

**Exploring the Potential of Festivals as Living Labs for Systemic Innovation
Insights from the Interdisciplinary Innovation Program DORP**

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5. Exploring the Potential of Festivals as Living Labs for Systemic Innovation

Insights from the
Interdisciplinary
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Program DORP



Abstract

Living Labs offer a promising approach to develop and test sustainable system innovations. One particular type of Living Lab that has received limited attention is the Festival Living Lab (FLL). Festivals can be considered as temporary mini-societies, facing systemic sustainability challenges in areas such as water, energy, housing, logistics, waste management, food, and behaviour. The temporary nature of festivals allows for adjustments to the overall societal system, allowing for experimentation with the mutual interrelationships between different aspects of the system. This makes festivals a distinctive setting for exploring sustainable system innovations. To assess the potential of FLLs as effective real-life experimentation environments, we introduce the Living Lab Activity Framework (LLAF), distinguishing various innovation stages and system levels. We utilise the LLAF to evaluate a selection of innovation projects from the DORP FLL held at the Welcome to The Village (WTTV) festival in Leeuwarden, the Netherlands. The analysis reveals that participating projects adapted their innovations based on new insights gained during various editions of the DORP FLL, demonstrating that festivals can support various stages of the innovation process on different system levels.

Introduction

Transition, system innovation, and Living Labs

Societal transitions, for instance the transition from a linear to a circular economy, are challenging processes that require innovative system changes to achieve the significant transformations in the way societal functions such as transportation, communication, housing, and feeding are fulfilled (Elzen et al., 2004). Many entrepreneurs, policymakers, and students propose innovative ideas to create a circular economy. However, only a few of these ideas are put into practice and scaled up (Kirchherr et al., 2018).

In the theory of strategic niche management (SNM), Schot & Geels (2008, p. 539) argue that many sustainable innovations face difficulties in finding market niches and user demand because they significantly differ from the prevailing technologies. To achieve a successful transition, innovation must occur at multiple system

levels, fostering co-evolution and mutual adaptation between these levels (Walker & Shove, 2007). One promising approach for experimenting with such transformations in real-life settings is through Living Labs.

Living Labs can be defined as 'physical or virtual spaces where stakeholders from various sectors, including companies, public agencies, universities, and users, collaborate to create, prototype, validate, and test new technologies, services, products, and systems in real-life situations' (Leminen et al., 2012, p. 7). These Living Labs may provide an excellent environment for real-life experimentation, supporting the transition to a sustainable future.

Within the field of Living Labs, there are various sub-categories, such as Sustainable Living Labs, Product Living Labs, and Urban Living Labs (Bulkeley et al., 2016; Schliwa, 2013; Steen & van Bueren, 2017). Another rather innovative category is Festival Living Labs (Boonstra et al., 2021). This study explores the potential of this specific type of labs to facilitate sustainable system innovation, as previously has been presented (Dijkstra et al., 2023).

Festival Living Labs

While there is no extensive scientific literature specifically focussed on Festival Living Labs (FLLs), there are ongoing initiatives exploring innovation at festivals. Several European festivals allow scientific research and testing of new innovations on their premises (de Ruiter, 2012; Open-House, 2019; Stichting Innofest, 2019). Additionally, several regional and European-funded projects are investigating the concept of festivals as test beds for innovation (Stichting Innofest, 2019; Inno-Quarter, 2019). These initiatives highlight the unique characteristics of festivals that make them ideal for experimentation, which have for instance been described in the Festival Experimentation Guide (Dijkstra & Boonstra, 2021).

Festivals may be defined as celebratory events that build one or more temporary, independent logistical infrastructures, such as an energy grid, a camp site, and/or water supply for the purpose of facilitating the gathering of people. Combining the definition of a festival with the definition of a Living Lab, a Festival Living Lab may be defined as a celebratory event that facilitates the gathering of people and that offers (interdisciplinary collaborations

between) companies, public agencies, universities, users, and other stakeholders access to one or more of their temporary, independent logistical infrastructures to create, prototype, validate, and test new technologies, services, products, and systems.

