Tools for collaborating and interacting in Living Labs – an exploratory case study on JOSEPHS®

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Abstract

Living Labs serve as a novel form of collaborating and developing innovation. As interactive, physical settings, they hold several possibilities of facilitating co-creation with diverse stakeholders. Research on tools and methods used in Living Labs is still under development. To contribute to this research, this paper investigates the use of tools for interaction in a Living Lab. A longitudinal exploratory case study on the JOSEPHS® in Nuremberg was applied. This study finds that (1) there are three categories of tools used for integrating visitors, (2) interaction with visitors in a Living Lab depends on the factors time and commitment and (3) tools for different integration types need to be matched to the determinants of interaction. The study contributes to literature on co-creation and interaction in Living Labs by highlighting that visitor roles should not be perceived as fixed user categories, but as the variable result of interaction with applied tools.

KEYWORDS: co-creation, living labs, tools, interaction

Introduction & Motivation

Shortening life-cycles of products and services lead to an increased demand of development approaches to reduce uncertainties and to fasten the innovation process. In the past two decades, with open innovation and the sharing economy developing rapidly, a vast amount of new approaches have emerged that put the user on eyesight with the producer in the innovation process. Today, large parts of the knowledge economy are based on the input of users and communities to solve technological and organizational problems (Harhoff & Lakhani, 2016). While previous research has focused on online sources of innovation such as contests, communities and toolkits, new innovation formats have developed, shifting open and co-creative innovation to physical spaces. Next to hackathons, design jams, and maker spaces, Living Labs have emerged a new approach for developing innovation in recent years (Dutilleul et al., 2010). These physical environments give multiple stakeholders the possibility to innovate and prototype in real-life settings. Living Labs enable a coupled open innovation process as they provide access to current developments (inside-out) as well as obtain

feedback and new insights (outside-in). To date, research on Living Labs has, amongst others, focused on aspects like network actors, the underlying methodology and innovation activities (Leminen et al., 2012; Leminen & Westerlund, 2017; Roth & Jonas, 2018).

First attempts to provide an overview of Living Labs are driven by the initiatives InnoLab and the European Network of Living Labs (ENoLL). The latter currently lists 411 Living Labs in its database, although the list is not complete. Despite this growing number of Living Labs, there are many open questions regarding characteristics of Living Labs, underlying processes that are happening in these environments and the methods creating value at these open infrastructures (Veeckman et al., 2013; Ballon & Schuurman, 2015). This paper seeks to shed light on user-integration tools in physical innovation spaces and asks: What tools for open innovation are used in the interaction with visitors of a Living Lab? What learnings can be derived from the usage of the tools?

Related Literature

With the advent of the Internet and the increasing digitization, markets have undergone a radical transformation and the traditional, closed approach towards innovation was revised by many companies at the end of the 20th century (Brant & Lohse, 2014, Chesbrough, 2006). The increased connectivity has led to consumers becoming more informed and aware about the products they buy and consume. These empowered consumers (called prosumers by Toffler, 1980) exhibit their needs and feedback, and seek to play a more active, shaping role in the product development process of companies as they are dissatisfied with available product choices (OHern & Rindfleisch, 2010). The resulting requirements on the complexity of products and the trend towards consumer centricity require new forms of innovation development. As a consequence the open innovation paradigm arose which finds a significant adoption in industry. Open innovation simply means opening and diffusing boundaries of corporations and their environments (Chesbrough, 2006). According to Gassmann & Enkel (2006), open innovation can take the form of three processes:

- The outside-in process refers to the use of external sources of innovation. This involves the transfer of knowledge from customers, suppliers, partners or even universities and competitors.
- The inside-out process happens when internally developed ideas are out-licensed to external partners. Main reasons to do so lie in distribution partnerships, collaborative development or to profit from a developed technology that is not used internally.
- The coupled process combines the outside-in and inside-out process, but rather than just sharing resources and expertise, companies collaborate closely as for example in form of a joint venture.

These processes were developed from a business perspective. In fact, open innovation with customers was mainly seen as an outside-in process, in which customers were seen as sources of ideas for new products or services (Brunoe et al., 2014). Meanwhile, this perspective has shifted towards consumer-centricity. Instead of exploiting the knowledge of the consumers, knowledge is co-created with users. Co-creation therefore can be perceived as a coupled process in which users generate ideas for new products and services, test prototypes and remain attached to the company beyond the development process (Brunoe et al., 2014). Thus, co-creation is a "form of market or business strategy that emphasizes the generation and ongoing realization of mutual firm - customer value. It views markets as forums for firms and active customers to share, combine and renew each other's resources and capabilities to create value through new forms of interaction, service and learning mechanisms" (Minghetti, 2014, p.14)

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Participants and self-selection

