketing resources                          | Promotion of living lab                                        |
|                              | Industry Partners   | Whitegoods and energy solutions, marketing resources        | Product testing and marketing                                 | Industry partners   | Products and services                                       | Product testing                                               |
|                              | Users               | Product experience                                          | Participation in product testing                              | User Firms          | Applied innovation projects                                | Use of co-working space, product testing                      |
| Platform growth              | University          | Applied research skills                                     | Development of projects portfolio                             | University          | Applied research skills                                     | Coordination of projects with partners                         |
|                              | SP                  | Contributions from new stakeholders across the city         | Engagement with external stakeholders                        | State Gov. Agency   | Financial and marketing resources                          | Promotion of living lab                                        |
|                              | Housing Coop.       | Management capability                                       | Innovation project development                                | Industry partners   | Products and services                                       | Product testing                                               |
|                              | Industry partners   | Products, technology, financial support                      | Product testing                                              | User Firms          | Applied innovation projects                                | Use of co-working space, product testing                      |
|                              | Users               | Product experience                                          | Participation in product testing and research projects        |                     |                                                             |                                                               |
Table A2 Platform governance in sustainable and CLLs

| Stage of platform evolution | Key actors | Actor’s goals | SLL | Platform governance | Results of joint action | Key actors | Actor’s goals | CLL | Platform governance | Results of joint action |
|-----------------------------|------------|---------------|-----|---------------------|-------------------------|------------|---------------|-----|---------------------|-------------------------|
| From platform idea to concept | University | Create knowledge of applied architectural innovation; increase funding opportunities and new industry collaborations | Approach: Top-down Relational Focus: A joint venture between HC and consortium model for industry partners | Collective goal: attract research collaboration between industry and academics | University | Promote new innovative projects; measure living lab performance | State Gov | New relationships with business partners | Relational Focus: Partnership with government | Output: New collective innovation projects | Collective goal: development of innovative research projects |
| | State Gov | Strengthen relationships with University and HC | Joint action: Meetings to share ideas; | Outcome: Agreement on basic concept idea | Industry partners | Use the facility as an office and showcase | Industry partners | Consolidate relationships with business partners; establish a research fund for new products | Relational Focus: Development of new products | Output: Setting of long-term plans | |
| | Housing Coop. | Promote its image as an innovative organization; explore new housing construction solutions | | | | | | | | |
| | Industry Partners | Research and development for new products | | | | | | | | |
| From platform concept to launch | University | Drive research within the space; obtain Swedish and European research funding | Approach: Top-down Relational Focus: A joint venture led by HC and consortium model for industry partners | Collective goal: attract research collaboration between industry and academics | University | Collect new knowledge-creation on sustainability | SP | Testing innovative solutions in the real-life setting | Relational Focus: Workshops to discuss circular economy application in living lab | Output: Commercial goals prevailed | |
| | Housing Coop | Expand the network of business relationships, increase activity on site | Joint action: Meetings to define the value proposition and facility planning; promotional activities | Output: New collective innovation projects | Industry partners | Accessing new partnerships and knowledge through community participation | Industry Partners | Limited co-actions | Relational Focus: Provide co-creation of value proposition | Output: Setting of long-term plans | |
| | Industry Partners | Research and development for new products | | | | | | | | |
| From platform launch to stagnation | University | Initiate research projects with industry | Approach: Top-down Relational Focus: the joint venture of industry partners but led by HC | Collective goal: Only between HC and industry | University | Promote new innovative projects; measure living lab performance | HC | Revenue from student accommodation; promotion of the facility | Relational Focus: Partnership with government | Output: New collective innovation projects | Collective goal: development of innovative research projects |
| | SP | New relationships with business partners | Joint action: Meetings dedicated to refocusing of the purpose | Output: New collective innovation projects | Industry partners | Testing innovative solutions in the real-life setting | Housing Coop | Continued development of innovation | Relational Focus: Workshops to co-create services provided and promote new technologies | Output: New collective innovation projects | |
| | Industry Partners | Research and development for new products | | | | | | | | |
| | Users | Live sustainably, contribute to knowledge-creation on sustainability | | | | | | | | |

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