Festival sites resemble small cities or temporary settlements, with temporary inhabitants engaging in activities like eating, sleeping, and waste generation. These temporary 'mini societies' face similar sustainability challenges related to water, energy, housing, logistics, waste management, food, and behaviour. For example, the three-day LowLands festival uses 300.000 kWh of electricity generated with 120.000 litres of Diesel each edition (LowLands, 2019). The unique aspect of festival sites, compared to cities, is their temporary and flexible nature. Since festivals are built from scratch for each event, it is relatively easy to make adjustments and interventions to experiment with different systems. The clearly defined borders of the festival site allow for better control and monitoring of material and energy flows. Additionally, festivals provide an affordable platform for experimentation, particularly for smaller companies focused on impact-oriented projects (Elks, 2019).

Festivals offer a unique opportunity to address behavioural change and social acceptance, which are essential for the transition to a circular economy. While attending festivals, people are expected to be more open to trying new things, making festivals ideal for introducing novelties (Potts, 2011; Schulte-Römer, 2013). From a Living Lab perspective, festivals attract a large audience that can be engaged as end-users in open innovation processes and experiments (Leminen, 2015). Moreover, the repetitive nature of some festivals may create an opportunity for a consecutive chain of FLLs, enabling multiple iterative experiments within slightly different settings in a relatively short period of time.

Evaluating system innovation at Festival Living Labs

Festivals have characteristics that make them ideal for experimentation and promoting sustainability transitions. With several FLLs already in operation, this offers an opportunity to examine the effectiveness and impact of these FLLs on sustainable system innovation. Therefore, this study aims to answer the following research question:

Are Festival Living Labs effective real-life experimentation settings for sustainable system innovation?

Evaluating FLLs poses a challenge. Several studies emphasise the need for standardised methods to assess the effectiveness, impacts, and performance of Living Labs (Beaudoin et al., 2022). A scoping review by Bronson et al. (2021) reveals that there is currently no widely applicable approach or framework for evaluating the impact of Living Labs. The dominant method described in literature is comparative qualitative case studies, assessing the overall functioning and achievement of specific Living Labs. However, since our focus is on evaluating the impact of experiments within FLLs, none of the existing frameworks adequately address our research question. We therefore introduce the Living Lab Activity Framework (LAFF) as an evaluative framework to assess the DORP Festival Living Lab. By discussing the results, we provide insights into the research question and conclude with recommendations for future studies. Through this work, we aim to contribute to the existing knowledge on evaluating and assessing the outcomes and impact of Living Labs.

Method

To explore the potential of Festival Living Labs for system innovation, we employed various research methods. Our approach can be summarised in the following steps:

- A. Develop Evaluative Framework: We conducted a literature review to identify existing evaluative approaches and frameworks for Living Labs. Based on this review, we developed the Living Lab Activity Framework (LLAF) to evaluate the progress of innovation projects in a Festival Living Lab across different stages and levels of the system.
- B. Case Selection: We chose the DORP Festival Living Lab as a case study to apply the LLAF. This selection was based on the authors' close involvement in this specific Festival Living Lab and access to relevant documentation. We used existing project documentation to describe the DORP Festival Living Lab.

- C. **Project Selection:** Over the years, numerous projects participated in the DORP Living Lab. To determine which projects to include in the LLAf analysis, we compiled a comprehensive inventory of projects that took place within the DORP Living Lab from 2015 to 2018. We then applied the following criteria to select projects for analysis: (a) Projects that occurred between 2016 and 2018 were included, as projects from the first pilot year of the DORP Summer School deemed not representative when the DORP program was still developing itself as a FLL, (b) Student projects were excluded, as they were primarily educational experiences with limited follow-up, and (c) Projects with insufficient or incomplete data were also excluded. This resulted in 31 projects to be analysed.
- D. **Plotting and Analysis of Projects:** The selected projects were mapped onto the LLAf by determining their innovation stage and system level before and after their participation in the DORP Living Lab. The categorization of projects into different innovation stages and system levels was done through an iterative process involving the researchers, who observed these projects in the field. The first author was involved as program leader of DORP. We used predefined criteria described in Tables 3 and 4. The resulting mapping is presented in Figure 1. Subsequently, the authors evaluated the activities of the projects within the DORP Living Lab through discussion, interpreting how and if the projects progressed between innovation stages and system levels.