Opening up the innovation process and co-creating products and services raises the question of suitable participants for this open process (Matthing et al., 2006). Since satisfying market needs is considered a main requirement for the success of new products and services, research is directed towards identifying and classifying the source of these needs. The literature lists numerous typologies; Scholarly work relates to users (Kristensson et al., 2008; Piller et al., 2013), consumers (Füller et al., 2009; Vernette & Hamdi-Kidar, 2013) customers (Carbonell et al., 2012; Gustafsson et al., 2012) or co-creators (Prahalad & Ramaswamy, 2004). Even within these definitions, there are numerous concepts that determine which traits an individual must possess in order to assume a specific function in the innovation process. The most well-known concept is possibly the lead user (von Hippel, 1986). But with emergent nature consumers (Hoffman et al., 2010; Vernette & Hamdi-Kidar, 2013), user innovators (von Hippel, 2005), co-producers (Vargo & Lusch, 2004) and ordinary consumers (Kristensson et al., 2008; Wendelken et al., 2014) there are several other concepts that categorize the unknown crowd of active and proactive stakeholders of innovations. These different concepts and categories help us to understand the tremendous potential for innovation that lies outside the boundaries of organizations. However, the identification, selection and acquisition of individuals for a planned innovation project can pose a demanding challenge, alongside defining the 'best way' how to design and arrange for co-creation activities (Matthing et al., 2006). Some organizations therefore initiate a "broadcast search" or self-selection, inviting everyone who deems themselves capable of solving an innovation challenge to the innovation process (Jeppesen & Lakhani, 2010).

Integration modes of participants

Besides knowing what different types of stakeholders are to be considered in co-creation, the question arises how they are to be involved in the innovation process. According to Jonas et al. (2014; cf. Alam, 2002; Edvardsson et al., 2010), stakeholder integration is implemented in the modes passive integration, reactive integration and mutual co-creation.

- In the mode "passive integration", stakeholders are integrated in the innovation process without their knowledge. Stakeholders are observed in order to gain insights from their behavior without direct communication.
- Reactive integration occurs when a stakeholder is answering a request for feedback. Surveys or interviews serve as an example of this mode as information is obtained from an initial trigger.
- Mutual co-creation happens when the stakeholder engages in active dialogue and the joint development of new products or services (Prahalad & Ramaswamy, 2004). Mutual co-creation represents stakeholder interaction on eyesight. Gustafsson describes this "as a frequent, bidirectional, and face-to-face communication process that is used when attempting creative problem solving" (Gustafsson et al., 2012, pp. 314-315).

Living Labs for open innovation

Living Labs serve as a novel approach to open innovation and fill the gap between user-centered methods and participatory design (Dell'Era & Landoni, 2014). Although multiple perspectives on the concept exist, the term "Living Lab" typically describes a physical test environment in which companies, public authorities and citizens cooperate and test new services, products and technologies (Niitamo et al., 2006). As a mixture between open innovation and user-centered research, the core of the concept of Living Labs is that the testing and generation of ideas happening in a simulated "real life" context leads to better insights regarding the practical suitability of the tested products and services (Leminen et al., 2012). Products and services are not just tested but also co-developed with potential users, resulting in an end-product that precisely meets the customers' needs and demands

(Leminen et al., 2012).[1] But Living Labs can be used beyond the testing-stage. Living Labs can also serve as a starting point for innovation as they enable users to explicitly exhibit their experiences, knowledge and daily needs (Bergvall-Kareborn et al., 2009).

According to Roth et al. (2014) four types of Living Labs can be classified by longevity and the operating principle. The first category describes Living Labs as existing temporary and being built by a specific company. The second category includes facilities that are operated by a specific company but whose operation is long term. The third and fourth categories describe Living Labs operated by intermediaries, either event-based or long-term. Leminen et al. (2012) offer a categorization focusing on the operators of Living Labs: utilizers (typically companies), enablers (public authorities and NGO´s), providers (research organizations) and users.

These different forms of Living Labs underline the impact the approach can have for different actors. While companies can develop and test prototypes with potential users, Living Labs also serve as innovation structure to tackle societal issues, raise awareness about topics of public interest, facilitate knowledge transfer and identify user needs (Greve et al., 2016). Living Labs are accordingly defined as "a platform for interactive co-creation and innovation which allow for direct exchange with the public, customers, users and other stakeholders" (Matzner et al., 2018, p. 16).

