Open Innovation for Innovation Tools: the Case of Co-Design Platforms

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ABSTRACT

This paper explores the dynamics of openness and enclosure of innovation activities with IT artifacts on the example of co-design platforms. While modern information and communication technologies offer many new possibilities for innovation, they also subject innovation to the underlying technical structures, which can misdirect the activities on the platform. In order to avoid this, we propose an open innovation approach for open innovation solutions. We perform an empirical study on two co-design platforms which become subjects of innovation themselves in an open laboratory in the downtown area of a European city. Visitors to the laboratory are allowed to engage in innovate activities regarding the co-design platforms in whatever way they want. The results show that they do not only address technical improvements of the platforms, but also look into new directions to make the platforms more relevant or to replace them by other ways of innovating in the given contexts.

General Terms

IT-artifacts in open innovation, technical drivers and restrainers of open innovation, theoretical frameworks of technology usage

Keywords

Tools of open innovation, mass customization and co-design, media theory, open laboratories

1. INTRODUCTION

Modern information and communication technologies have created many new opportunities for collaboration across institutional boundaries during innovation processes. Möslein suggests a classification of the artifacts that support this collaboration according to five different functional categories [1]: innovation communities provide space for open exchange of ideas and opinions; innova-

tion contests let participants compete for best solutions to a given task in a limited time frame; innovation markets connect solution seekers and solvers with each other and innovation toolkits supply different instruments and environments for the construction of new solutions; last but not least, innovation technologies serve as a general infrastructure for collaborative design and development activities.

While innovation communities can emerge in an evolutionary process from the interaction in a social network or a user forum, all other artifacts require a higher amount of planning and design. Planning and design becomes even more important when the different functions are combined to form more sophisticated solutions like co-design platforms that complement innovation toolkits with innovation communities and contests and allow additional contributions based on further innovation technologies.

Imagine, for example, an internet platform for T-shirt design where users can choose from different sizes, materials, shapes and colors, discuss with each other what they like, win prizes for designs and integrate pictures or accessories that they have created at home. The design activities that are taking place on the platform show a high level of collaboration, both in terms of co-operation and competition, which lays the groundwork for highly innovative outputs in terms of new styles and trends. But this is not necessarily the case for the design of the platform itself. Quite in the contrary, one can assume that a company or a different institution that sets up such a platform will strongly control its development and follow a clear architectural guideline to make sure that it works properly and that it can be easily maintained. Innovation is, in this sense, carefully staged on the basis of a sophisticated technical system.

In the view of the wide range of possibilities for information exchange and processing in digital systems, it gets easily forgotten that the openness that is achieved by using them goes along with a technical enclosure. Digital information systems subject innovation procedures to the structures of electronic data processing. This does not only change the symbolic code in which the procedures are explicated. It also redefines the meaning of the whole activity with respect to the given application situation. This is often expressed by referring to the design of information system as a wicked problem [2]. The given application situation is widely intransparent and depends on factors that are difficult to control. Information systems therefore do not only provide solutions to problems. They also affect the understanding of the problem by providing determinate structures that describe what is going on and how solutions to the problem can actually look like. The re-

sulting increase of transparency can be considered to account for a large part of the efficiency gained by introducing information systems to support business processes [3].

The design of co-design platforms accordingly has a constitutive effect for the innovation procedures that are going on. It sets up the search space in which users can look for solutions and provides the instrumental apparatus that can be used to get to them. In addition to procedural questions regarding the solution activities, this raises questions of relevance regarding the setup itself. Even if a platform attracts a high number of users which create a continuous flow of output, it can very quickly become obsolete when it is overtaken by external trends that cannot be mapped within the platform structures. Companies that focus their attention on possibilities of innovation on the platform are likely to neglect the impossibilities inherent in the platform design.

Open innovation approaches to platform design can be expected to widen the focus of the development, because they integrate different external perspectives. This, however, does not necessarily ensure that the contributions consider improvements or change of relevance of the platform for innovation as well as its performative characteristics. Whether or not the participants address both issues – and, if so, how – remains unclear and is therefore postulated as research question within this paper.

The following qualitative study gives empirical evidence of the treatment of these two aspects of platform design in an open innovation approach. The subject matter of the study is provided by two co-design platforms that are built around innovation toolkits for shoes and jewelry. In order to find out how collaborative approaches address innovations referring to the performance on and the relevance of the platforms, they were made available in an open laboratory with free access to the public. Visitors were invited to use the platforms and discuss them in the general context of innovation. The results show that their contributions contain valuable input with respect to performance as well as relevance. For each platform however, these two kinds of contributions remain clearly separate from another.