Living Lab Activity Framework

In the introduction, we argue that transitioning to sustainable systems requires radical innovation, which often happens in niche areas where system levels mutually adapt (Sengers et al., 2019). Living Labs are seen as a way to experiment with these adaptations. Therefore, projects in Living Labs should focus on (a) experimentation and (b) exploring interdependencies between system levels. To evaluate the potential of using festivals as real-life settings for sustainable system innovation, we have identified two sub-questions for our evaluation framework:

- *Sub-question I: What phase of the innovation process do projects in the Festival Living Lab focus on?*
- *Sub-question II: What system level do projects in the Festival Living Lab focus on?*

We acknowledge that design and innovation processes are non-linear, lacking a predetermined sequence for addressing specific system levels within innovation. While there's a resemblance between the hierarchical approach of system levels and the means-end chain often used by designers (Joore & Brezet, 2015), innovation processes, influenced by factors like technology, legislation, and user markets, develop interdependently. This holistic approach is evident in models such as Acklin's Design-Driven Innovation Process (2010) and the TU/e Innovation Lab model (Den Ouden et al., 2016). Real-life testing in Living Labs unveils these interdependencies, allowing projects to start with a focus on a specific aspect or system level but adapt as needed based on feedback and challenges from other levels or aspects. The iterative learning process involves conducting experiments, monitoring outcomes, and making improvements, generating valuable knowledge in a real-life setting (Schliwa, 2013). The ability to iterate between innovation stages and system levels adds value to the design process in Living Labs.

To show the iterative nature between innovation stages and system levels, we created a matrix, forming the Living Lab Activity Framework (LLAF) as depicted in Figure 1. In this framework, both sub-questions correspond to the two axes: system levels (sub-question I) are represented along the y-axis, and the project's innovation stages (sub-question II) are represented along the x-axis. Based on literature (refer to Tables 1 and 2), we identified five innovation stages on the x-axis (1. Exploration, 2. Development, 3. Experimentation, 4. Implementation, and 5. Commercialisation) and four system levels on the y-axis (A. Product-Technology System, B. Product-Service System, C. Socio-Technical System, and D. Societal System).

System level	D. Societal System	D1	D2	D3	D4	D5
	C. Socio-Technical System	C1	C2	C3	C4	C5
	B. Product-Service System	B1	B2	B3	B4	B5
	A. Product-Technology System	A1	A2	A3	A4	A5
		1. Exploration	2. Development	3. Experimentation	4. Implementation	5. Commercialisation
		Innovation phase				

Figure 1. Living Lab Activity Framework (LAFF) for evaluating Festival Living Labs projects (Dijkstra et al., 2023).

The LAFF is used to plot a project’s innovation phase and system level on the framework before and after participating in the Festival Living Lab, using the criteria described in Tables 3 and 4. This provides a visual representation of a project’s development in the Living Lab.

Although Living Labs involve diverse actors, resources, and activities that support innovation throughout the lifecycle (Leminen et al., 2012), projects in Living Labs can only undergo a limited number of iterations within their programs and settings. Therefore, the framework only shows the progress of the research, development, and/or experimentation process made by projects within one or more editions of the Festival Living Lab itself. It does not indicate the overall impact of the Living Lab on a project’s innovation progress. Additionally, since different programs within our case study focus on different types of challenges (e.g., technical prototypes, business models, user behaviour), the phase a project starts or ends in does not reflect the quality of iterations made by the projects. Therefore, the iterations made by projects are not qualitatively comparable.

