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# Co-Designing Innovation in Fast-Paced Environments: Organizational Challenges and Implications

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*Carried out in a large multinational airline company, this study advances the understanding of the organizational challenges and implications of introducing co-design in fast-paced environments defined by agile development methods. The research is carried out in the framework of three interconnected organizational challenges of co-design's implementation: methods, mindset and behaviour. The results were collected from five joint co-creation sessions with employees of the company and six sessions with passengers, carried out while they are waiting for their flights. As an overall approach action research was undertaken. The collected insights advanced our understanding of creating innovation infrastructure that is based on co-design principles. Furthermore, the insights support constructs that can negate some of the major challenges attributed to multidisciplinary collaboration in fast-paced contexts. Last but not least, although specifically designed for this context, the results discussed in this paper can be translated to contexts similar to this one and thus advance the understanding of how behaviour, mindset and methods can support the implementation of co-design in fast-paced environments.*

**Keywords:** co-design, fast-paced environments, methods, behaviour, mindset

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## Introduction

The goal of this research is to advance the understanding of co-design's role (Sanders & Stappers, 2008) in fast-paced environments defined by agile methods. Co-design's emphasis on long-term active user participation through quick iterations makes it well-equipped for such contexts. To our knowledge, although it is primarily developed and studied in and for the context of large companies that allow time for co-designing with users, little research has been carried out on using it within the framework of agile. Therefore, we focus on advancing this understanding in a large multinational airline company that uses agile methods to accelerate their innovation process.

The foundation of this research is based on three organizational challenges of co-design's implementation that we consider to be interconnected and amplifying each other: methods, mindset and behaviour. First, co-design *methods* (Sanders et al., 2010) due to their different view on users' role (Sanders & Stappers, 2008) require hands-on means to enable stakeholders to actively involve users. Users can become part of the design team as 'expert of their experiences', but they must be given appropriate tools to do so (Sleeswijk Visser et al. 2005). Second, according to Sanders & Stappers (2008), co-design's fundamental belief that all people are creative and experts of their own experiences is not commonly accepted in business. This implies that making employees susceptible to co-design and its characteristics involves creating new *mindset* that can facilitate it. Last but not least, enabling participants to perform the desired *behaviour* (using co-design methods and mindset) should be facilitated. Ultimately, we believe that these three factors can aid the design of a new innovation infrastructure. Therefore, the question this research aims to answer is: *What are the challenges and implications of using co-design in fast-paced environments to build an innovation infrastructure focusing on participatory methods, mindset and behaviour?*

This paper is structured as follows. First, details are provided on the context of the qualitative methods employed: co-creation sessions followed by unstructured interviews taking place in consecutive iterations. Second, the findings are presented in the iterative structure, in which they took place. Drawing on the literature and the insights gathered from the research, challenges and possible implications of co-design for the new innovation infrastructure are reflected on. The paper concludes by

addressing the theoretical and managerial contributions of the study and offers directions for future research.

## **Context**

This research aims to gain better understanding of the organizational challenges and implications of introducing co-design to a new department of an airline company. Created as a joint project between the firm and the local airport in September, 2015, the department is still in its initial development. Currently there are four full-time and eleven part-time members. In this paper we refer to them as ‘the team’. The goal of the department is to become a platform that enables the company to generate new ideas efficiently and effectively and test them for feasibility and desirability. It also aims to empower each employee within the company to become a pioneer. The levels of envisioned collaborations to achieve these are threefold: B2B (with the local airport and other stakeholders), B2C (with passengers) and B2E (with employees of the airline and the airport). However, this study could focus only on the latter two due to the early stages of development of the department.

The process is carried out by the multidisciplinary team of non-designers in quick two-week iterations, following a new innovation approach based on agile principles (Martin, 2003) and using Scrum as their project management tool. The process is defined by three stages: discovery (analysing quantitative data), ideation (idea generation) and building & testing (minimal viable products (MVP) with passengers/employees in real time). The projects they are working on are based on two ambitions aimed at optimizing the company performance in processes connected to both passengers and employees.

One of the biggest problems is the almost singular focus on building and testing due to external pressure to perform, which led to many carried out tests and little utilization of the gathered insights. In addition, learning is limited, causing the team to experience difficulties dealing with the overwhelming amount of insights. Furthermore, the fast-paced environment restricts the way passengers are involved in this process in several ways: 1) passengers have 15 minutes at best, 2) they are already in the context, 3) the noisy environment, 4) the multiple airport regulations and 5) cultural differences and language barriers. The context for co-designing, together with the limited understanding of users’ needs that are inherent in every

agile method (Kautz, 2011), made the team aware of the urge to implement changes in their current approach.

