

# Toolkit-Based Modelling and Serious Play as Means to Foster Creativity in Innovation Processes

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In this article we describe and discuss means that foster the emergence of innovation through representational methods which interrelate manual modeling with playfulness. Based on the observation that demands to innovation processes have changed significantly in recent years due to changed collaboration forms, like co-configuration or open innovation, we look for a methodological approach able to deal with such collaboration forms. We describe and discuss a methodological approach on how innovation processes in heterogeneous – interdisciplinary, cross-functional and interorganizational – groups can be kicked off to bring about collectively shared understanding, as well as the ability to develop creative ideas. The approach relies on a playful modeling methodology, which is based on the hands-on creation of visualizations and physical models in connection with their verbal explanation and narration. With reference to two case studies we report and discuss experiences of applying the methodology.

## Introduction

Owing to changed forms of collaboration in innovation processes in recent years, such as co-design, co-creation and open innovation (e.g., Chesbrough, 2003; Sanders & Stappers, 2008; Bogers & Horst, 2014), requirements for the management of innovation processes have changed significantly. The potential of creativity and innovation lies especially in these open work forms, where different individuals with various views interact with each other (Reed et al., 2012; Sannino & Ellis, 2014). However, in such collaborations people from various disciplines, organizations and backgrounds should be brought together to exchange knowledge, perspectives and experiences in order to collectively develop something new. Therefore, we explore methods likely to handle the challenges of such open and interdisciplinary forms of collaboration in innovation processes. We argue that particularly representational methods which apply manual toolkit-based modelling, using for instance crafting paper and cardboard or toy building blocks in a goal-

oriented but playful way (serious play), foster the emergence of innovation in heterogeneous groups. Based on case study research, in this paper we aim to explore how the conceptual approaches of serious play and toolkit-based modelling can be combined and applied in innovation processes with reference to heterogeneous groups who are inexperienced in the use of design methods. With our example cases, which we understand as an explorative study, we provide patterns of the application of a playful goal-oriented use of toolkits. We aim to open up the field for further, particularly empirical, research and discussion related to the subject.

How to bring about creativity in design and development processes is one central issue in innovation management (Le Masson et al., 2011). Diverse disciplines deal with this question by focusing on different aspects like team constellations and processes (West & Farr, 1990; Amabile, 1996; West, 2002), the integration of users and external knowledge (von Hippel, 1986; Cohen & Levinthal, 1990), the knowledge and innovation management

process (Basadur & Gelade, 2006), design and modelling methods (Eckert & Boujut, 2003; Cross, 2006; Sanders & Stappers, 2008) or creativity methods (for a summary, see, e.g., Runco & Pritzker, 1999). Discussions about methods on how to design and facilitate innovation processes are not only restricted to new products but also address process development or social change.

Innovations increasingly emerge in collaborative forms such as co-configuration between users, designers, producers and suppliers (Victor & Boynton, 1998) or as open innovation integrating a broad variety of different people or stakeholders (Chesbrough, 2003; Reed et al., 2012). However, the process of innovation can be seen as a nonlinear practice which needs to take into account the creative potentials of different individuals or groups (West & Farr, 1990; West, 2002; Rogers, 2003).

Through the active involvement of 'external stakeholders', ideas and meanings are questioned and clarified by the potential suppliers, network partners, customers or users. In innovation research this is known as co-innovation or participatory innovation (e.g., Buur & Matthews, 2008). Particularly in such processes, group members originate from different backgrounds and have diverse skills, knowledge, perspectives and views (see also Bogers & Horst, 2014). With respect to creativity, such divergent groups show more innovation-generating potential than homogeneous ones (West & Farr, 1990; Basadur & Head, 2001). However, it should be taken into account that the participants in such processes are experts in their fields but not necessarily experts in creativity and design methodologies (Sanders & Stappers, 2008; Pei et al., 2010).

To benefit from the creative potential and expertise of the diverse stakeholder groups, participation needs to actively integrate the different stakeholders in the ideation and design process. Such inclusion is particularly successful at early stages of innovation processes which benefit from diversity more than later stages (Le Masson et al., 2011), and where the lack of design capabilities can be compensated through representational methods (Sanders & Stappers, 2008). Nevertheless, the inclusion of stakeholders who are not familiar with common creative and design methods provides a challenge for the ideation process (Lee, 2008). The demand, however, lies not only in the request how to facilitate creativity that leads to the development of new ideas (Fisher & Amabile, 2009). A prior question is how a collectively shared understanding of the object under consideration can develop among the participants, which is an essential prerequisite in interdisciplinary and cross-

functional processes (Jacobs & Heracleous, 2006; Schulz, 2008). In parallel, participants have to develop a common language to understand each other in terms of the desired innovation as well as regarding their cooperation processes. Hence, meaning is negotiated among actors in their communicative interactions (Thomas et al., 2011). Particularly open innovation and co-configuration processes have to deal with boundaries of knowledge, skills, experience, language, perspectives and expectations. Such different perspectives and understandings need to be bridged and shared through, for example, so-called 'boundary objects' (Carlile, 2002; Nicolini et al., 2012; Bogers & Horst, 2014). Haptic models, mock-ups and stories play an important role as such boundary objects because they are metaphors for understanding and sense-making within the innovation process (e.g., Buur & Matthews, 2008; see also Lee & Amjadi, 2014). Therefore, using toolkits to build manifest models which function as boundary bridges can foster creativity in such participatory innovation processes.

The question arises whether current methods in innovation management address the above demands for creativity and the development of a shared boundary object in cross-functional inter-organizational innovation processes. Creativity, innovating and change have been theoretically well conceptualized in diverse fields (e.g., Amabile, 1996; Engeström et al., 1996; Rogers, 2003); however, often without answering the question of how the emergence of creative ideas can be facilitated in such collective processes (Sannino & Ellis, 2014). Particularly in process and organizational innovation, ideas mostly emerge out of discussions and are only verbally communicated or noted, using a discipline-specific language. In this case, specific creativity methods are applied; they are often not linked to the ideation process as a whole and therefore rather limit creativity (Le Masson et al., 2011). In product design, visualization and modelling methods that originate from arts studies or industrial design are frequently used. Such methods, however, require crafting or artistic skills and training.