Table 1. Comparison of innovation stages in literature (x-axis) (Dijkstra et al., 2023).

Living Lab Activity Framework	TRLs (Mankins, 1995)	Stage-Gate Model (Cooper et al., 2002)	The Fugle Model's Innovation Funnel (Du et al., 2008)	TUe Innovation Lab (den Ouden, 2016)	ULL Way of Working (Steen & van Bueren, 2017)	
1. Exploration	TRL0 – Not officially defined by NASA	1. Preliminary assessment	A. Idea Generation/ Identification	Exploration	Research	
	TRL1 – Basic Research	2. Definition	B. Concept Definition			
2. Development	TRL2 – Proof of Principle	3. Development	C. Concept Feasibility and Refinement	Concept Development	Development	
	TRL3 – Early lab scale demonstration		D. Portfolio			
3. Experimentation	TRL4 – Lab scale demonstration		4. Validation	E. Deployment		Evaluation and Validation
	TRL5 – Validation					
4. Implementation	TRL6 – Early prototype	5. Commercialisation	F. Refinement and Formalisation	Market Introduction	Implementation	
	TRL7 – Late prototype					
5. Commercialisation	TRL8 – Early stage commercial environment application		5. Commercialisation	G. Exploitation Stage		Commercialisation
	TRL9 – Market ready application full commercial application					

Table 2. Comparison of system levels in literature (y-axis) (Dijkstra et al., 2023).

Living Lab Activity Framework	Innovation levels (Ceschin & Gaziulusoy, 2016)	MDM Model (Joore & Brezet, 2015)	Transition Management (Geels, 2005)	Intelligent Products (Andrews, 2003)	Design for Sustainability (Brezet et al., 2001)	Systems Engineering (Haugan, 2001)	Means-end-chain (Roozenburg & Eekels, 1998)
D. Societal System	Spatio-Social innovation level	S: Societal System	Transitions (landscape)	Rethinking Values	System innovation	System	Values
C. Socio-Technical System	Socio-Technical System innovation level	R: Socio-Technical System	System innovation (social-technical regime)	Systemic Context	Function innovation	Sub-system	Needs
B. Product-Service System	Product-Service System innovation level	Q: Product-Service System	Process innovation (niche)	Ecological Context	Function Redesign	Element	Functions characteristics
A. Product-Technology System	Product innovation level	P: Product-Technology System	Product innovation (niche)	Immediate Context	Product Improvement	Component	Form

Table 3: LLAF innovation stages (x-axis) (Dijkstra et al., 2023).

Dimension	Description	Criteria
1. Exploration	The process of making new discoveries about a problem or solution and coming up with an innovative concept.	The project is based on an idea or problem but has no evidence to base its assumptions on. It is an unproven concept and no validation has been done yet.
2. Development	The process of advancing basic ideas and concepts into more concrete and holistic requirements of the innovation.	The project is based on a clear concept but needs further development and/or validation of its underlying assumptions.
3. Experimentation	The process of testing and validating assumptions about the innovation.	The project has a prototype that needs to be tested. This can be a physical prototype but also, e.g., a service or societal concept.
4. Implementation	The process of applying or integrating the innovation in its designated real-life setting.	The project has a product, service, or approach that is tested in relation to its context while being integrated in the larger system.
5. Commercialisation	The process of making the innovation available on the market.	The project has a product, service, or approach that is implemented and commercially operates in its (simulated) context, testing mutual dependencies between all system aspects (technical, economic, and social).

Table 4. LLAF system levels (y-axis) (Dijkstra et al., 2023).