## Method

In co-design the user should have a prominent role in knowledge and concept development, and idea generation (Sanders & Stappers, 2008). However, this study focuses on involving employees primarily in the idea generation phase and exploring the role of passengers in the knowledge development phase as an initial step towards the design of an innovation infrastructure. Such focus was chosen since co-creation practiced at the early front end of the design development process has a positive, long-ranged impact (Sanders & Stappers, 2008). Therefore, this paper discusses five different consecutive joint co-creation sessions between employees of the company and the team and six sessions with passengers while they are waiting for their flights. During the former, the goal was to generate ideas to improve processes carried out by the employees. The researcher worked with a designer with co-design experience, who helped with the structure of the sessions and facilitated them. The researcher was actively involved in the preparation of the workshops and method selection, as well as how the methods were adapted to the context of the research. The facilitative role of the designer allowed the researcher to be an objective observer of the sessions. For the latter, the researcher took a facilitative role and in only one of them, she acted as an advisor to an external for the department team of user experience (UX) designers. In addition, three distinct roles for the participants in this study can be distinguished: the *designer and researcher* – facilitate sessions with passengers; *the designer* – facilitates joint co-creation session and *the team* – builds and test MVPs. The insights were collected within the framework of action research (Hult & Lennung, 1980) through the means of participant and fly on the wall observations, unstructured interviews with the designer, product owners, team members and passengers. This study adopted an iterative approach and the initially gained insights were clarified and confirmed by the subsequent interviews and observations as well as by further in-depth literature study. The results were collected in detailed blog entries functioning as a reflective research journal.

## **Results**

To answer our research question, first the optimal structure of the joint co-creation session was explored. Simultaneously, six explorative sessions with passengers were carried out to gain better understanding of the role they can play in the innovation infrastructure and how to involve them in the co-design process. However, this study covers partially the implementation of passengers' insights into the joint co-creation sessions (only in Session 2). Reflecting the iterative nature of the study, this section is structured as follows: first each session is explained and based on the gathered insights, both presumptions and supporting literature is identified that can explain our process of design.

### *Joint Co-Creation Sessions*

According to Sanders (2009), design research involves more than practicing its tools and techniques. The most critical is the mindset, “the established set of attitudes held by someone” through which the tools and techniques are used. It also shapes people's motivation (Murphy & Dweck, 2016). To reflect this notion in our research, we started communicating the co-design mindset to the team by explaining why it is important to involve users in the early stages of the ideation process as well as how to do so. The difficulty was in convincing them that they can use user insights to better understand the challenge and to support the ideation phase instead of relying solely on quantitative data. After several discussions, we agreed to pilot two sessions (one for each ambition) and see what benefits they might bring to the innovation process. After the generated outcomes, the team saw the benefits and thus three more joint co-creation sessions were carried out.

Each session had a different scope, eight participants (twelve in Session 1, ten in Session 4) and lasted four hours. As already mentioned, the focus of these sessions was on generating ideas, therefore the methods we used were a combination of traditional idea generation and participatory methods (Sanders et al., 2010). The participatory methods were positioned either in the beginning of the session or at its end. Furthermore, although the co-design mindset was new to each participant, we did not control for a specific preliminary mindset of the contributors. However, the team shares a growth mindset (Dweck, 2000) that seems to be beneficial for co-design due to its iterative nature. The only thing we explicitly did was to verbally encourage the participants to feel as experts.