2. THEORETICAL BACKGROUND

The theoretical background for the addressed research question is twofold: on the one hand, the concept of interactive value creation serves as framework to find and structure crucial arguments for the use of co-design platforms. On the other hand, media theories are used to substantiate the application of the two issues "relevance of platform" and "performative characteristics". The interactive creation of value with customers is postulated in the co-creative paradigm, and refers to the joint application of knowledge and resources [4],[5].

In this respect, customer Co-Design is closely related to the idea of mass customization, which opens up industrial productions to individualization. Mass customization does not want to turn factories back into workshops. Its aim is to combine the advantages of both worlds, so that factories still produce output efficiently in high numbers, but with larger diversity for the customers [6]. In order to do so, manufactures use platform strategies and modular product designs that allow the assembly of many different combinations. Furthermore, they rearrange the steps of the manufacturing process wherever necessary to postpone the moment in which the product characteristics have to be fixed [7]. As a result, companies are able to offer their customers a large variety of choices to pick from. Modern information and commu-

nication technologies support the decision processes on the customer side with different kinds of design toolkits. Product configurators let customers select their preferred product characteristics and complementary options from lists. They usually also visualize the result to give customers a better impression of the final product. A higher modularity of the design requires more sophisticated toolkits that allow their users to assemble the single building blocks on their own. This culminates in virtual design studios that offer complete workspace environments. The increasing possibilities of customers to influence the product design with such toolkits, mass customization gradually turns into an open innovation process [8],[1].

This paper is concerned with online platforms on which such toolkits are made available. Increased freedom of choice in the toolkits means that manufacturing constraints loose importance as organizational criteria for the design process. It is therefore necessary to consider other factors that influence the performance of the users on the platforms as well [9][10]. Among these factors are the perception of complexity and control over the decision process, the personal attribution of the uniqueness of the result and the enjoyment of using the platform [11][12]. In order to address these factors, co-design platforms are expanded by the integration of other tools, such as interactive visualizations and simulations of environmental conditions and usage effects, but also comment functions, online support and social networking [13],[14]. Co-design platforms can accordingly not be exhaustively described as tools. They also embody sensorially rich environments for exploration, design and decision making procedures, which are known to follow a different logic than other business environments [15].

Considering the strong relation of mass customization with the re-organization of the production process, it stands to reason that companies have an outstanding role in the development of co-design platforms in this context. However, the more these platforms follow their own dynamics of innovation beyond the limitations of existing industrial structures, the more the question arises if the users can become active participants in the platform development as well. The potential of users as drivers of innovation is well known and has received a lot of attention during the past years and collaborative innovation activities between customers and organizations offer high potential for the development of sustainable innovations [16],[17]. With the advent of the internet, user innovation has taken an increasingly collaborative character, as it is visible in user communities and forums that can be run by the companies that provide the products and services in question or by other operators, including the users themselves [18].

Users are known to add a different perspective on the given problem situations, based on their specific individual knowledge and point of view. Innovations are often initiated from the user side because of individual needs and experiences with deficiencies in the current solutions, which only come to the notice of the solution providers if they interact with them [19],[20]. In this respect, the user perspective on innovation is strongly focused on performative issues of predetermined tasks. Users, however, are also known to adapt the concepts of value creation with products and services to their own needs and reinterpret their technical significance [21]. This lays the groundwork for new forms of usage that can eventually lead to completely different product and service ideas. Nevertheless, the term "user" implies that the products and services that are used remain the object of reference for the innovation activities. For this reason, questions of relevance are not directly addressed.

A different approach can be developed on the background of media theories that consider the relation between artifacts and their users on a more general level. Unlike other approaches, such general media theories consider every human action essentially as instrumental. This means, that there is always an artifact necessary to establish a relation between a subject and an object. This third entity in between, which may be of a physical or mere conceptual nature, is the medium. Roughly said, general media theories provoke two different kinds of discourses which do not seem compatible with one another [22] (see also [23]). On the one hand, media are considered in their constitutive role for the possibilities they provide to relate to an object. If there is no alternative to the usage of a medium to relate to an object, the subject is not able to distinguish between medium and object. The medium either disappears behind execution of the task on the object, such that the task is discussed exclusively in terms of its effect [24]. On the other hand, the medium is considered to replace the object. It becomes itself the message [25]: the act of using the medium is discussed independently from the variety of outcomes that might result from different ways of using it.