Dimension	Description	Festival Context	Criteria
A. Product-Technology System	The Product-Technology System level is made up of tangible products that one can touch.	Within the context of a festival, the product level refers to the 'hardware' the festival is built up from (tents, cabins, sound systems, generators, etc).	The project focuses on tangible products.
B. Product-Service System	The Product-Service System level is made out of the combination of physical and organisational components that together fulfil a specific function.	Within the festival, the service level refers to the services provided for by the festival; the total of products and services providing, e.g., the economic infrastructure (often coins) people can buy food or drinks with, the campsite people can safely sleep in, but also the provision of drinking water and the service of waste removal.	The project focuses on new types of services (e.g., Product-as-a-Service models, cryptocurrency systems) and/or exploring their product's market fit.
C. Socio-Technical System	At the Socio-Technical System level 'a large number of components are combined that are not formally related to each other' (Joore & Brezet, 2015). The socio-technical system can be defined as 'a cluster of aligned elements, including artefacts, technology, knowledge, user practices and markets, regulation, cultural meaning, infrastructure, maintenance networks and supply networks, that together fulfil a specific societal function' (Geels, 2005).	Within the context of a festival, this level refers to the coherence of the festival's technical and economic infrastructure together with its entertainment program, its safety protocols, its organisation, suppliers and stakeholders, and its audience.	The project focuses on the integration of new products or services in (a part of) the full festival system. An important difference within this criterion as opposed to experimentation on other system levels, is that something in the wider system of the festival is depending on the project innovation's functioning.
D. Societal System	The Societal System level relates to the intangible believes, traditions, norms and values of a community of people in a specific place.	Within the festival context the Societal System level is made up of the festival audience that behaves according to its communal believes.	The project focuses on behavioural change or the acceptance of change.

Results

Description of the DORP Festival Living Lab case

The DORP Festival Living Lab was a part of Welcome to The Village (WTTV), a popular music festival that took place over three days in Leeuwarden, a city in the north of the Netherlands. The festival attracted around 9,000 visitors who enjoy music performances on three stages, along with theatre shows, visual arts, and a program focused on social issues, sustainability, and innovation. From 2014 to 2018, more than 70 innovation projects by students, start-ups, and companies were featured in various innovation programs associated with the WTTV festival. These programs aimed to develop, test, and promote sustainable concepts, prototypes, business models, and service models. Each program focused on projects at different stages of the innovation process and utilised the festival in different ways to support and accelerate sustainable innovations. Together, we refer to all these programs as the DORP Festival Living Lab (DORP meaning VILLAGE in Dutch).

Test and implementation projects

In the DORP Festival Living Lab, entrepreneurs had the opportunity to test their innovations using the festival's infrastructure and audience. Innofest, a platform supporting innovation at festivals, facilitated several projects that used the festival as a real-life testing ground. For example, **Greener** tested their off-grid battery, which provides sustainable energy for festivals as an alternative to diesel generators commonly used. Another project, **Loyal Garden**, developed a blockchain system to pay festival volunteers with a specific cryptocurrency. A prototype of the system was implemented during the DORP Summer School prior to the festival, where participants used a personal QR code on their festival wristbands to purchase drinks at the DORP bar. During the festival, the system was tested with volunteers in the backstage area.

Additionally, as the festival organiser, WTTV sometimes acts as an early adopter of new sustainable and circular innovations, particularly those related to festivals. One example is the collaboration with **LILY**, a light installation initially designed to illuminate the pathway from the festival to its campsite. Over the

years, LILY has been extensively tested and further developed at the WTTV festival. It has evolved into a floating art installation inspired by natural patterns such as schools of fish or flocks of birds. Illustrations of these projects can be seen in Figure 2.



Figure 2. Illustrations of test and implementation projects at WTTV: Greener (Picture © Greener), Loyal Garden (Picture © Innofest), and LILY (Picture © WERC).

Innovation projects

Within the DORP Festival Living Lab, there was a sub-program called the DORP Summer School. This program used the festival as a place for collaboration and co-creation. The DORP Summer School was created to give entrepreneurs and organisations the chance to further develop their innovative ideas and concepts with the help of a diverse team of students from different disciplines, faculties, and universities. The students work together with the entrepreneurs or organisations for 7 days, guided by experts, using a hackathon format based on the design thinking approach.