## Joint Co-creation Sessions Overview

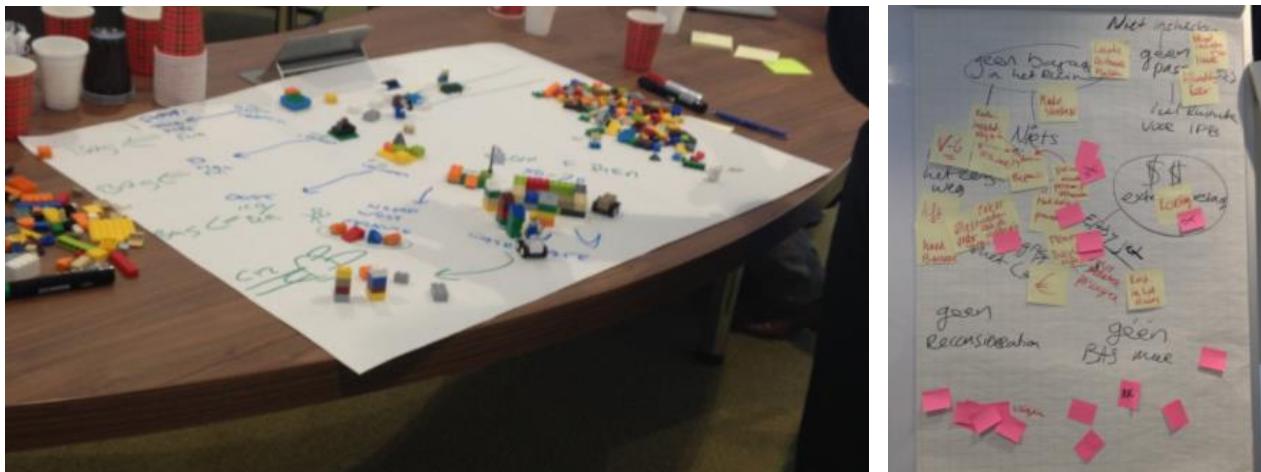
*Table 1 gives an overview on the carried out joint co-creation sessions discussing the initial presumptions, literature on which these presumptions are based, methods, results and insights. In the methods section the order of methods used in each session (participatory (PM) or ideation ones (IM)) is listed.*

S	Presumptions	Literature	Methods	Results	Insights
1	Clarity of instructions; Ambiguous goal; Mix participatory methods with traditional idea generation techniques	Factors influencing multidisciplinary collaboration;	IM - diverge using the methods “Worst Idea” – the whole team; IM - Converging (two phases) in 3 sub-teams – first write/draw out their ideas, PM – build the ideas with Lego	Depth of ideas while diverging; First stage of converging: each group made a bullet list; New ideas were criticized; Silent team members	Using Lego helped to visualise, detail and better explain the ideas; No shared understanding of the process; Silent team members due to a big group;
2	Start individually; Gradually move to bigger groups (groups of 4); Present insights from passengers will create a shared understanding of the process;	Factors influencing multidisciplinary collaboration;	PM - Present a mindmap of passengers' insights IM – diverging (individually); converging (2-phases): groups of 2 to combine their individual ideas; groups of 4 – make one final idea;	One of the groups drew (there was a designer in the team), the other – presented a list of features; All of the user insights were used; There was no discussion over what passengers want;	Using a template could've nudged them to draw; Once put in a group, the participants stopped drawing; The presented passengers' insights reduced unnecessary discussions;
3	Create a shared understanding; Use a simple template (timeline) to map the process; Make it as easy as	Shared mental models (Mumford et al., 2001); Follow the	PM - map the entire process; identify 3 hotspots (in 2 sub-teams). Done to prime participants for	A designer in one of teams suggested drawing out the passenger journey; Two	Using template works; Being told to select three hotspots helped