At this point we see significant methodological shortcomings with respect to ideation processes which include various stakeholder groups, although methods of creation by representational modelling have been transferred from design to more abstract fields of innovation like business strategy or organizational change under the label of 'design thinking' (Best, 2006; Cross, 2011). Participants in early stages of the innovation process should be able to develop and express their ideas and

thoughts even if they have limited or no design and craft skills (see Sanders & Stappers, 2008); otherwise ideas remain tacit or are likely to be misunderstood. Additionally, ideation is not only an exchange of knowledge, opinions and ideas but also an intuitive and playful development process inspired by mutual exchange (Roos et al., 2004). Thus, methods fostering creativity and ideation need to combine both: intuitive, playful action and tools to be handled without specific skills. We consider the combination of manual toolkit-based modelling and serious play as a promising way to foster the emergence of innovation in heterogeneous – cross-functional and inter-organizational – groups. The built models function in connection with their verbal explanation as metaphors to explicate understandings and creative ideas. Therefore, our approach refers to the following conceptual principles, which originate from both strategic planning and arts and design: First, the toolkit-based creation and explanation of models, in which mock-ups are created using specific toolkits or provided materials and are explained through narratives (Eckert & Boujut, 2003; Cross, 2006; Sanders & Stappers, 2008); and second, the serious play principle, in which physical models are created through intuitive ‘playing’ (Roos & Victor, 1999; Roos et al., 2004; Statler et al., 2011; Heracleous & Jacobs, 2011).

Out of our empirical repertoire of a series of workshops using the serious play principle and toolkit-based creation of models, we refer in this paper to two one-day workshops which focus on the early stages of innovation processes. In particular, one case study focuses on the beginning of a product development, whereas the other focuses on an organizational development process. In the first case study, new product applications of certain ‘augmented reality’ technologies were developed. The second case study describes the development of a future vision of a research laboratory. Both workshops included participants from different disciplines and potential user groups with different levels of expertise. Our explorative study focuses on a process description and outcomes of the application of the above described representational toolkits in combination with playful modelling. The objective of the paper is to discuss first empirical insights in the light of the theoretical framework of the methods.

## Conceptual Framework

### *Toolkit-Based Modelling*

Toolkit-based modelling (Sanders & Stappers, 2008) aims firstly to explicate thoughts

through haptic models to provide shared understandings among diverse people, and secondly to facilitate creative idea development at early stages in the innovation process. Such models exemplify specific living environments, representing and explicating the thinking of its creator. Through the use of diverse toolkits (described below), physical models are built and presented to the other participants through stories (e.g., Boje, 1991; Gabriel, 2000). Thus, abstract and non-self-explaining models develop meaning through verbal explication (see also Orr, 1996, 2006). Shared understanding is provided through the communication of these meanings to one another.

The used toolkits may be to a certain extent traditional such as using pictures, sketching material and crafting cardboard, or more play oriented like toy building blocks and play dough, or volatile ones like drama playing. However, transferring specific toolkits across disciplines (e.g., Brown, 2009) may also require a certain degree of specific skills such as sketching and modelling from the participants. If these skills are unequally developed within a group (or even if some just think that they are unequal), then the innovation process may be hindered. Those who cannot draw are inhibited in a team of designers (Roam, 2008). In a heterogeneous group, for example comprised of experienced designers and non-designers, this problem might be even more visible. In order to not have to re-evaluate and reapply the traditional division of tasks (Lee, 2008), all group members should be able to communicate and interact adequately. Hence the methodology provided should be open enough to enable participants to express their thoughts and make themselves understood. This has to be provided and fostered by the toolkit used.

Therefore, toolkits used for such modelling in non-design experienced groups should be easy to handle and appropriate to provide high informative value, and to generate meaning easily (Sanders & Stappers, 2008). Toolkits can be toy building blocks, cardboard, pictures, building tools, geometric shapes, icons, symbolic characters, moulding material or similar. Of course the facilitators need to be aware that the toolkit not only enables but also limits the creative action of the process participants (Le Masson et al., 2011). The combination of modelling with storytelling relativizes the quality of the model designed, and therefore levels out the modelling skills of experienced and inexperienced participants. Unlike visual arts, a model contributing to an innovation process has hardly any explanatory and communicative power on its own. It is the story which gives the model its meaning.

The toolkit can be put together in different ways, which leaves room for creative design. The modelling toolkit should, however, not require specific manual capabilities of the creator, otherwise a gap is created between users dependent on their manual and artistic capabilities, and so an equal discussion level would not be possible. It must enable “users to create and test [...] products and services” (von Hippel, 2006, p. 154). However, the choice of the toolkit requires keeping the balance between (a) the possibility of building a solution and model which expresses the thoughts of the creator, and (b) the simplistic value of the toolkit. The toolkit and its use may vary throughout the process or remain unchanged. Through the modelling with the toolkit, creative ideas can quickly be developed and concretized. The procedure of model building combined with storytelling and discussion can be repeated several times throughout the modelling process (Roos et al., 2004). Subsequent models build on the experience of preceding ones.

The toolkit-based modelling approach described in this paper allows the development of hypothetical or preliminary ideas as well as the exposure of problems and opportunities, and their discussion on the basis of metaphors and abstractions in an explorative manner. Hence, solutions emerge regardless of details or design, which allows full participation of inexperienced participants. Toolkits are a means to express and document diverse understandings and ideas. Therefore they can be seen as mediating artefacts or boundary objects in the communication process between workshop participants (Vygotsky, 1978; Oliver & Roos, 2007; Nicolini et al., 2012). Such mediating artefacts can be used in two different ways: to transport meaning or as part of a creation process. In the second case the meaning of the artefact develops through its use.

### *Serious Play*

Play has always been important in human development and is deeply rooted in human beings as a way to learn how to cope with a complex environment (Kolb & Kolb, 2010; Bogers & Sproedt, 2012). Children use play and imagination as the primary mechanism for making sense of their new, rapidly evolving world. Regarding innovation processes Thomas and Brown (2011) point out that

[i]n a world of near-constant flux, play becomes a strategy for embracing change, rather than a way for growing out of it. [...]. The need for innovation – the lifeblood of business – is widely recognized, and imagi-

nation and play are key ingredients for making it happen (pp. 48–9).