During the Summer School, the interdisciplinary teams assist in developing and validating the concepts or prototypes directly at the festival. This quick feedback loop sets it apart from other hackathon programs that usually focus on either idea generation or development phases. From a university perspective, the Summer School serves as an interdisciplinary course that teaches students how to work together effectively in interdisciplinary teams.

The challenges brought to the DORP Summer School can cover various aspects and may be in different stages of innovation. For example, there may be a need for scientific research to develop innovative concepts, such as the project **Offgrid Basecamps** brought in by construction company Van Wijnen. In this challenge, the team worked on finding a solution for construction site managers to select the best renewable energy option for their sites.

On the other hand, entrepreneurs may already have a technical prototype that needs further development and testing. For instance, **Saru Soda** sought assistance in modifying a post-mix lemonade machine to dispense their organic lemonades. Another example is **Comp-A-Tent**, who aimed to create an appealing and functional festival tent using their newly patented compostable material. You can see illustrations of these projects in Figure 3.



Figure 3. Illustrations of innovation projects at WTTV: Saru Soda (Picture © Nena Bode), Comp-A-Tent (Picture © DORP Summer School), and Offgrid Basecamps (Picture © DORP Summer School).

Experience projects

Festivals provide an exciting opportunity to introduce new and innovative ideas. To involve festival-goers in the innovation process and gather feedback for the projects, a designated area within the WTTV festival site is dedicated to innovation. This space serves as a platform to showcase new products, business models, and services in a fun, interactive, and accessible manner. Its aim is to raise awareness and generate support for sustainable changes. Here, festival attendees become unwitting participants in scientific research or provide feedback on the new offerings from entrepreneurs.

One example of such a project is the **Hair-Washing District** created by the Japanese artist Sachi Miyachi. In collaboration with students from the DORP Summer School, they designed a raised and self-sustaining structure where festival-goers could have their hair washed, encouraging them to appreciate life's simple pleasures. Another instance is the **Snackathon** introduced by WTTV in 2018. In the Snackathon, food entrepreneurs were challenged to develop healthy and sustainable snacks for the 'Cafeteria of the Future' during the DORP Summer School. These snacks were then sold directly to festival attendees, allowing them to sample and provide feedback. Examples of the snacks created include 'cricket fries,' made from cricket flour by **&Cricket**, and the **Vegandel**, a vegan twist on a traditional Dutch snack using seitan. You can see illustrations of these projects in Figure 4.



Figure 4. Illustrations of Experience projects at WTTV: Hair-Washing District (Picture © Nena Bode), Vegandel (Picture © DORP Summer School), and &Cricket (Picture © DORP Summer School).

Resulting plotting of DORP projects

Plotting the selected DORP projects on the Living Lab Activity Framework (LAFF) helps visualise their progress. You can see the results in Figure 5.