Participant involvement in Living Labs

According to Bergvall-Kareborn and Stahlbrost (2009), three key elements are essential characteristics of Living Labs: openness, realism and empowerment of users. These three elements also regulate the tools that can be used in the Living Lab to interact with stakeholders. Realism is often achieved through the use of physical artifacts (Dell'Era & Landoni, 2014). Tools used in Living Labs include co-creation techniques and innovation research methods, but also market research (Leminen et al. , 2012; Magadley & Birdi, 2009). Franz (2015) argues that the tools used in Living Labs should better exploit the benefits of interactivity and the real-life environment and go beyond traditional and proven tools. However, few studies have investigated the facilitation and use of tools in the context of Living Labs (cf. Greve et al., 2016; Beutel et al., 2017, Leminen & Westerlund, 2017). Existing studies focused on the development process of new products and services (Feurstein et al., 2008) or on the use of individual tools. For this reason, this paper aims to shed light on the following research questions:

RQ 1: What tools are used in the interaction with visitors of a Living Lab for open innovation?
RQ 2: What learnings can be derived from the usage of the tools?

Methodology

In order to gain in-depth insights on the usage of tools in Living Labs, a qualitative research design is particularly well suited. As stated by Möller (2017), especially when investigating new and complex topics such as Living Labs, it is appropriate to include the context of the examination object in the study. As an open, qualitative approach, case studies allow for the generation of new insights and an understanding of underlying processes and are therefore suited for the exploration of new phenomena such as the processes and practices in Living Labs (Eisenhardt & Graebner, 2007; Yin, 2009). To explore the usage of tools in the interaction with self-selected visitors the research design of an exploratory single case study was chosen (Yin, 2009). To investigate tools for the co-creation with customers, users, non-

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[1]Concepts such as participatory design (Björgvinsson et. al., 2010), commons (Seravalli, 2014) and publics in the making (Lindström & Ståhl, 2014) are closely related perspectives on this topic.

users and other stakeholders of an innovation, an accessible, established open Living Lab needed to be selected, which would provide access to information about their applied tools.

The Case

The case study is conducted at the open innovation lab JOSEPHS®, a Living Lab located in downtown Nuremberg, Germany. JOSEPHS® resembles an intermediary platform that facilitates co-creation and collaboration between users and companies. This is achieved by a publicly accessible physical place where companies have access to five co-creation spaces, to present, discuss and evaluate products or service prototypes. Visitors are invited to interact with the prototypes, experience them and generate feedback. Thereby, visitors are gaining the opportunity to play a significant role in the early or in the late phases of the innovation process. No selection of visitors is taking place at JOSEPHS®: the Living Labs' operating principle relies on broadcast search and self-selection of co-creators coming to the space as it is open during the local retail opening times and accessible for free. At JOSEPHS®, the companies´ innovation projects are organized in three month periods under the umbrella of a common theme, in which a variety of co-creation tools may be used. This allows for an agile innovation process, as companies can evaluate, compare and alternate prototypes according the consumer feedback. Since its' founding in May 2014, JOSEPHS® visitors had the opportunity to co-create in about 76 different projects. To initiate and lead the interactions in the Living Labs' innovation spaces, JOSEPHS® operates with a team of innovation guides, who welcome and encourage visitors to try and test prototypes as well as to give feedback.

Data Collection & Analysis

To gain insight into tool implementation for co-creation with visitors in the open innovation space, this case study analyses the set-up of co-creation spaces of seventy-one innovation projects in the Living Lab JOSEPHS®. The case study includes data of every innovation project at JOSEPHS®, from May 2014 until August 2017. Therefore, a large variety of individual cases was covered, ranging from large companies to start-ups, from product to service-focus and from early to late phases of the innovation process.

Various data sources were used for the realization of the exploratory case study: observations, project documents and photographic documentation. The collection of the primary data in form of observations was carried out by a team of trained researchers in the period from May 2014 until August 2017. The combination of data sources enables the understanding of the specific context and increases the reliability of the data evaluation. For the data analysis, the various sources of data were sighted, structured and analyzed in a step-by-step process depicted in table 1.

Data Analysis Phase	Activity & Outcome
1 Structuring the data	• Sighting the data and extracting information about the tools used at the innovation spaces in order to derive an overview of all tools used at the innovation spaces, sorted chronologically and by theme world.
2 Pattern analysis of the data	• Iterative analysis of data to identify patterns in respect to the used tools across projects and theme worlds.
3 Derivation of evolutionary phases	• Building on the previously identified patterns, three distinct phases of tool application were derived.
4 Data analysis according to integration modes	• By sorting the used tools regarding their mode of integration, the predominant type of integration was identified for the tools used in each phase.
5 Workshops for validation of findings	• In order to validate the results from the data analysis, two workshops with practicioners from the JOSEPHS® were conducted, resulting in adjustments and enriched findings.