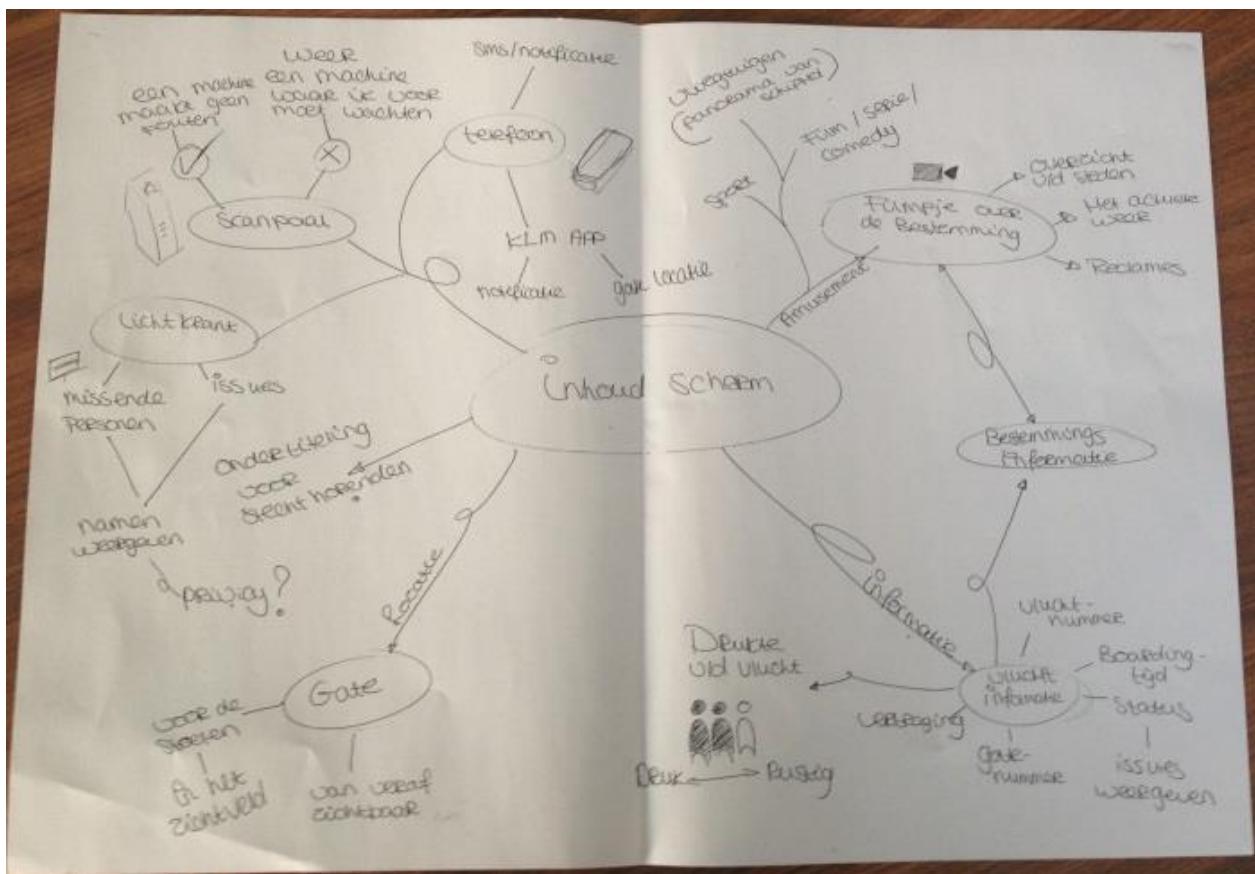
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	possible; Don't use design jargon language;	path of expression (Sanders & Stappers, 2014)	idea generation; IM – diverging and initial converging;	similar processes; Similar hotspots and ideas; The group of the designer drew, the other one didn't;	participants to cluster their ideas and provided focus when diverging; Achieving clarity is still a problem;
4	A follow-up of S3 Clear goal and focus; Use template; Creation of a Shared mental models ; Map the process as a team;	Co-design (Sanders & Stappers, 2008) Priming; Context mapping methods; Rubicon model; Fogg's matrix	Share insights from C3; PM - map the process as a team IM – diverging and initial converging (2 teams); PM – embody their ideas with the use of Lego and paper;	Similar ideas; Partial use of the template; Elaborated ideas with Lego; Shared understanding of the process;	The templates and directions should be clear; As the involved people were not designers, they felt conscious when they are asked to draw; Using Lego works very well;
5	A follow up of S4; Working individually will prevent similarity of ideas; Priming participants; Anonymity will encourage participants to draw; Shared mental models by sharing insights from previous session;	Inadvertent plagiarism (Sassenberg & Moskowitz, 2005); Context mapping methods (Sanders & Stappers, 2014)	PM – individually make notes; IM – individual diverging (generation of idea variation in 8 minutes); IM - Work out one idea (using the template); IM – group converge;	7 completely different ideas; The majority of the participants sketched their ideas;	Such structure can prevent inadvertent plagiarism; Participants sketch their ideas when working individually;

*Session 1 (S1) & Session 2 (S2)*



*Picture 1 Results from S1 (on the left – diverging phase; on the right – 3D idea mock-ups created with Lego)*



*Picture 2 Mindmap of the insights gathered from 2 context-mapping sessions with passengers (Magic Wand and Customer Journey)*

The main goal for S1 was to explore possible areas of interest for the given topic (improving the process of loading luggage into the plane) and to generate preliminary ideas. It served as a basis for S3, S4 and S5. On the

other hand, S2 had clear scope and goal – design content for screens that inform passengers about the actions they should take before boarding. S1 took place in the morning and S2 in the afternoon of the same day. The preparation for both of them was based on presumptions of the researcher stemming from a previously carried out study on optimizing multidisciplinary collaboration in fast-paced environments. Our focus areas were to establish clarity of expectations, tasks and goal for the session and to enable every team member to take equal participation. Establishing clarity is important since it can stimulate better cooperation and ensure team members' confidence in the direction of the project (Dewald, 2002). To achieve such, we asked the product owners to share their vision and goal for each session. To tackle the issue of equal participation, we formed small teams with equally distributed expertise. In addition, all of the choices we made were based and stemmed from the co-design mindset (Sanders & Stappers, 2014) we communicated in the beginning of each session.