When play happens within a medium for learning it creates a context in which information, ideas and passions grow (Thomas & Brown, 2011). Play is a source of creativity (Mainemelis & Ronson, 2006) and therefore a trigger for innovation. Moreover, in open collaborative innovation processes playing can facilitate intangible social interaction across boundaries. Play addresses the cognitive, emotional and social dimension of learning (Bogers & Sproedt, 2012). Therefore, the role of play in organization is becoming increasingly important (Mainemelis & Altman, 2010; Sørensen & Spoelstra, 2012).

As mentioned above, the creation of a model using toolkits can be described as ‘playful action’, since the creator is immersed in applying the given tools to design a model out of it. Since this playful action has an intention and is at least goal-oriented, it is called ‘serious play’ (Roos et al., 2004). This means that the general objectives for consideration and/or main principals (e.g., the potential customer group) are given (see also Bogers & Sproedt, 2012). The playfulness is part of the problem-solving and creative process itself (e.g., developing an idea) using the available toolkits. Hence, although an objective is given, results may differ significantly in direction and depth. The term ‘serious’ is related to the objective, the expression ‘play’ to the (creative) process.

Serious play invites participants to ‘think with the hands’ through creating a model (Roos & Victor, 1999). Serious play can be seen as creative acting where ‘players’ are motivated by the task itself and correspond with the artefacts given. The basic assumption of serious play is that, according to Polanyi’s (1969) idea of tacit integration, ideas and answers of challenging questions (e.g., to develop something new) are already present in the minds of the participants without their being aware of them. Hence the answers come through acting – for example, modelling. Following Polanyi (1969), any practice is characterized through such unawareness in acting. However, serious play retains high creative potential through its intuitive playful character. The term ‘serious play’ describes a paradox since the playfulness is accompanied by an intention (Statler et al., 2011); for instance, to describe a situation or to bring about novel ideas. As mentioned above, the toolkit-based model built through playful action is subsequently given meaning through storytelling (Sanders & Stappers, 2008). The meaning can easily be grasped by the other



participants in the process. This ‘storytelling’ is also of playful character as it is more a dialogue with the model than an explanation. The storytelling is a reification of the result of serious play.

### *Synthesis: Combining Toolkit-Based Modelling with Serious Play*

The following combination of toolkit-based modelling with serious play provides a basic sequence as it may be applied repeatedly in innovation workshops (Schulz & Geithner, 2014):

- (1) Posing a question (providing an intention): The participants are challenged by a question which should have no obvious or easy solution to provide a stimulus for the creator. The challenge covers the object for consideration as the aim of the workshop.
- (2) Development of a representational model using given toolkits (playful action): The participants make sense of what they know and what they can imagine by constructing a model using the toolkit.
- (3) Presenting and sharing the model (storytelling): The participants conceive a story covering the meaning of the model. The stories are shared between the participants. At this stage contradictions within the model and between participants may appear.
- (4) Asking questions (reflecting): As a way of internalizing and grounding the story, reflection upon what was heard or seen in the model is encouraged.

Depending on the objective of the workshop, the sequence may be repeated several times with different issues building on each other. A toolkit-based serious play workshop, especially with inexperienced groups, may follow various pre-defined compositions. To increase understanding and innovation capacity of the process, it can be useful to increase complexity stepwise, for instance through starting to build a model about the context of consideration or basic principles of acting. Individual views can be designed in a model, and individual perspectives can be combined and connected to a shared model or whole process. Each level may include the above four steps. The overlapping between playfulness, intentionality, storytelling and reflection within a group process requires coordination, facilitation and moderation. Consequently, the creative potential of serious play should not only be considered as improvisation of the actors. It rather integrates the two facets of

creative action: composition and improvisation (Amabile, 1996; Fisher & Amabile, 2009). Within a toolkit-based serious play workshop participants improvise through playful action. Such a workshop benefits furthermore from the building part of playing. Learning is fostered and knowledge is gained when participants actively create models (Papert & Harel, 1991). The relationship between hand and brain coordination (Jensen, 2000) inspires and therefore fosters creativity (Roos & Victor, 1999). The characteristics of improvisation and serious play are closely connected with metaphorical and abstract modelling. Therefore serious play has its particular meaning in the early stages of innovation processes, where ideas are supposed to emerge out of playful action and communication. Hence actors can intuitively follow their ideas which emerge out of the task.

Based on the above described *modus operandi*, we applied a series of toolkit-based serious play workshops in different settings and with several objectives over four years. The aims of the workshops were, for example, the development of new products, the development of future visions of processes, corporate strategies, or new structures of organizations and of regional networks. Hence the three dimensions of innovation – product, process and social – were covered within the workshops. All objectives of the workshops required the creativity of the participants because they were aiming to develop future visions, concepts and products. Depending on the aim of the workshop as well as the number of participants, the various workshops lasted between a half day and three days. In each workshop diverse stakeholder groups (e.g., people from different units of a company, customers and suppliers) participated. We used diverse toolkits such as toy building blocks, crafting cardboard, photos or sketches.

## **Case Studies**

In the following we describe two workshops with a particular focus on the creation and development of ideas in the early stages of innovation processes. In Case study 1, new product applications of certain ‘augmented reality’ technologies were developed. Case study 2 describes the development of a future vision of a research laboratory. We particularly chose these two cases for two reasons. First, the two case studies used contrasting toolkits without overlap: in the product development process (Case study 1), more traditional tools such as crafting cardboard,

pictures and sketches were used, whereas only toy building blocks were utilized as toolkits in the organizational change workshop (Case study 2). Second, the research team, which includes the authors of this paper, took part in both workshops as participants and facilitators with alternating roles. Hence the workshop participation and data collection (observation, brain dump) of both workshops was a primary experience for all researchers, which enabled an adequate empirical level of exchange, discussion and interpretation due to the same experiences. Furthermore, both perspectives of participant and facilitator could be included and exchanged at the same time.

### *Research Questions and Methods*

Our study refers to explorative field and practice research, which means the object of study is researched in its natural dynamic environment, taking into account multiple influencing factors (Corbin & Strauss, 2008). Such case study logic provides multiple resources of evidence and therefore patterns of behaviour (Yin, 2008), which we consider as highly important with reference to our practice-based approach (Gherardi, 2012). However, unlike experimental settings, our study does not provide statistical results.