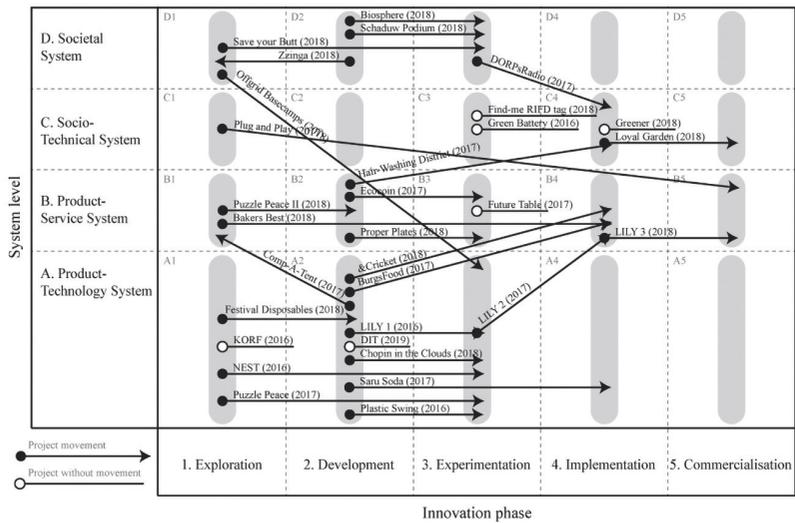


Figure 5. Selected projects participating in the DORP Living Lab from 2016 to 2018 plotted on the Living Lab Activity Framework (Dijkstra et al., 2023).

Figure 5 shows that many projects have made significant progress in their innovation process by testing, implementing, or even commercialising their products, services, or concepts at the festival (16 out of 31 projects). For example, **Saru Soda** moved from Product-Technology Development (A2) to Product-Technology Implementation (A4).

The framework also highlights that some projects iterate between different levels (7 out of 31 projects). On one hand, there are forward iterations. For instance, **Offgrid Basecamps** started with research on selecting the best renewable energy solution for

construction sites. They developed a decision-based algorithm (D1) and then created a prototype of a serious game, which was tested at the festival (A3) among the audience. Another project with significant iteration is **Plug & Play**, which transitioned from the Exploration phase on the Socio-Technical level (C1) to the Commercialisation phase on the Product-Service level (B5). Plug & Play aimed to explore how electric car batteries could power music stages in the future. At the festival, the students working on this challenge successfully 'hacked' an electric car and organised a fully operational car-powered silent disco. Projects that also made quite large iterations are **BurgsFood** and **&Cricket**. These two projects were part of the Snackathon and developed, tested, and eventually sold sustainable snacks at the festival. As they were challenged to sell their snacks according to the official festival rules (so they would not be unfair competition to other food stalls) these projects were really forced to make a leap from Development on a Product-Technology level (A2) to Implementation on the Product-Service level (B4).

On the other hand, some projects iterate backward in the framework (2 out of 31 projects), namely **Zzinga** and **Comp-A-Tent**. This backward movement does not mean that no valuable insights were found, but rather that they encountered challenges during the program that required them to reassess the viability of their ideas in their current form. This was one of the objectives of the DORP Summer School: to identify early on whether an innovative concept is feasible before investing significant time and resources into its development. For example, **Comp-A-Tent** aimed to design and test a new biodegradable tent for festival-goers based on their patented material. However, during the design process, they discovered that their intended user (the festival-goer) was not their actual customer. The festival organisation itself became their customer, leading to changes in the requirements and the overall business case. Despite this shift, the DORP Living Lab still provided valuable insights for Comp-A-Tent, albeit on a different system level than initially intended.

Not directly visible but worth noting is that projects that participated in the DORP Living Lab for multiple years focused on challenges at different system levels each year. A prime example is the **LILY** project by WERC, which was present at the WTTV festival every year. It evolved from a single LILY prototype in 2016 to a

fully implemented sustainable art installation in 2018. Another example is **Puzzle Peace**, which initially joined the DORP Living Lab in 2017 with a challenge to develop multifunctional furniture. They successfully created a prototype that the festival organisation purchased as a launching customer. The following year, they returned to the DORP Summer School to develop their business case, which they then tested among the festival audience.

Discussion

The aim of this study is to understand whether FLLs may function as effective real-life experimentation settings for sustainable system innovation. Our research resulted in three key findings:

1. Festival Living Labs may function as a relevant real-life experimentation setting for sustainable innovation.

Festival Living Labs can serve as practical settings for testing sustainable innovations. The proposed LLAf supported visualising the progress of innovation projects, showing how they move horizontally between different innovation stages and vertically across system levels. The analysis of 31 DORP projects indicates that Festival Living Labs, like DORP, can support learning across innovation phases and navigate between system levels. This is crucial because achieving radical change for sustainable transition requires a holistic view and coordination across system levels (Walker & Shove, 2007; Schot & Geels, 2008). The DORP Festival Living Lab is a unique initiative linked to the identity of the WTTV festival. To better understand whether all festivals can support sustainable system innovation, further research on the characteristics and requirements of Festival Living Labs and other types of Living Labs is necessary.