Due to the fast-paced nature of the process, the participants had to go quickly through the initial stages of team development and start performing (Tuckman, 1965) in less than thirty minutes. This limitation defined the two insights that fuelled our further literature search. On the one hand, after the first workshop we saw that working in one big group during diverging prevented the majority of the people to participate in the discussion (or barely do so). Once we formed sub-teams, there were more interactions. Regardless, some team members were still silent. We changed the structure

of S2 to adapt the setting for this insight and we gradually grouped the team members to make sure all of them were actively involved. This proved to work well.

On the other hand, one of the biggest differences between these two sessions was that in S1 there was a lot of discussion about the process we were trying to improve, while in S2 the discussion was building on the passengers' insights



*Picture 3 Filled in template after the session. On the upper side the process is illustrated. On the lower one, three hotspots are identified and different ideas are generated for each one of them.*

collected prior to the case. According to Mumford, et al., (2001), an important variable in shaping team performance, especially when it comes to reaching common understanding, is the availability of shared mental models. Such are common knowledge structures possessed by the entire team (Cannon-Bowers, et al., 1993). They help team members to anticipate each other's reactions, adjust their behaviour accordingly, and evaluate potential alternative courses of action (Klimoski & Mohammed, 1994). In fact, Mumford, et al. (2001) argues that the need for shared mental models may be particularly important when groups are asked to work on creative problem solving tasks. Their availability helps to generate relevant ideas and to evaluate them.

### *Session 3 (S3)*

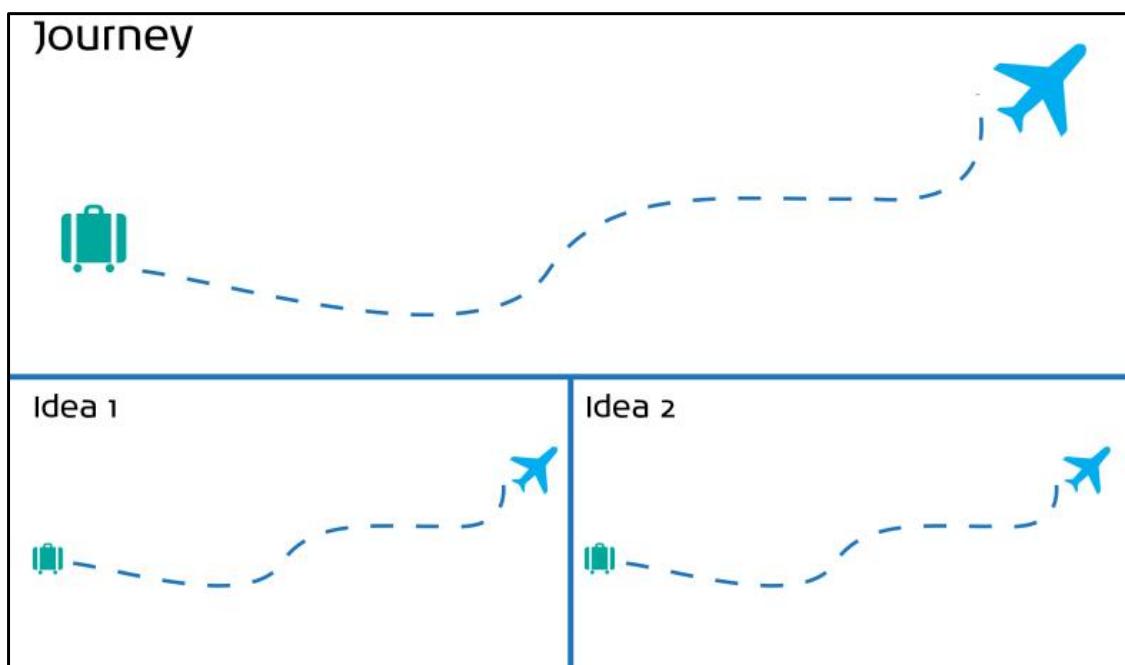
Based on the learnings from the previous cases, the focus for S3 was to understand how to create a shared mental model. We tried to do that by inviting data experts who have a clear overview on the process the participants were generating ideas for. Once the expert explained the process, each one of the two sub-teams mapped it out by implementing their own insights. The action of mapping the process together allowed us to incorporate the concept of Path of Expression (Sanders & Stappers, 2014). This created a strong base for idea generation. Furthermore, we made our methods and tools explicit by using simple templates that provided cues of desired behaviour. It worked well, but the generated ideas by the sub-groups were very similar to each other. In addition, in the diverging phase there was too much depth and not enough breadth of ideas.