Due to the difference of the underlying conceptions of actors, tools and purposes, these two discourses do not seem to be compatible with each other. General media theories are accordingly characterized by a fundamental dualism with the disappearance and the prominence of the medium as focal points. If this dualism is applied to the case of customer co-design platforms, it implies that the platforms can only be discussed in terms of the performance of users on the platform (and thus disappear in the relation between subject and object), or in terms of the ability of the platform to meet the requirements of innovation (which means that they replace the original object as the focal point of action). There is no logical connection between the two different discourses. Even if they proceed at the same time, they will not mix.

3. RESEARCH MODEL

Our empirical research model adopts the theoretical point of view expressed in general media theories. We hypothesize that customer co-design platforms can either be addressed in terms of their performance in creating solutions, or in terms of their relevance as tools to accomplish this task. So far, however, there is little known about the way how these two discourses affect open innovation activities on co-design platforms. This can be explained by the fact that most empirical approaches take the technology of a co-design platform as an a priori. The research design therefore puts constraints on the discourse that can take place, which creates strong limitations for the insights that can be gained. We are therefore interested in conditions under which such constrains are reduced to a minimum. Where this is the case, customers are free to relate to the platforms in whichever way they want: they can use them or they analyze them and question their feasibility.

The aim of our research is to gain a better understanding of the interplay between relevance and performance issues in the discourses that emerge under such conditions. In order to accomplish this, we us a single case study with a double embedded case design [26]. Our study has an explorative character. It is guided by the question how improvements of relevance and performance are addressed and in what way both relate to each other. In order to answer these questions, the study looks at the behavior of innovators who are given access to such platforms in an open laboratory in which they are able to decide on their own if they want to use the platform for innovation or turn it into an object of innova-

tion itself. The study uses a qualitative method of analysis in the elaboration of different themes in the contributions of the innovators. In accordance with the principles of exploratory research, the intention of our study is to gather knowledge for further theory creation and the formulation of new hypotheses [26],[27].

To a certain extent, the model drawn from general media theory shows similarities to technology acceptance studies based on the model by Davis, which distinguishes between perceived usefulness and perceived ease of use [28]. Usefulness also reflects the relevance of the platform for innovation, while ease of use is connected to the performance of the operations on the platform. In contrast to participants in technology acceptance studies, however, the relation of the innovators in the open laboratory towards the technology is not predetermined. They are free to proceed with innovation in any other mode as well.

The open laboratory used for this study is JOSEPHS – the service manufactory, situated in the downtown area of Nuremberg, Germany [29]. It provides a space where companies can interact with visitors in the generation of new ideas regarding their field of business, their evaluation or the further development of solutions. Based on the principles of crowdsourcing, the context of the interaction is defined by the companies that are present in the laboratory. The laboratory is open during regular business hours and access is not restricted. As usual in crowdsourcing, the visitors who get involved in the innovation procedures can be characterized as a self-selected group of voluntary participants.

The study is concerned with two internet co-design platforms which were made available in the open laboratory in summer 2014. Updated versions of both platforms are still successfully in operation. One of them is concerned with shoes, the other one with jewelry. In both cases, the visitors to the laboratory were given the opportunity to design their own individual products on the platforms and also discuss the platforms themselves with respect to the general innovation context. In order to support this discussion, the laboratory provided further information about the products and their manufacturing process, sample items and illustrations of different components out of which the products are made.

The research assistants in the open laboratory followed a minimally invasive interaction protocol. They restricted themselves to explaining the topic and the technology and inviting the visitors to contribute in whatever way they wanted. Visitors were also able to return later and proceed then with the further exploration of the subject matter if they did not have enough time or were distracted. The behavior of 48 visitors and the content of their contributions were documented by the research assistants in lab notes. At that point, they were not informed about the research question of this study. The lab notes were subsequently subjected to a content analysis in order to identify common patterns and general themes with respect to innovation in the given application contexts.

4. RESULTS

Prior to giving recommendations for improvement, the innovators exhibited two contrasting patterns of behavior in getting acquainted with the platforms. The majority of the participants started working with the design toolkits to explore their functions. In various cases, they spent a lot of time in front of the screen browsing through the offerings and designing different products. Another large percentage, however, focused more on the products

and parts that were displayed and explored them on their own. They let the personnel of the laboratory demonstrate them the usage of the platform and asked for additional information without getting involved themselves.

The former group of participants showed other patterns in the discourse on improvements than the latter. A frequently recurring theme in their contributions concerned the technical performance of the platform in terms of response times, menu structure and transparency of the layout. The innovators recommended very specific changes of certain aspects of the design toolkits in order to make them easier to use. For example, they discussed the storage of temporary design solutions and the possibilities to compare them. Printing functions for designs were also a topic that received a lot of attention among the innovators.