Based on the general approach of our study, to explore how the conceptual approaches of serious play and toolkit-based modelling can be combined and applied in innovation processes with reference to heterogeneous groups who are inexperienced in the use of design methods, we particularly inquired into the following research categories operationalized through the subsequent research questions:

- (a) *The process of toolkit-based modelling and serious play:*
  - How do participants make use of and interact with the toolkit?
  - How do models and explanations develop in the creation process?
- (b) *Interaction and involvement of participants along the workshop:*
  - How is the development of 'mutual understanding' among the heterogeneous participants related to the emergence of 'innovative ideas' (regarding augmented reality applications resp. future vision of the research laboratory)?
  - In which way do the individual models influence each other?
  - How are the models and explanations recognized and discussed among participants?

- (c) *Potential effects of toolkit-based and playful modelling in terms of innovativeness:*

- What levels of novelty do the models have (physical model and explanation) in the assessment of the participants and of the facilitators?
- What are the limitations of the toolkits and the serious play process in terms of contributing to the innovation process?

As mentioned above, all authors alternately contributed as participatory observers or facilitators in the two workshops. Empirical data were collected by the researchers through participatory observation, (partial) video recording and photos of the models and the creation process. In each workshop one of the facilitators focused on the observation process using an observation manual developed from the research questions. These roles changed over the workshops. The participating researchers created brain dumps after the workshops. Furthermore, subsequent to the workshops (after the creation of the individual observation protocols and the brain dumps), the researchers discussed photos and video sequences. Additionally photos and videos, particularly of the explanation of models (storytelling), served not only as a research method, but also as a means to document results. Furthermore, participants were asked to give oral feedback immediately after the sessions about their experiences and indicate their appreciation of the process. Feedback questions were also related to the above research questions. Both workshops included participants from different disciplinary and professional backgrounds with different levels of expertise. The workshops followed a similar roadmap. Each workshop lasted for one day and was organized according to the levels and steps described previously.

### *Case Descriptions*

#### *Case Study 1: Developing Augmented Reality Applications*

*Task and Provided Toolkit.* The first study describes a workshop which brought together eleven designers, engineers and economists from three organizations (see Figure 1). Their task was to develop innovative product concepts in order to create new market opportunities for augmented reality technology applications. The workshop was moderated by two experts and there was a recurrent switch between individual work, presentations (storytelling) and teamwork. Different sets of drawing, writing, handicraft papers, cardboard and photographs were prepared as a



Figure 1. Case Study 1: Developing Augmented Reality Applications Using Cardboard, Photos, Pens and Paper



Figure 2. Case Study 1: Discussion, Testing and Presentation of Models

workshop-specific toolkit. The workshop sequence was derived from typical processes in industrial design; much attention was paid to visualization as a means of thinking and communication (Woelfel et al., 2013). However, the focus was on selecting, arranging and tinkering rather than sketching and drawing in order to take into account the participants' diverse drawing skills.

*Process of the Workshop.* The workshop participants started with modelling the context. They generated user-archetypes (personas) and their own narrative context (a day in a life). This was accomplished through individually written notes, followed by oral presentations. In the workshop, the emphasis was put on exemplary archetypes rather than statistical representative user groups, thus ad-hoc stories were chosen rather than data-driven explanations (Pruitt & Adlin, 2006). Subsequently, in addition to other aspects, individual needs of the user-archetypes were analysed and added to the results.

After the phase of the framework analysis, the definition of the basic model in terms of the abstract goals was accomplished. The participants were asked to develop design concepts for the situations of their personas (Pruitt & Adlin, 2006; Cooper et al., 2007). The concepts consisted of a set of visualizations chosen from 150 photographs, which stood as metaphors for specific characteristics or behaviour, mood words and verbal claims, all of which related to the stories of the user-archetypes. Subsequently, the participants started to decrease the level of abstractness by proposing and embedding concrete solutions. The solutions were discussed among small sub-groups. In the following step participants started to build simple mock-ups out of coloured cardboard, tape and markers (see Figure 2). By engaging the mock-ups in play, they tested, refined and communicated their models which represented customer and industrial goods such as shopping guides, sports gear or logistics devices.





Figure 3. Case Study 2: Developing a Vision of a Future Research Laboratory Using LEGO® Building Blocks

The process was moderated by two facilitators who provided the methodology by setting the tasks and toolkit. Furthermore, the facilitators engaged in the storytelling and reflection by posing questions or making suggestions. Finally, the facilitators dealt with the time management of the process, particularly the limitation of the modelling processes.

#### *Case Study Two: Transforming a Research Laboratory*

*Task and Provided Toolkit.* In the second case study participants of the workshop received the task to conceive a vision of a future research laboratory (see Figure 3). Additionally, they were asked to describe the path from the existing laboratory to the future one. The participants group consisted of ten people, engineers, architects, business people and psychologists; seven of them worked within the laboratory, the other three were collaboration partners. As tools throughout the whole workshop, a set of mixed building blocks, the LEGO Serious Play kit<sup>1</sup> (e.g., Roos & Victor, 1999), was used. With such building blocks, models can be built and modified easily and rapidly.

*Process of the Workshop.* After a warming-up exercise to familiarize the participants with the material, they had to build and present the context of their work, namely their ideal workplace. The task was announced by the facilitator,

followed by a short building period, and then an explanation by all participants in any order. The metaphorical model of the futuristic workplace was followed by the design of an individual model (see Figure 4): a response to the question of how each participant considered the existing research laboratory. The participants could either continue with their built metaphor or start with an entirely new model. The results again were presented among the participants.

In the next step these individual models were connected to create a shared model of the current situation. The facilitator emphasized that all diverse views needed to be included and the individual models were allowed to be modified when connected. The explanation of the collective model was given by several contributors. The shared model of the existing research laboratory was meant to provide a collectively shared understanding of the current situation before moving to the future one. Subsequently the participants individually designed their futuristic models which were presented and afterwards again connected to a future model (see Figure 5). Consequently, the individual modelling and connecting steps were carried out twice.

Finally metaphors about tasks, institutions and actors had to be established with the intention to show how to get from the existing model to the futuristic one. The workshop ended with a summary of the process from the 'now' to the 'future'. The model was documented with photos; and the story about the model was videotaped. The facilitating and

<sup>1</sup> LEGO Serious Play is a registered trademark of the LEGO(R) company.