One of the major learnings from this session is first of all, discussing the process as a team and mapping it on a template significantly reduced process discussions (shared mental model was created) during ideation. The template can also be seen as a form of 2D mapping (Sanders et al, 2010) that advanced the understanding and facilitated the ability of the participants to perform the behaviour. This insights is in line with what Heckhausen & Gollwitzer, (1987) defined as the Rubicon model of action phases. The model suggests that the course of action can be segmented into four consecutive phases: 1) the Predecision phase where preferences are set, 2) the Preaction phase, during which the execution of goal-directed action has to be planned by deciding on when, where, and how to act, 3) the Action phase is bringing the initiated goal-directed action to a successful end and 4) the Postaction phase during which the individual decides whether the

desired goal has been achieved or whether further striving is needed. According to Gollwitzer, (2012), however, in order an action to occur, one should have sufficient level of motivation (Predecision) and good understanding of the how, when and where (Preaction). These two phases are in line with the behaviour framework defined by Fogg (2009). According to him, behaviour is a product of 1) sufficient motivation, 2) ability to perform the behaviour, and 3) behaviour trigger. All three factors must be present at the same instant in order behaviour to occur. However, Fogg (2009) claims that increasing motivation is not always the solution. Instead, the focus should be on increasing the ability (making the behaviour simpler) and designing the right facilitative trigger for that. Therefore, we focused on creating such triggers by designing simple templates and using non-jargon language (not using the words “design” or “visualization”, as we thought this might intimidate the participants who were not designers). In addition, we controlled for motivation (by inviting people who have sufficient amount of it) and instead, focused on facilitating their ability.

## *Session 4 (S4)*

### **Template**



*Figure 1 A template for process mapping and idea generation*

To implement the collected insights, during S4 we communicated the results from S3, but this time we asked the entire team to map the process together. Once this was done, we divided them in two sub-groups. To encourage breadth, we asked the participants to generate ideas for each step of the process they elaborated on. However, the participants did not follow the instructions, as the amount of work seemed to be too overwhelming. Furthermore, the template was generic and did not suggest that they should do that.

Similar to S3, the ideas generated by both of the groups resembled each other. An explanation to this is the theory of inadvertent plagiarism discussed by Sassenberg & Moskowitz, (2005). According to them, such plagiarism occurs because examples are highly accessible during idea generation and this activates knowledge impacts on the generated ideas without awareness (Marsh, et al., 1999) and thus beyond intentional control. In addition, Sassenberg & Moskowitz, (2005) argue that thinking differently by intention is not possible. However, activating the processing rule to think differently by priming can successfully help to get around the predominantly activated knowledge. In fact, Sassenberg & Moskowitz, (2005) claim that participants primed with either the concept “creativity” or reminded of their earlier success in being creative were more able to overcome inadvertent plagiarism.

Last but not least, during this case, we found Lego to be a particularly useful tool as it allowed the team members to make their ideas tangible quickly and thus provided new opportunities for discussions. We saw similar outcomes during S1 where the use of Lego was helpful for the participants to translate their ideas from bullet points to tangible constructs. In both sessions it sped up the discussion since significantly less clarification of what everyone meant was needed. Thus, the participants managed to reach consensus rather quickly.

## *Session 5 (S5)*

To prime the participants, we started the session with a game of combining seemingly unrelated objects in creative ways. This introduced the notion of converging to the participants. To eliminate the influence of inadvertent plagiarism, the team did not map the process together, but instead we showed the generated insights from the previous sessions. This also served the purpose of understanding whether a shared mental model can be created without the team mapping the process first. Then we asked

them to distil the most important insights individually and base their idea generation on them. Furthermore, we reassured them that the ideas they generate are anonymous. This action was triggered by S2 where we noticed that once put in teams the participants stopped sketching out their ideas.