Table 1: Illustration of the qualitative data analysis process

Two expert workshops with research and operations personnel from JOSEPHS® were held to support and validate the preliminary findings. The expert workshops took place in April

2017 and were captured via photographs and written documentation. These data, interviews and the secondary data were analyzed through an abductive approach according to Siggelkow (2007), building on literature and models on co-creation, applying an iterative pattern matching logic (Yin, 2014; Gibbert & Ruigrok, 2010).

Findings

The evaluation of the collected data generated a number of insights on the usage of tools, modes of interaction as well as requirements on tools in the Living Lab JOSEPHS®. First, the analysis of the interactions with visitors shows that the tools for mutual co-creation, for reactive integration and for passive integration have been implemented in chronological phases; the interaction with visitors and learnings derived had a substantial impact on the selection of the tools. Second, longitudinal case data puts forward that the implementation of tools for reactive visitor integration is the dominant mode in the analyzed Living Lab. Third, the case study reveals that co-creation in the Living Lab JOSEPHS® is not only defined by the tools and the mode of interaction, but foremost characterized by the enthusiasm of the co-creating visitor and the available time for interaction.

Evolutionary phases of tool usage

The tool implementation shows chronological phases: In the first phase, from May 2014 to January 2015, JOSEPHS® was designed as an experimentation room for companies. Company representatives were asked to be present and engage in active co-creation with the visitors. However, it became apparent that the companies lacked the resources to be present continuously and the staff at JOSEPHS® took on the role as an innovation intermediary. In this early phase, the majority of tools used in the co-creation space can be assigned to the modes passive integration and mutual integration (observations and open discussions). However, little structure for documenting the feedback existed.

The second phase, from February 2015 to January 2017, saw increased use of reactive integration tools in JOSEPHS®. Here, emphasis lies on quantitative survey-based methods such as questionnaires to answer pre-defined research questions. In this period, the focus shifted from observational data to more structured data. This shift was partially compensated by the increased use of tools for co-creation, mainly by designing the co-creation spaces to have a special corner for post-it notes. In this phase some experimentation regarding the setting of the co-creation spaces took place. In contrast to the first phase, where the prototypes were mostly exhibited and focus was laid on interaction, it was attempted to put the visitors in a certain atmosphere to simulate real-life situations.

Period of Time	Phase	Type of integration	Tool	Times Used
May 2014 – January 2015	Phase 1	Passive Integration	Observation	7
		Passive Integration	Emotion Recognition	1
		Reactive Integration	Toolkit	2
		Reactive Integration	Questionnaire	2
		Reactive Integration	Interview	1
		Co-Creation	Open Feedback	4
February 2015 – January 2017	Phase 2	Passive Integration	Observation	8
		Reactive Integration	Voting Mechanism	6
		Reactive Integration	Questionnaire	31
		Reactive Integration	Interview	9
		Co-Creation	Open Feedback	27
February 2017 – August 2017	Phase 3	Passive Integration	Observation	4
		Reactive Integration	Voting Mechanism	4
		Reactive Integration	Toolkit	1
		Reactive Integration	Questionnaire	5
		Reactive Integration	Interview	5
		Co-Creation	Open Feedback	7

Table 2: Usage of tools in the evolutionary phases

The third phase, from February 2017 until August 2017, is characterized by an increase in the use of more engaging tools such as semi-structured interviews. While the interviews can still be attributed to reactive integration, these tools leave room for open feedback. This phase can be seen as a synthesis of the first two phases. Although much emphasis is put on structured data collection, visitors are more openly integrated.

Tools used in the JOSEPHS® Open Innovation Living Lab

Overall, the analysis of data from more than 3 years shows that the majority of the tools used in JOSEPHS® are used for the reactive integration of visitors. This means that visitors on the individual co-creation spaces will interact with a prototype or concept in order to subsequently give feedback. The range of this feedback is pre-determined in advance by key questions.

Tools for passive integration	Tools for reactive integration	Tools for co-creation
Indoor Tracking	Voting Mechanism	Open Feedback
Emotion Recognition	Questionnaire (open)	Open Dialogue
Observation	Questionnaire (closed)	
	Interviews	
	Toolkits	

Figure 1: Tools used in the JOSEPHS® open innovation lab

Tools for passive integration enable visitors to interact non-invasively with prototypes as the focus lies on the interaction with the prototype itself rather than the feedback obtained from the visitor after the interaction. A distinction can be made between technology-assisted tools and observation-based tools. Technology assisted tools include indoor tracking to record visitors' movement patterns within the Living Lab and emotion recognition systems to monitor visitors reactions. Observational-based tools rely on the observation through trained staff on site (shadowing). Main principle of this type of observation is to disturb the observed person as little as possible so that the behavior observed remains as natural as possible. Tools that integrate visitors in a passive way offer no opportunity for open feedback from the visitor. Some overlap with tools for reactive integration exists though (for example the critical incident technique can combine observations and interview questions).