Figure 4. Case Study 2: Individual Model Building and Storytelling



Figure 5. Case Study 2: Shared Model about the Futuristic Research Laboratory

moderating process was focused on explaining the workshop tasks, and providing diverse hints on how the tools can be used, and taking responsibility for the timetable. Furthermore, the facilitators actively participated in the reflection process; they asked questions about the models to encourage discussion.

#### *Key Findings and Comparison of the Two Case Studies*

With reference to the research question, it can be pointed out that playful intuitive creation and development could be observed in both case studies. The participants in the first workshop found the traditional tools like crafting paper, cardboard and pictures easier to use than the metaphorical use of LEGO blocks in the second workshop. Cardboard

models were also more concrete and self-explanatory than the LEGO models. With reference to the heterogeneity of the participants, the first modelling rounds in both workshops included directly and indirectly the expression of specific perspectives of the participants. Through the description of archetype-users and contexts, these views became clear and obvious in Case study 1, but in Case study 2 a lot of discussions about meaning emerged at the beginning of the workshop. With the LEGO models it could, however, be observed that the complexity and creativity of models enhanced along the process. Furthermore, the continuous use of the LEGO Serious Play toolkits in Case study 2 inspired a more playful behaviour than the more traditional toolkits in Case study 1 with their varying use.

The participants in Case study 2 also had to present a shared model (Figure 5) as a group. Discussions about how to describe the model were far less complex than the description presented by the participants afterwards. There the participants supplemented each other and inspired each other to add additional aspects. However, between the two cases the models created did not differ significantly in terms of originality and novelty. Results were brought about in groups of heterogeneous stakeholders and could be considered as highly innovative, as participants developed ideas beyond existing concepts and products. Participants reported in both workshops that the toolkits and the creation process helped them to focus their ideas. However, as participants stated, toolkits provided for the augmented reality workshop (card, paper, art craft material) required more craft skills than putting LEGO building blocks together. Furthermore, the variety and complexity of LEGO models were higher due to the higher number and variance of the bricks. Meaning and innovative ideas, however, were mainly transported through the paper, cardboard models and storyboards. In the case of the LEGO toolkit the meanings were brought about through the storytelling and innovation emerged through mutual exchange about the models and descriptions. When asked about this effect, participants stated that the cardboard modelling was more a goal-oriented process towards a result, whilst in Case study 2 they emphasized the aspect of listening to others and building of ideas into their own model and story whilst creating. Hence creating understanding and ideas are more closely related in Case study 2 with the LEGO toolkit than in Case study 1. In both workshops, however, the exchange about models and stories influenced each other: One of the participants in the augmented reality workshop explained a method of displaying information in glasses which in the next step several other participants integrated as well.

The methodological combination of manual model building and storytelling led to high attention among all participants. In some cases the crafted models were sophisticated but complemented by short explanations, in other cases simple models were accompanied by sophisticated explanations. Hence, the explanatory power of the models did not differ significantly.

In both workshops participants stated that they were surprised by the results and at the beginning they did not expect that they would be able to contribute to the task in such an elaborated way. However, in both workshops limitations of the toolkits were mentioned. In Case study 1 the majority of participants com-

plained that non-material aspects are difficult to express (like software or dynamic effects). In Case study 2 some participants mentioned that the shape of the LEGO blocks limits the creation of bodies which are less abstract and lead more towards implementation.

Table 1 presents a summary of the empirical results of the two cases and compares them in terms of the three research categories introduced above.

## Discussion

Based on our understanding of the field research, the empirical results are discussed in the light of the theoretic conceptualization of toolkit-based serious play. In contrast to experimental settings, a direct comparison with a non-toolkit-based approach is not possible and also does not correspond with our understanding of researching practice contexts. Our innovation workshop design integrates the three main concepts: (1) co-creation among heterogeneous participants, (2) the use of toolkits for modelling, and (3) the playful modelling process. These three aspects will subsequently be discussed.

### *Co-Creation among Heterogeneous Participants*

The two different case examples show a high level of creativity and therefore innovation potential. According to the literature we referred to, two aspects are responsible for this; first the diversity of participants and the resulting ambiguity of meanings (e.g., Basadur & Head, 2001; West, 2002), and second the toolkit-based modelling process (e.g., Sanders & Stappers, 2008). The diversity of groups with a lack of design experience, however, provides a major methodological challenge to the process – or in other words, the question arises how toolkit-based modelling should be applied to bring about creativity. The empirical results show that the workshop design and facilitation is of even higher importance for promising outcomes than the choice of the toolkit. Participants' statements at the beginning (after introducing the toolkit and workshop goal) claim they could not imagine an innovative outcome, but at the end of the workshop the results and their personal contribution was far beyond what they expected, proving that guidance through the process is essential.

With regard to heterogeneous groups in terms of function, profession and organizational origin, the creation of a common ground for collaboration was the initial and