The individual idea generation stage of the session went smoothly and resulted in eight very different ideas. In addition, the majority of the team members sketched out their ideas. The communication of previous insights served well to create a shared understanding of the problem. Although this session can serve as a proof that when working individually participants create different ideas, the optimal balance between individual and team work that positively affects behaviour should be further investigated. The stage of team development during which a shared mental model should be established needs further clarification, too.

## *Sessions with Passengers*

### **Session Overview**



*Figure 2 An overview of the carried out sessions and our goals in each one of them*



*Picture 5 Photos from the sessions with passengers (from left to right: Lego session, brainwriting session and filled in template of the second customer journey session).*

As already mentioned, next to the sessions with employees, we carried out explorative sessions with passengers at the gates to find the optimal

role for their insights in the innovation infrastructure. Due to the already discussed limitations, we had to adapt the participatory methods we used.

## Sessions Description

Table 2 discusses the learnings and activities during each session.

	Activities	Learnings
1	Use Lego to build the perfect waiting area	In less than 2 hours, 10 passengers joined and built their ideal waiting environment with Lego. Although at first it seemed silly to them to play with Lego, once we reassured them that there's no way to make a mistake and everything they do is valuable, they all built their ideal environments. However, not enough time to carry out a short interview with them
2	Brainwriting method to generate ideas for the perfect waiting area with a group of 6 passengers;	Having a small focus group for 15 minutes works nicely, not enough time to talk to each one of them, but when they present their ideas, the researcher could ask questions. More difficult to arrange.
3	Magic Wand to generate ideas for the way information should be communicated on the screens at the gate;	It works nicely and people give a lot of different ideas. However, most of the time this is done with one passenger and thus it takes less than 2 to 3 minutes. It can be used as a nice start to a short unstructured qualitative interview.
4	Journey mapping with photos - map their journey from home to the airplane	Use of ambiguous picture stimuli and no template works well. Majority of the people, however, use 3 to 4 photos to describe their journey and they never write.
5	Journey Mapping with photos and a simple template	The use of the simple timeline (Picture 5 – on the right) made the format of their journeys similar, but they still used 3 to 4 photos. However, they wrote down a few words when they were asked to identify which moments they enjoyed and which they didn't. The path of expression didn't work as envisioned.
6	User testing carried out by an external to the department team of UX designers	Once the researcher carried out the first interview with a passenger, one of the external designers did the same with 3 other passengers.

The setup of the sessions was simple – a table, bi-lingual posters inviting the passengers to share their ideas with us and branding elements from the airline all located at three gates in the airport. This simple setup worked very well and each time in a period of two hours approximately 10 people joined. The first three sessions were aimed at understanding how the passengers

should be approached and how the methods should be adapted to the context. During them we focused on idea generation and tried to understand whether reverse path of expression (start with the future, instead with now) can be used in less than 15 minutes. While the passengers were generating their ideas, we made use of unstructured qualitative interviews to gain insights into their latent and tacit needs. However, the collected data is shallow (Braun & Clarke, 2013).

Therefore, during the following two sessions we decided to make use of the path of expression as described by Sanders & Stappers (2014). There was no significant difference between using template or not during the journey mapping. The template prescribed how passengers should position their journey and possibly limited their ways of expression. Due to the little time available, however, it served its purpose. Furthermore, we continuously encouraged and reassured the passengers in the value of their ideas. We also made use of qualitative interview techniques (particularly presupposition questions) as suggested by Patton (2002). However, using the path of expression did not work as envisioned. The passengers managed to map their journey, explain why and how they expressed it through photos, but they did not manage to translate that into ideas.

In the session, in which the researcher had an advisory role (6), she had to advise external to the team UX designers on how to test their website with passengers in real time. The designers used eye-tracking software for their test and each passenger had to go through a use-case scenario. Such methods are typical for user-centred design, which is significantly different from co-design in regards to the role of users (Sanders & Stappers, 2008). Thus, at first she let the designers do it on their own, without interfering in their process. However, they experienced troubles with involving passengers. Hence, to accommodate for the differences between the two mindsets and test whether co-design can be applied in such instances, the researcher approached one passenger and asked him to go through the test scenario. In addition she also carried out a short unstructured interview with him. Subsequently, one of the UX designers applied the same technique with three other passengers, supporting the notion of vicarious learning (Gioia & Manz, 1985) and possibly the ease for designers to switch between the two different mindsets.