Tools for reactive integration include more traditional innovation research tools such as questionnaires, guided interviews but also digital voting mechanisms. Within this category a distinction can be made between open and closed tools. Closed tools incorporate voting mechanisms (technology-assisted or manual) and questionnaires that use closed questions to determine a specific variable (e.g. price sensitivity, usability score). Usually the closed tools consist of a rigorous set of questions with fixed answering possibilities a visitor is not allowed to divert from. Open tools range from questionnaires with text-based answers to semi-structured interviews. Open questionnaires allow the visitors to express own thoughts, associations and ideas in their own words and in as much detail as they want. Semi-structured interviews allow for a more agile way of obtaining data and the interviewers' observations can lead additional insights. Voting mechanisms, closed and open questionnaires are typically used after the interaction with a prototype on a co-creation space while interviews are also used during the interaction with a prototype. Toolkits deserve a somewhat distinctive place in the group of reactive integration tools as they enable the visitor to create prototypes by using an interactive development environment. For example, visitors were asked to create an, from their point of view, optimal website by combining various magnetic elements on a whiteboard. Both the prototype itself can serve as a feedback while

the process of prototype creation can be accompanied by observation or interview to generate additional insights. Common element of all tools for reactive integration is that they aim at answering a predefined research question.

Tools for co-creation enable the visitor to express own thoughts, associations and ideas without a question or feedback stimulus being present. In the JOSEPHS® context, two types of tools for co-creation can be identified: object-triggered open feedback and human triggered open dialogue. Object triggered open feedback manifests in publicly available sticky notes that invite the visitor to document new ideas on predefined "feedback walls". Human-triggered open dialogue requires the presence and availability of JOSEPHS® staff enabling a visitor to engage in conversations. The feedback is often not documented in a structured form, but as publicly available information (often in form of sticky notes on the feedback wall) which can also serve as a source of inspiration for other visitors.

Tools and visitor integration

During the workshops it was found out that two factors are essential for the choice of tools and their impact in JOSEPHS®: time and commitment. Time determines the length of stay of the visitor in the Living lab and poses a challenge to the respective research design, since certain co-creation spaces require a longer evaluation of the prototypes / concepts as do the used research tools. Commitment determines the intensity of the interaction and the ability of the visitors to engage in the course of co-creation.
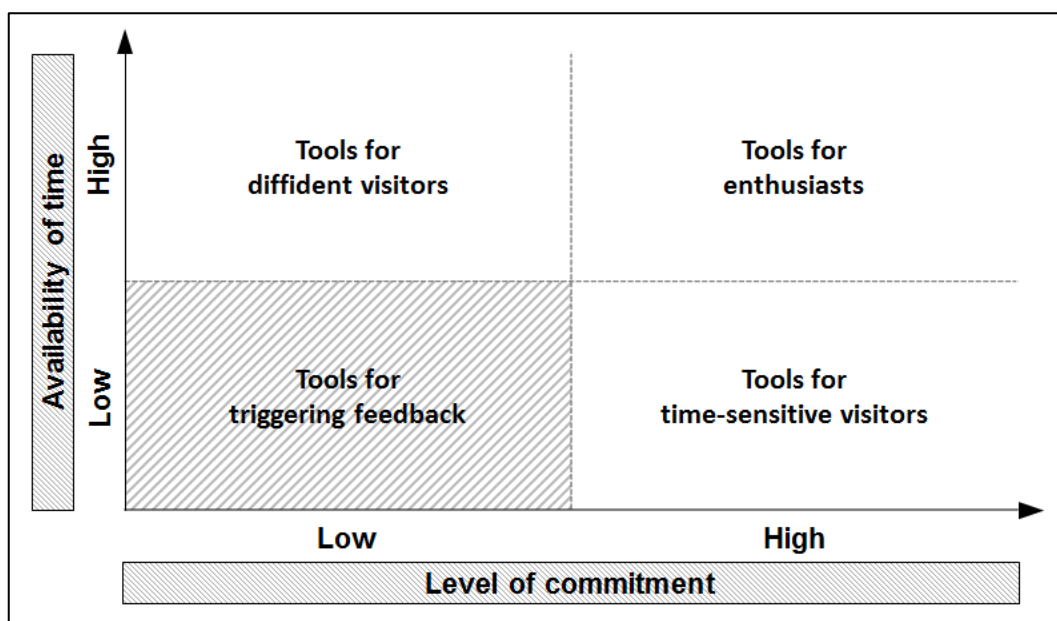

Figure 2: Determinants for visitor integration tools

The combination of these factors results in patterns of interaction the JOSEPHS® staff on site is often confronted with and which significantly influence the involvement of visitors on the co-creation spaces. Special requirements result from time-sensitive visitors, diffident visitors and enthusiastic visitors. Time-sensitive visitors are characterized by limited time available, although they have the ability to participate in the co-creation process. Diffident visitors are difficult to engage and hold the challenge of requiring an impulse to express their own thoughts and ideas. Enthusiastic visitors are characterized by a relatively high level of time available as well as by the ability to engage in co-creation. Although these visitors are very promising, challenges can arise from documenting and structuring the amount of feedback generated. Visitors that score low on time as well as commitment are difficult to engage with in the co-creation process. In some cases the use of certain triggers (questions, objects) can move the visitor to the diffident- or time-sensitive- category.