Table 1. Comparing Findings between the Case Studies

Questions	Case Study 1 Augmented Reality	Case Study 2 Research Lab Transformation	Conclusions
<i>Toolkit used</i>	<ul style="list-style-type: none"> <li>– Storyboards, pictures, sketches, crafting cardboard and paper, drawings.</li> </ul>	<ul style="list-style-type: none"> <li>– LEGO Serious Play toolkit comprising an assortment of various building blocks, characters and connections.</li> </ul>	
<b>(a) The process of toolkit-based modelling and serious play</b>			
<i>How do participants make use of and interact with the toolkit?</i>	<ul style="list-style-type: none"> <li>– Principally all participants applied the given tools; however, some had problems, e.g. to define characters or life stories.</li> <li>– Participants carefully listened to the instructions of the facilitators since the tools changed from task to task.</li> <li>– Tools were only used within the given frame.</li> <li>– The mock-up building caused problems with the time frame, since the modelling required some handicraft knowledge.</li> </ul>	<ul style="list-style-type: none"> <li>– Most of the participants easily used the building blocks; however, at the beginning of the workshop they had difficulty in modelling the given task with the toolkit (metaphor building).</li> <li>– The participants played with the building blocks all the time, as well as during the given tasks.</li> <li>– Participants had problems with the time restrictions.</li> </ul>	<ul style="list-style-type: none"> <li>– Principally all participants easily applied the given tools/ building bricks.</li> <li>– Known materials used in a traditional way are easier for initial use.</li> <li>– The continuous use of the LEGO Serious Play toolkits inspired for a more playful behaviour than the more traditional toolkits.</li> <li>– Problems with time restrictions in both workshops.</li> </ul>
<i>How do models and explanations develop in the creation process?</i>	<ul style="list-style-type: none"> <li>– The basic meaning of the models was clear for the other participants.</li> <li>– Concretion and complexity of the metaphors increased within the workshop; however, creativity was also limited by the material provided (e.g., problems with 3D representations).</li> <li>– Due to the rather concrete cardboard models, the descriptions had a rather explicatory character.</li> <li>– Feedback questions mainly dealt with characteristics and intentions of the models.</li> </ul>	<ul style="list-style-type: none"> <li>– Due to the high abstraction of the LEGO models, explanation was essential for understanding meanings.</li> <li>– At the beginning some participants had difficulty in explaining the meanings of the abstract models.</li> <li>– Complexity and creativity of models enhanced during the process.</li> <li>– Abstraction and symbolism of the models increased over the workshop, particularly the complexity of the explanations enhanced.</li> <li>– Feedback questions changed over time from very general questions on how to understand the model to questioning specific meanings and views.</li> </ul>	<ul style="list-style-type: none"> <li>– The more abstract a toolkit use is the more important is the explanation of the model.</li> <li>– Creativity and complexity of the models as well as questions and explanations (stories) elaborated throughout the two workshops.</li> <li>– The variety and complexity of LEGO models were higher than in Case study 1 due to the possible combinations of building blocks.</li> </ul>



Table 1. Continued

Questions	Case Study 1 Augmented Reality	Case Study 2 Research Lab Transformation	Conclusions
<p><b>(b) Interaction and involvement of participants within the workshop</b></p> <p><i>How is the development of 'mutual understanding' among the heterogeneous participants related to the emergence of 'innovative ideas'?</i></p>	<ul style="list-style-type: none"> <li>- At the beginning some participants had difficulty in understanding the objectives of the workshop and their contribution to innovation as they had no previous experience with augmented reality technologies and such types of ideation processes.</li> <li>- Model building and storytelling helped to develop a mutual understanding about the workshop aim which fostered the emergence of innovative ideas throughout the workshop.</li> </ul>	<ul style="list-style-type: none"> <li>- All participants basically understood the objectives of the workshop; however, they doubted that the expected results could be reached.</li> <li>- Participants had very different views on the current situation of the research laboratory as well as about the future vision shown by means of the individual models.</li> <li>- Building a shared model about the future vision fostered the development of a mutual understanding about the future vision.</li> <li>- Meanings were brought forward through the storytelling and innovation emerged through mutual exchange about the models and descriptions.</li> </ul>	<ul style="list-style-type: none"> <li>- Particularly in heterogeneous groups, shared understanding goes ahead of idea development.</li> <li>- For the participants the connection between the modelling process and innovative workshop goal is at first difficult to grasp and requires stepwise experience of the process.</li> </ul>
<p><i>In which way do the individual models influence each other?</i></p>	<ul style="list-style-type: none"> <li>- Diversity of individual models and metaphors was very high throughout the whole process.</li> <li>- Communication between participants was related to questions and feedback about the metaphors and their potential use.</li> <li>- The exchange about models and stories influence each other. Participants borrowed the ideas of others.</li> </ul>	<ul style="list-style-type: none"> <li>- Diversity of individual models and metaphors was very high throughout the whole process.</li> <li>- The closer the tasks were related to personal work and concerns, the more diversity the models showed.</li> <li>- Balance between coherence and diversity, especially some stories were strongly influenced by predecessors.</li> <li>- At a final stage the individual models were connected to a shared one about the future vision which was an amalgamation of the individual ones through a highly intense discursive process.</li> </ul>	<ul style="list-style-type: none"> <li>- Although the models provide diversity, the participants are mutually influenced through the exchange about the models.</li> <li>- Individual models built with building blocks can easily connect to a shared model in discursive processes and where contradictions can be discussed.</li> </ul>

Table 1. Continued

Questions	Case Study 1 Augmented Reality	Case Study 2 Research Lab Transformation	Conclusions
<i>How are the model and explanations recognized and discussed among participants?</i>	<ul style="list-style-type: none"> <li>- Models were recognized as being of the same value.</li> <li>- Mainly individual models which potentially could be used were mutually assessed at some points where participants tried to connect with other models (supplementing opportunities to use).</li> </ul>	<ul style="list-style-type: none"> <li>- Individual models were recognized as being of the same value.</li> <li>- However, building a shared model encouraged some participants to dominate the building process.</li> <li>- Workshop facilitators had to ensure through questioning that all participants were satisfied with the shared model.</li> </ul>	<ul style="list-style-type: none"> <li>- The basic sequence of both workshops allows each participant to explain his/her model in a sufficient way.</li> <li>- Workshop facilitators are to ensure that all participants are equally able to explain their models (time management).</li> </ul>
<b>(c) Potential effects of toolkit-based and playful modelling in terms of innovativeness</b>			
<i>What levels of novelty do the models (physical model and explanation) have in the assessment of the participants and of the facilitators?</i>	<ul style="list-style-type: none"> <li>- Results could be considered as highly creative and innovative.</li> <li>- The innovation lies in the creation of the model which is explained to the others, who adopt ideas.</li> </ul>	<ul style="list-style-type: none"> <li>- Results could be considered as highly innovative.</li> <li>- The innovation is based on the model but is enhanced through the storytelling.</li> </ul>	<ul style="list-style-type: none"> <li>- Both toolkits are appropriate to facilitate the emergence of innovations.</li> <li>- The LEGO toolkit, however, provides more general and abstract principles than the cardboard and paper modelling, which is more concrete.</li> </ul>
<i>What are the limitations of the toolkits and the serious play process in terms of contributing to the innovation process?</i>	<ul style="list-style-type: none"> <li>- The frequent change of tools (although they are common workshop tools) caused some disturbance in the playful modelling process and therefore it was a more reflective than intuitive process.</li> </ul>	<ul style="list-style-type: none"> <li>- Particular forms are not able to be realized as well as concrete shapes.</li> <li>- The toolkit remains on a higher abstraction level.</li> </ul>	<ul style="list-style-type: none"> <li>- Intuitive playful modelling is stimulated more by toy building blocks than by traditional craft-based toolkits.</li> <li>- Combination of toolkits may foster the development of mutual understanding and innovations.</li> <li>- Toolkits are particularly useful in the early phases of the innovation process.</li> </ul>