2. Festival Living Labs (FLLs) have the potential for system innovation, but this has not been conclusively proven.

The dynamic and adaptable nature of festivals makes them ideal for experimenting with technical, economic, and social systems (Dijkstra & Boonstra, 2021). In the LLAf, projects exploring these systems corresponds to sections C3 and C4. However, in the DORP FLL, only a few projects fall into this category. Analysis indicates that most development in DORP FLL focuses on product-technology systems (level A) and product-service systems (level B).

This aligns with findings by Steen & Van Bueren (2017) that many Urban Living Labs lack key characteristics for groundbreaking innovations. The LLAF also shows some experimentation with the Societal System (level D), supporting the idea that festivals are suitable for trying novel ideas (Potts, 2011; Schulte-Römer, 2013).

The emphasis on the lower left corner of the LLAF may suggest FLLs are not effective for sustainable system innovation. However, the limited projects in this area could be influenced by research limitations, such as incomplete data plotting and different perspectives from project owners. DORP FLL programs primarily focus on accelerating innovation in general, not specifically on Socio-Technical System innovation. Thus, while our study indicates FLLs can be effective for sustainable innovation projects, it doesn't necessarily confirm festivals as particularly effective for sustainable system innovation.

To better understand FLLs' effectiveness for sustainable system innovation, case studies specifically focusing on Socio-Technical System innovation are needed. These studies would explore how movements on the LLAF towards and from the Socio-Technical system level can be facilitated.

3. The LLAF may contribute to analysing the effectiveness of Living Labs by providing a framework to evaluate and compare their impact over time.

The LLAF can help assess the effectiveness of Living Labs by providing a framework to evaluate and compare their impact over time. There is a growing need for methods and frameworks to evaluate Living Labs' impact and effectiveness (Beaudoin et al., 2022; Bronson et al., 2021). Using the LLAF to visualise the progress of Living Lab projects may offer deeper insights into their outcomes, allowing for potential improvements in focus or design to enhance innovation results. However, it's important to note that the LLAF only captures project iterations within one or more editions of a Festival Living Lab (FLL). It doesn't reveal whether a project's involvement in the FLL has a lasting impact on its long-term innovation process outside of the FLL event. Assessing the FLL's impact beyond the event is beyond the scope of this chapter. To validate the effectiveness and applicability of the LLAF, further

research should apply the framework to other FLLs or Living Labs in different contexts (e.g., various Urban Living Labs). Additionally, exploring how FLL experiment results and insights may be scaled beyond the FLL would be valuable.

Conclusion

The purpose of this study was to explore whether Festival Living Labs (FLLs) can be effective settings for system innovation. We wanted to investigate if festivals, with their infrastructure, can support real-life experiments on the Socio-Technical System level and contribute to accelerating sustainable transitions. To answer this question, we developed the Living Lab Activity Framework (LLAF) to help identify the innovation stage and system level of projects participating in an FLL. By analysing 31 innovation projects from the DORP Living Lab at the Welcome to The Village festival in the Netherlands, we found that projects were present at all system levels. This suggests that FLLs can indeed facilitate experiments across different levels. However, most of the projects in the DORP Living Lab primarily focused on developing products and services. Therefore, the findings don't strongly support the idea that festivals are specifically effective for sustainable system innovation. Nevertheless, the study indicates that festivals can be suitable environments to function as Living Labs for various types of innovation, including system innovation. Future research could explore how movements towards and from the Socio-Technical system level can be facilitated. To gain a deeper understanding of whether festivals are suitable contexts to support sustainable system innovation, more research on FLLs and other types of Living Labs is necessary, with a specific focus on system innovation and sustainable transitions.

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