Additional interaction factors

In addition to the listed factors, the case analysis showed that the co-creation facilitating staff at JOSEPHS® is encountering special instances of interactions, with visitor groups, school classes and children. Visitor groups show to be challenging in tool implementation because of the fact that they are not of homogeneous nature, but rather comprised of individuals with different interests and backgrounds. Therefore the initiation of a dialogue, engagement in co-creation and the documentation of the visitors' feedback cannot follow standard procedures, and not all tools are suitable to group interactions. Children are an interesting factor emerging from the context of the case Living labs as, due to the affiliated coffee shop, JOSEPHS® is frequently visited by families. In this context, children act as a facilitating factor - if there are objects that invite children to interact, thereby gaining their attention, the accompanying adults also tend to stay longer and engage in co-creation processes; whereas the children themselves can be contributors to innovation when accompanied by their parents and provided with suitable interfaces for co-creation.

Discussion

The case study has shown that the use of tools in the Living Lab JOSEPHS® can be categorized into three categories: passive integration, reactive integration and co-creation. Further, the use of tools has evolved over the lifespan of the Living Lab. Passive integration is not enough if the Living Lab acts as an intermediary for innovation as tools for structuring data are missing. Reactive integration enables structured data collection, but does not take advantage of the physical setting of the Living Lab thereby missing potential of particularly creative visitors. Therefore, either tools that leave a degree of freedom or a mix of tools should be used when interacting with visitors of the Living lab. The most recent generation of co-creation spaces at the JOSEPHS® already take these findings into account. On a currently existing co-creation space (November 2017), the goal (development of future a banking service) is tried to be achieved through a mix of tools. The visitor is initially requested to choose one of three scenarios / situations for a banking service to catch interest (tool for triggering feedback). Subsequently, a toolkit and semi-structured interview are used as tools of reactive integration. The presence of a JOSEPHS® guide at the co-creation space further facilitates an open dialogue with the visitor (co-creation).

There is a substantial amount of research on who are the right partners for the course of co-creation, how they can be identified and at what stage of the innovation process they should be integrated. Although this knowledge is of high value for innovation settings such as workshops and online platforms, the results can only partially be applied to new innovation formats such as the open innovation Living Lab JOSEPHS®. Due to the nature of the innovation laboratory as an open setting, visitors can appear any time during the opening hours. Given these circumstances, no selection and no user type determination can take place. The case study shows that the interaction between visitor and physical co-creation space is determined by the factors of time and commitment. In the context of the case study, the important question is not with whom the co-creation process should happen, but how the interaction should be structured.

Existing literature (Eriksson et al., 2005) states that the integration of users in Living Labs should proceed beyond traditional methods such as focus groups and surveys. Nevertheless, up to today it is still investigated which roles and types exist among the self-selected visitors. For example, Veeckmann et al. (2013) distinguish between testers, informants, contributors and co-creators. It can be argued that this categorization only reflects the perspective of certain stakeholders in Living Labs such as companies and research partners. Further, these categories reduce the visitor's participation towards executing a specific task (e.g. prototype testing) which is reflected in the choice of tools used. This however would not be in accordance with the initial idea of co-creating products and services on eyesight. Instead,

visitors should be given the opportunity to choose their own roles when engaging in co-creation processes. More recent research by Leminen et al. (2015) proposes a similar perspective and distinguishes between visitors taking roles and making roles. While assertive visitors may opt to take a role (e.g. testing), creative visitors would make a role by actively innovating (Leminen et al., 2015). The proposed determinants of co-creation with visitors in this case study, time and commitment, state that visitor roles should not be perceived as fixed categories, but may vary.

Accordingly, co-creation spaces in open innovation Living Labs should not follow a "one-size-fits-all" principle that requires every visitor to follow the same sequence. The findings from this case study propose the idea to tailor the design of co-creation spaces and the use of tools to the interaction types so that visitors themselves can choose the most fitting integration tools. While there is already a broad repertoire of tools for reactive integration for diffident visitors, new tools need to be developed for time-sensitive visitors and enthusiasts. While tools for time-sensitive visitors should be designed to generate high-quality feedback in a short time, tools for enthusiasts must ensure that the vast amount of data is well structured and documented. Consequently, a mix of tools should be used on each co-creation space, addressing different types of interaction and optimally utilizing the potential of each visitor.