most important aspect at the beginning (Schulz, 2008), as stated during the discussions and inquiries among participants about meanings and views. For this reason, idea development follows shared understanding. The expression of views and understanding was obligatory for the participants as the workshop

design required modelling or sketching and explicating the result for the others. The verbal explication (storytelling) was essential to discover diversity and ambiguity and finally to create a mutual understanding. Hence already the expression of views was part of the creative process and challenged and inspired the other

participants. It was, however, the facilitator's task to create a balance between shared understanding and maintaining diversity and ambiguity. The shared understanding should not compensate diversity, which would have been counterproductive in terms of creativity, but should create a working platform. The participants speak through the models; therefore the metaphors are not only a means of communicating understandings to others, they also create awareness of personal understandings (see also Lee & Amjadi, 2014). Views are brought about in an intuitive and playful mode (Roos & Victor, 1999). Through such object orientation understandings are rapidly made explicit, which distinguishes the process from the long-term enculturation in traditional project work. The created metaphors bring about 'boundary objects' between workshop participants with different experiences, functions or from different organizations (Nicolini et al., 2012; Bogers & Horst, 2014).

#### *The Use of Toolkits for Modelling*

Although in both workshops the emphasis was based on applying toolkits to be used without design knowledge, the two case studies provided different experiences. The picture boards, sketches, paper and cardboard models are in general less abstract than rapidly assembled LEGO brick models. Consequently the latter are less self-explanatory, and therefore verbal explanation (storytelling) is more important. However, apart from traditional oral exchange (Orr, 1996, 2006), the context of the story is provided through the physical model. The cases showed, however, that self-explanatory models (e.g., from paper, cardboard or storyboards) tend to simplify outcomes whilst the abstract models are likely to lead to more metaphoric and complex solutions and therefore to discursive processes among participants. As the case studies show, a broad variety of tools is adequate as long as no deeper design-specific knowledge is required for its use. The modelling with the LEGO Serious Play toolkit was, however, according to the users, considered more difficult in creating meaning than with traditional sketching and crafting materials. In other workshops, where participants could choose the toolkit, cardboard, paper and pictures were chosen rather than the LEGO toolkits, probably because of the perceived level of difficulty, as described before. Hence, facilitation is an important aspect, particularly in cases where design inexperienced users are involved.

The use of building blocks showed one further characteristic. The models can be easily

connected to a collective one, which enables further encounters with the object. Such a process, however, has a different nature of playful action. Exchange among participants while building leads to a permanent alteration between building and reflection. The use of toy building blocks enabled participants to physically connect the individual models to a shared one. In Case study 2, innovative ideas could therefore be connected to an entire model, including diverse perspectives and emphases. However, the focus lies on 'collectively shared', which means it is not a full integration but a connection representing similarities and diversity (Schulz, 2008). The connected model not only represents an addition of individual ideas but rather an enhanced perspective due to new views being created through connection. Shared creativity emerges through reifying thoughts with building and explaining metaphors (see also Jacobs & Heracleous, 2006; Oliver & Roos, 2007).

#### *The Playful Modelling Process*

In terms of the playful modelling process, our exploratory case study research indicates that playful and intuitive acting describes a *modus operandi* where the actor is immersed in dialogue with the object of inquiry. Participants were not willing to be interrupted by facilitators during the creation process. The built models in the two cases demonstrate that playful modelling is a main source of creativity (Amabile, 1996), particularly through ongoing practice. As stated above, the workshops show that facilitation is needed, particularly in a way that creative potential is fostered but also to focus on the collective object of inquiry which is the 'serious' component in play (Statler et al., 2011; Schulz & Geithner, 2014). To move away from conscious design towards playful creation, hands-on activity is useful (Oliver & Roos, 2007).

The core process of idea development is a playful dialogue, between actor and toolkit, which can be emotional, imaginative and emergent (Roos et al., 2004; Statler et al., 2011). The dialogue is expanded to a social component, when the result of the intuitive modelling is subsequently presented to other actors, expecting their feedback. Playing can therefore be seen as improvisation. Playful periods, however, need an additional didactic component, for instance through increasing the complexity of tasks. Hence, a serious play workshop requires both improvisation through playing and composition (Amabile, 1996; Fisher & Amabile, 2009). The composition aspect of the creative action becomes apparent on two levels. First, the playful mod-



elling follows a specific task focusing on an object of inquiry (e.g., Roos & Victor, 1999). Second, the whole workshop follows a composition, the roadmap, which is fostering the participants' capabilities of dealing with the innovation objective and the provided tools. Such restrictions of time and tool resources are useful to avoid too elaborated modelling processes, which would move the focus away from task fulfilment to artistic model design. The dialectics between improvisation and composition defined in the case studies are also the role of the moderators and facilitators. Generally, they are in charge of the composition but need to be open to the improvisation of participants. Besides the roadmap and the given task, in the workshop using building blocks, several participants were constantly playing around with the toolkit. The easy-to-handle building blocks fostered such behaviour. The models created thereby represented an added value to the innovation process and were partially built into the given tasks.

Moreover, toolkit-based modelling and serious play enable participants to take on contradictions or failures as a creative resource without bringing about conflicts. The toolkit-based modelling puts a strong focus on the object of inquiry and its explanation. The model as it stands is a material reality, once finished somehow distant from the creator. As such it allows discussions about the metaphor largely disconnected from the creators, which enables an objective discourse about ideas which is important in heterogeneous groups. Consequently power and hierarchical relations of the group participants play only a minor role in the process. Furthermore, through the composition logic of the workshops each participant builds a model and tells his/her story, hence dominance of particular persons can be avoided. It is, however, a challenge for the facilitator to emphasize this aspect in the workshop. In the two case studies it could be observed that the attentiveness of the participants was oriented towards the model and not towards the creator. Even critical discussions, in Case study 2, for instance, about the main focus of the research laboratory, were led in a surprisingly calm way.