A related theme was the aesthetic impression of the platform and the enjoyment of using it. This included pictures, colors, but also general impressions of the artifacts which left the specific ways of improvement rather vague and turned the attention to the deficiencies of the current functional content. For example, innovators suggested adapting the design to make it more appropriate to aesthetic preferences and visual limitations of older users. Text sizes should be more variable, pictures clearer, language that is used less puerile etc. A topic raised by younger people was respondent design.

The other themes appeared independently from the participants' usage behavior. The question of technical improvements was also raised with respect to the simplicity of the combination of process steps from the first design choice to the finalization of the product and its submission for production. Recommendations by the participants emphasized the importance of a quick path towards a solution for those who did not want to spend much time with the design or who focused on one specific aspect without being interested in others. These recommendations often referred to specific characteristics of the artifacts only as illustrations for possible interests, but not because of their content.

The content of the design choices was addressed in suggestions for further product characteristics that might be added as additional dimensions of configuration or in suggestions of other choices in the existing dimensions, particularly the shapes of the products. Innovators described different heel designs for shoes that could also be included. One even drew pictures of such heels and sole shapes in true scale to the exhibits to prove that it worked well together. Regarding jewelry, people presented their own rings or pendants, suggesting that these should also be included. Choices and dimensions that participants considered obsolete were not pointed out.

Another theme in the recommendations for improvement questioned the general design approach that was implemented in the structure of the platforms. For example, it was emphasized that shoes needed to be tried out in practice and that companies should accordingly think about cyclical approaches of solution design. Furthermore, participants turned the attention to the target group of the platforms and suggested their expansion through different offerings or combinations with other objects to be designed, in particular regarding the offerings in jewelry, which were considered to show potential for expansions in various directions.

Some participants also mentioned the need to review the significance of the whole design process, asking whether the effort was worthwhile at all considering the resulting benefit or whether design was rather needed for other products. This included questions about the level of novelty of the results that could be produced on a combinatorial basis. Three innovators turned the attention to alternate design procedures, such as manual work with plaster or other material with similar characteristics. Those who did this named personal design experiences with such material as a background for their suggestions.

Some participants were also interested in more radical forms of innovation. Extreme cases were pavements that would not require any shoes at all or surgical measures on hands and feet for fashionable embellishments with a more lasting impression than jewelry or functional issues like making feet more suitable for walking and solving the problem of keeping rings on the finger while wearing gloves.

Table 1 gives an overview of the different themes and assigns them to the focal points for innovation that were derived from the theoretical considerations before.

Table 1. Assignment of Themes to Focal Points

Platform relevance	Platform performance
Product characteristics	*Technical performance*
Dimension open for configuration and available choices in dimensions	Usability of toolkit in terms of answering times, menu structure, layout
Design approach	*Aesthetic impression*
Adequacy of the general procedure to come to solutions for the artifacts	Look and feel of the platform layout, overall experience of using it
Target group	*Simplicity of process*
Range of product selection with respect to the audiences that are attracted	Effort to get to a result and submit it to production

Wider scope of relevance
Set of artifacts
Overall significance of the artifacts that are addressed by toolkits as design objects
Redefinition of topic
Radical ideas about something new instead of jewelry and shoes as they currently exist

None of the participants in the study switched the focal point for innovation during the discourse of a toolkit. However, several of them switched from one focal point to the other when they turned the attention from the toolkit for shoe design towards the toolkit for jewelry and backwards.

5. DISCUSSION
The analysis of the data confirms the theoretical conclusions about relevance and performance as two contrasting focal points

in the discourse about innovation. The platforms were either discussed in terms of their correspondence with the necessities of innovation in the given context or in term of the experience of applying the respective functions available on the platforms. The themes related to relevance could further be categorized according to their scope. While some of them remained connected to the general conception of jewelry and shoes as objects of reference for the innovation activities, others went much further and developed radical ideas of novelty. One can say that they made use of their independence from the technology in the given setup to look at the proposed problem solving process from a wider distance and focus on the humans involved in it.

The different themes that were identified also make clear that the experience of the design process was not only constrained by cognitive restrictions of the users in working with many different design choices. In fact, the question of transparency over the multitude of choices in order to get hold of them played a surprisingly little role in the discussions. The applicability of the design toolkits is accordingly not only a matter of how they enable rational choice. The design prescriptions implemented in the software are not just seen as means of decision support, but also means of discovery. They are supposed to provide guidelines for the users to come up with something new. The perceptive and imaginative abilities of the users are expected to be expanded and enhanced, instead of being compensated in order to achieve optimal results. This also corresponds with the finding that that the participants in the study recommended extensions of the choices available on the platforms, but none of them recommended reductions or simplifications.