Conclusion & Future Research

Established methods used for co-creation, such as co-creation and lead user workshops are based on the careful selection of participants, or depend on self-selection based calls for specific skills and industries (e.g. in innovation contests). The self-selection that takes place in Living Labs shifts the focus away from the type of user to the type of interaction. Based on the case study at the Living Lab JOSEPHS®, this paper proposes, that (1) there are three integration categories of tools, (2) interaction with visitors in a Living Lab depends on the factors time and commitment and (3) tools for different integration types need to be matched to the factors determining interaction.

As a single case study, this research is subject to limitations; it addresses a single Living Lab with specific characteristics that could be distinct from other forms of Living Labs. With this research design this paper shows limited generalizability of results. Future research should go beyond this single case study and investigate aspects that influence the factors time and commitment such as perception of time, self-assessment, prior knowledge, personal interest and even individual contextual reasons such as mood and atmosphere.

References

Ballon, P., & Schuurman, D. (2015). Living labs: concepts, tools and cases. *info*, *17*(4).

Bergvall-Kareborn, B. H. M. S. A., Hoist, M., & Stahlbrost, A. (2009). Concept design with a living lab approach. In *System Sciences, 2009. HICSS'09. 42nd Hawaii International Conference on* (pp. 1-10). IEEE.

Beutel, T., Jonas, J. M., Möslein, K. M., (2017). Co-Creation and User Involvement in a Living Lab: An Evaluation of Applied Methods. Student Track of the *13. Internationale Tagung Wirtschaftsinformatik, Student Track*. St. Gallen, Switzerland

Björgvinsson, E., Ehn, P., & Hillgren, P. A. (2010). Participatory design and democratizing innovation. In *Proceedings of the 11th Biennial participatory design conference* (pp. 41-50). ACM.

Brunoe, T. D., Nielsen, K., Joergensen, K. A., & Taps, S. B. (Eds.). (2014). *Proceedings of the 7th World Conference on Mass Customization, Personalization, and Co-Creation (MCPC 2014), Aalborg, Denmark, February 4th-7th, 2014: Twenty Years of Mass Customization–Towards New Frontiers*. Springer Science & Business Media.

Chesbrough, H., Vanhaverbeke, W., & West, J. (Eds.). (2006). *Open innovation: Researching a new paradigm*. Oxford University Press on Demand.

Dell'Era, C., & Landoni, P. (2014). Living Lab: A methodology between user-centred design and participatory design. *Creativity and Innovation Management*, *23*(2), 137-154.

Dutilleul, B., Birrer, F. A., & Mensink, W. (2010). Unpacking european living labs: analysing innovation's social dimensions. *Central European journal of public policy*, 4(1), 60-85.

Eisenhardt, K. M., & Graebner, M. E. (2007). Theory building from cases: Opportunities and challenges. *Academy of management journal*, 50(1), 25-32.

Eriksson, M., Niitamo, V. P., & Kulkki, S. (2005). State-of-the-art in utilizing Living Labs approach to user-centric ICT innovation-a European approach. *Lulea: Center for Distance-spanning Technology*. Lulea University of Technology Sweden: Lulea.

Feurstein, K., Hesmer, A., Hribernik, K. A., Thoben, K. D., & Schumacher, J. (2008). Living Labs: a new development strategy. *European Living Labs-a new approach for human centric regional innovation*, 1-14.

Franz, Y. (2015). Designing social living labs in urban research. *info*, 17(4), 53-66.

Füller, J., Mühlbacher, H., Matzler, K., & Jawecki, G. (2009): Consumer empowerment through internet-based co-creation. *Journal of Management Information Systems*, 26(3), 71-102.

Gassmann, O., & Enkel, E. (2006). Open innovation. *Zeitschrift Führung+ Organisation*, 75(3), 132-138.

Gibbert, M. & Ruigrok, W. (2010). The What" and How" of Case Study Rigor: Three Strategies Based on Published Work. *Organizational Research Methods*, 13(4), 710–737.

Greve, K., Martinez, V., Jonas, J., Neely, A. and Moslein, K., (2016), Facilitating co-creation in living labs: The JOSEPHS study. (Workshop Series). Retrieved from http://cambridgeservicealliance.eng.cam.ac.uk/resources/Downloads/Monthly Papers/2016MayPaper_FacilitatingCoCreationinLivingLabs.pdf

Gustafsson, A., Kristensson, P., & Witell, L. (2012). Customer co-creation in service innovation: a matter of communication? *Journal of Service Management*, 23(3), 311-327.