## Conclusions and Implications

In this paper we aimed to explore how the conceptual approaches of serious play and toolkit-based modelling can be combined and applied in innovation processes with reference to heterogeneous groups who are inexperienced in the use of design methods. We con-

sider the use of representational toolkits such as toy building blocks, crafting paper/cardboard or picture boards in a playful manner as a powerful method to actively integrate different stakeholders in an innovation process. From our point of view, the main benefit lies in the combination of toolkit-based modelling with playful aspects alongside given tasks and a main objective of the process. This combination integrates perspectives originating mainly in design (toolkit-based modelling; e.g., Sanders & Stappers, 2008) with strategy and gaming views (serious play; e.g., Roos et al., 2004).

Contemporary conceptual views and practical approaches to innovation (co-creation, co-configuration, open innovation) try to benefit from various stakeholder groups representing whole process chains and customer groups. Although research confirms the innovative potential of such heterogeneous groups (West, 2002; Sannino & Ellis, 2014), the challenge arises how to create understanding among participants from various origins and how to foster their creative potential. We argued that inter-organizational and interdisciplinary stakeholder groups, which are generally inexperienced in design processes, require simple-to-use tools that enable them to bring about innovation. We subsumed that playful modelling with simple-to-use toolkits can provide an important contribution, particularly to early stages of the innovation process. With our exploratory case studies we particularly compared idea development of a product innovation with an organizational innovation process. Although the philosophy and setting of the workshops were very similar, we used more traditional toolkits such as craft paper and cardboard or pictures in the first case and building blocks of different shapes in the second case.

We assume that playful modelling with simple-to-use toolkits can provide an important contribution to creativity and idea generation: the toolkits help to reify ideas and inspire the creator through 'thinking with the hands' (Roos & Victor, 1999). The adequacy of toolkits, however, depends on the tasks. Our results are based on workshops using cardboard modelling, picture collages and building blocks as toolkits. The building blocks especially inspire constant modelling; however, models are abstract and need to be given meaning by the creator through verbal explanation. The traditional tools like cardboard are more concrete and therefore focus the creator more on the task. One should also be aware that the toolkit not only enables but simultaneously restricts creativity. As our observations of the two workshops show, each modelling

method and each toolkit has its restrictions and therefore not only enables but also limits creativity, especially for the more experienced user (e.g., Pei et al., 2010; Le Masson et al., 2011). Thus, on the one hand a combination of tools within a workshop can be useful, on the other hand it can disturb the flow of enhanced use of the toolkit. In product innovation, as Case study 1 explores, traditional tools like cardboard and paper enable the actor to create free shapes, which is relevant if the process moves beyond principle solutions. Such a design is not possible with building blocks as shown in Case study 2. They have their specific value in representing diversity and complexity which is, for example, necessary in organizational development processes. Hence, the adequacy of the toolkit(s) within a workshop has to be carefully taken into account. Furthermore, the workshops dealt with participants who were inexperienced in design issues; therefore guidance through the facilitators was gainful and necessary, as the statements from the participants confirm. In the case of users experienced in design, it may be useful to reduce the roadmap to only a few key points and also leave the choice of the toolkits open to the participants.

The concept of 'serious play' (Roos et al., 2004) implies that the toolkit is used in an intuitive, playful manner. The creator intuitively interacts with the object under consideration. Hence, the outcome of the playful inquiry is unpredictable, although a general task is given (Statler et al., 2011). Play in general is a cognitive, emotional, sensory and social experience (Bogers & Sproedt, 2012). The aspect of seriousness in play represents a direction or general goal which, however, should not be seen as a limitation of the play itself, but rather as a scaffold to foster creative acting (Schulz & Geithner, 2014). Basically, the playful modelling provides two main aspects which both represent creative activities. First, the model explication enables the emergence of a collectively shared understanding among participants (Schulz, 2008). This does not mean that all participants are fostered to think in a similar direction; it is rather to create a common basis of communication – understanding the other's perspectives. Second, creative development of concepts and solutions is fostered, which is likely to go beyond existing views.

The playful activity is, however, not only restricted to the interaction of the creator with the toolkit, it shows a broader dimension: participants of the second workshop using the LEGO toolkit play with the building blocks as well as adjacent to the given tasks. Moreover, storytelling often also has a playful character

as the stories develop while talking (Vygotsky, 1978). Therefore, building of connected models is a process of collective acting and reflecting where the group is deeply involved with the object. All these facets of playful activity need to be considered as sources for creativity. Furthermore, the workshop participants are mutually inspired by these different types of activities. Consequently the source of creativity should not only be seen in the core process of the object-oriented playful interaction with the toolkit but in the whole workshop context.

Hence, the combination of adequate toolkit(s), task, roadmap and facilitation are of high relevance for the outcomes of the workshop. Concerning the organization of the workshop, the composition of a framework is necessary to provide a scaffold for the participants to orientate around (Fisher & Amabile, 2009; Schulz & Geithner, 2014). Concerning the playful modelling itself a maximum of scope is useful to provide space for individual and collective creativity (Fisher & Amabile, 2009; Schulz & Geithner, 2014). Such freedom could also include the free choice of the toolkit. In groups inexperienced in design at early stages of modelling, however, the creators are easily overstrained by such degrees of freedom. Therefore continuity in the workshop organization and methodology provides space for the creative activity. The workshop moderation should take such aspects into account. Apart from the methodological guidance, openness about the results and a potential adaptation of the workshop direction is important. Although moderation in our two workshops orientates along a roadmap, facilitators should be open to radically different demands, for example if participants prefer to use different tools or to switch the tasks.

As the early stage of ideation is only one part of innovation, the question arises of how to switch to later stages of innovation processes. Although the playful modelling with toolkits is from our current view not adequate for concrete design and development, the models created are means for communicating results of the ideation process. The model(s) can be a platform for further discussion of various issues such as feasibility, financing or potential user acceptance. Such model use, however, requires a thorough documentation of the model in combination with the story told, e.g. through videotaping.

This type of research is explorative and therefore intends to introduce the conceptualization and first experiences in application. That is why we wanted to provide patterns of behaviour and effects to provide a first basis

for future research in the field. To provide more detailed data, further empirical cases are needed. Particularly variations in settings, groups of participants and toolkits need to be included in such research. Furthermore, we suggest as future research topics in the field the exploration into how such workshops can be integrated and connected to a whole innovation process.

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