Regarding the themes that relate to the relevance of the platforms for innovation, the results show that they are considered to be prescriptive for the construction of objects in various different ways. With respect to the configurable attributes and the available choices for these attributes, the participants addressed the solution space that unfolds in the design toolkits. With respect to the design approach, they addressed the solution strategies that were implemented, which includes different forms of decision making based on visual helps, user ratings and explanations of styles and solution procedures in additional texts. They also looked into the question of the audience that is targeted with these prescriptions.

In all 48 cases that were researched, the two parts of the discourse remained separate for each single platform, although changes appeared when the participants moved from one to the other. Due to the small size of the data set, the significance of these findings is quite limited. Nevertheless, they give reason to assume that the perspectives in the discourse about improvements are indeed incompatible. There does not seem to be any logical relation between the arguments in one respect and those in the other respect; innovation regarding the relevance of the platform and the performance on the platform in terms of the practical applicability of design rulesets and methods accordingly appear to be two distinct objectives and each of them shows a different dynamic.

Another aspect which seems to be important for further theory development is the role of the co-design platforms as boundary objects for the collaborative innovation process. Although the open innovation laboratory also offered sufficient space for innovators to think about shoe or jewelry design in different ways, only a minor fraction turned the attention to alternate design procedures. Craftsmanship traditions would offer a large background for further ideas in this direction. Apparently, the availability of the co-design platforms in the open innovation laboratory worked as a catalyst for solution development, attracting the imagination of the visitors to come up with improvements, better solutions or more radical ideas. There little no interest in following up on other instruments for design in order to innovate. One might in this respect discuss the idea of affordances expressed by the co-design platforms.

6. CONCLUSION

IT artifacts in open innovation have a double meaning. On the one hand, they open up a new space of possibilities for innovation to proceed and solutions to be created. On the other hand, they restrict innovation to this very space that they create and keep their users from exploring other trajectories of development. This dynamic becomes visible when such artifacts turn into the subject of open innovation activities themselves, which proceed in an environment where the participants do not only have the choice how to use the IT-artifacts, but also whether they want to use them at all.

In many respects, all forms of technical operations are subject to the same dynamic. When it comes to innovation, however, restrictions of the space of possibilities have a different quality than in the case of a simple tool usage to perform a task that does not claim to bring novelty into the world. For innovation, it really makes a difference which directions can be taken and which cannot. The notion of open innovation implies that there are not many restrictions to consider. This is indeed true with respect to the participants in the process, but the usage of modern information and communication technologies to include a maximum number of different participants comes at a price. Innovation now turns into a mainly digital process which depends of the formal representation of the operations that are taking place in the codesets of electronic data processing.

Open innovation laboratories that create a physical space for people to meet in person and exchange ideas create another dynamic in open innovation. They cannot replace the activities in the internet supported by IT artifacts, but they offer a different environment that can partly compensate the restrictions of digitalized solution spaces and allow the usage of information and communication technologies in a more reflective mode that gives the visitors the freedom to decide largely on their own how they want to make use of IT artifacts in their activities. One might describe this as another degree of openness that multiplies the possibilities created by open innovation as it is known from online solutions. In this sense, laboratories like JOSEPHS express openness to the second power: openness in co-design and openness in the choice of the form in which visitors participate.

Co-design platforms are one of the most popular settings for open innovation that currently exist. The existing solutions on the internet are continuously enhanced or expanded; and further new platforms are introduced on a regular basis. In the view of the incredible possibilities for innovation that they offer, the fact that there are always alternatives to them can easily get out of sight. As far as the two platforms studied in this paper are concerned, it turned out to be quite easy to initiate innovation activities that did not only result in valuable ideas for the further development of the platforms, but also for other ways to come to new solutions in an open laboratory.

By performing our empirical study in such a space, we therefore hope to have contributed to scientific progress in a variety of ways: first, in directing more attention to the phenomenon of technical enclose of open innovation, second, in providing practical evidence about the dynamics of mediated innovation activities and, third, in exploring the potential of open laboratories to expand the variety of innovation practices into new directions. Open laboratories are in this respect not only interesting for scientific research, but also for economic practice. They offer innovation managers valuable alternatives to the existing approaches in the field which can certainly be used in many other ways that the one described here as well.

6. ACKNOWLEDGEMENTS

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