Harhoff, D., & Lakhani, K. R. (Eds.). (2016). *Revolutionizing innovation: Users, communities, and open innovation.* MIT Press.

Hoffman, D. L., Kopalle, P. K., & Novak, T. P. (2010): The "right" consumers for better concepts: Identifying consumers high in emergent nature to develop new product concepts. *Journal of Marketing Research*, 47(5), 854-865.

Jeppesen, L. B., & Lakhani, K. R. (2010). Marginality and problem-solving effectiveness in broadcast search. *Organization science*, 21(5), 1016-1033.

Jonas, J. M., Roth, A., & Möslein, K. M. (2014). Stakeholder Integration for Service Innovation. *Service Science* 8(3), pp. 320–332.

Leminen, S., Westerlund, M., & Nyström, A. G. (2012). Living Labs as open-innovation networks. *Technology Innovation Management Review*, 2(9).

Leminen, S., Nyström, A. G., & Westerlund, M. (2015). A typology of creative consumers in living labs. *Journal of Engineering and Technology Management*, 37, 6-20.

Leminen, S., & Westerlund, M. (2017). Categorization of innovation tools in living labs. *Technology Innovation Management Review*, 7(1).

Lindström, K., & Ståhl, Å. (2014). Patchworking publics-in-the-making: design, media and public engagement.

Magadley, W., Birdi, K. (2009): Innovation Labs: An Examination into the Use of Physical Spaces to Enhance Organizational Creativity. *Creativity and Innovation Management*, 18(4), 315–325.

Matthing, J., Kristensson, P., Gustafsson, A., & Parasuraman, A. (2006). Developing successful technology-based services: the issue of identifying and involving innovative users. *Journal of Services Marketing*, 20(5), 288-297.

Matzner, M., Büttgen M., Demirkan H., Spohrer J., Alter S., Fritzsche A., Ng I. C. L., Jonas J. M., Martinez V., Möslein K. M., & Neely A. (2018). Special Research Paper: Digital Transformation in Service Management. *SMR – Journal of Service Management Research,* 2, 3-21

Minghetti, M. (2014): *Collaborative Intelligence: Towards the Social Organization*. Cambridge Scholars Publishing

Möller, K. (2017): Questioning the theory-praxis gap in marketing – types and drivers of research implementation. *European Journal of Marketing*, 51(7/8), 1163–1172.

Niitamo, V. P., Kulkki, S., Eriksson, M., & Hribernik, K. A. (2006). State-of-the-art and good practice in the field of living labs. *In Technology Management Conference (ICE), 2006 IEEE International* (pp. 1-8). IEEE.

OHern, M. S., & Rindfleisch, A. (2010). Customer co-creation. In: Malhotra, N. K. (Ed.) Review of Marketing Research, 6, 84-106. Emerald Group Publishing Limited.

Piller, F., Gatzweiler, A., & Blazevic, V. (2013). When Users Take Control: Managing the Dark Sight of Customer Co-Creation Deviant. *ISPIM 2013*, (3), 1–9.

Prahalad, C. K., & Ramaswamy, V. (2004). Co-creation experiences: The next practice in value creation. *Journal of Interactive Marketing*, 18(3), 5–14.

Roth, A., Fritzsche A., Jonas J. M., Danzinger F., & Möslein K. M. (2014): Interaktive Kunden als Herausforderung: Die Fallstudie „JOSEPHS® – Die Service-Manufaktur“. *HMD Praxis der Wirtschaftsinformatik*. 51, 883-895.

Seravalli, A. (2014). Making Commons: attempts at composing prospects in the opening of production. Malmö University.

Siggelkow, N. (2007). Persuasion with case studies. *Academy of Management Journal*, 50(1), 20–24.

Toffler, A. (1980). The third wave (1st ed.). New York: Morrow.

Vargo, S. L., & Lusch, R. F. (2004). Evolving to a New Dominant Logic for Marketing. *Journal of Marketing*, 68(1), 1–17.

Veeckman, C., Schuurman, D., Leminen, S., & Westerlund, M. (2013). Linking Living Lab Characteristics and Their Outcomes: Towards a Conceptual Framework. *Technology Innovation Management Review*, 3(12).

Vernette, E., & Hamdi-Kidar, L. (2013): Co-creation with consumers: who has the competence and wants to cooperate. *International Journal of Market Research*, 55(4), 539-561.

Von Hippel, E. (1986): Lead users: a source of novel product concepts. *Management science*, 32(7), 791-805.

Wendelken, A., Danzinger, F., Möslein, K. M., & Rau, C. (2014). Innovation without me: Why employes do (not) participate in organizational innovation communities. *R&D Management*, 44(2), 217–236.

Yin, R. K. (2009). *Case study research: Design and Methods*. SAGE publications. Thousand oaks.