## Discussion

These sessions provide a good starting point for better understanding of the challenges and implications of using co-design in fast-paced environments such as the one described in this paper are. The collected results distinguish several. First of all, the carried out sessions with employees (and to an extent with passengers) confirm that to achieve the desired behaviour, facilitative triggers (e.g. a simple timeline reduced the amount of questions the facilitator received), clarity and a shared mental model have to be created. All of the triggers we used worked well and were enhanced by the use of clear guidelines, communication and no jargon language. However, the product owners still have difficulties to identify a clear and manageable goal for each session.

Regarding the shared mental model, the carried out sessions show that if created in the beginning by all participants, the focus during the idea generation phase is much clearer. However, the generated ideas are very similar and resemble already existing solutions within the company. The same results were observed during the sessions consecutive to the ones described in this article. Two possible explanations exist. On the one hand, according to Sassenberg & Moskowitz, (2005) such similarity occurs because examples are highly accessible during idea generation. Therefore, a solution could be not to share the previously created ideas with the participant. Explaining the process and asking each team member individually to map the most important steps also works (S5), although this might not be the case if the process is not well thought-trough yet. A possible solution to this problem might be to ask the team to map the process together and then generate ideas individually. On the other hand, the similarity of generated ideas might stem from the fact that the majority of the team members in each session work on the operations we were trying to improve and as a result, our multidisciplinary teams lacked the necessary level of heterogeneity. Hence, for them it was difficult to have a bird-eye view on their own process and come up with ideas that are not already in practice. Therefore, the results from both the sessions discussed in this article and the consecutive ones suggest that working with employees involved in the process to be optimized are better suited for the explorative phase. During the idea generation phase, we should work with teams, in which only one or two members come from the operation to be optimised.

Second, one of the main focuses of this study was on understanding how to create optimal conditions for the joint co-creation sessions. This provided

insights on how to better prepare such sessions by enabling participants to perform the desired behaviour. In addition, these sessions showed that co-design mindset is not restricted to the use of PM, but it can also accommodate IM. What worked well in our case was to position the PMs in the beginning (to prime and understand) and in the end (to understand and generate ideas) of the sessions. For instance, using 3D mock-ups (Lego) served as a boundary object and provided the participants with a means to express their ideas clearly and thus a consensus was reached significantly faster than without one.

Third, since the sessions carried out with passengers had explorative nature, further investigation on passengers' role and the possibilities of involving them into the co-design process is needed. In addition, although the path of expression worked well in the joint co-creation sessions, this was not the case with passengers. If the order is shifted and instead with now, the start is set with future, the passengers can go through all of the stages. However, the collected data is shallow. In addition, a structure for capturing the insights should be designed. According to Sleeswijk Visser et al. (2007), such structure should incorporate 3 key qualities: 1) support engagement, 2) provide inspiration and 3) enhance empathy. Furthermore, we still have difficulties implementing passengers' insights in the innovation process (except in S2) due to the already discussed considerations. Hence, further investigation is needed.

Fourth, although the team begins to notice the benefits of involving users in the innovation process (either passengers or employees), they still use quantitative data to define areas for exploration. The fact that the team is not well-equipped to deal with the qualitative nature of such research and to analyse the collected data gives a partial explanation. Regardless, there is already a noticeable shift within the team toward the mindset of co-design as the department is in its early stages of development and thus there is a lot of room for agility and desire to learn. Furthermore, they share a growth mindset (Dweck, 2000) that seems to be beneficial for co-design due to its iterative nature. Thus, further investigation is needed on how such structure can be designed and implemented.

Last but not least, all of these sessions were facilitated either by the researcher or the designer. Therefore, further research is needed on how the team could perform these actions on their own and what the implications of this on the innovation infrastructure are. In addition, the third level of collaboration (B2B) still needs to be researched in depth.

## Conclusion

This paper aimed to answer the following question: *What are the challenges and implications of using co-design in fast-paced environments to build an innovation infrastructure focusing on participatory methods, mindset and behaviour?* The generated results show that indeed these three factors are interconnected and amplify each other. In addition, they fit well in a culture with a predominantly growth mindset. Although this study focused primarily on idea generation phase, it provided valuable insights on the dynamics of co-creation sessions in which design plays a facilitative role. Furthermore, it advanced our understanding of involving passengers in co-design activities in less than 15 minutes. Another important insight is that a combination between a facilitative trigger, a shared mental model and clarity of communication, tasks and goals can negate some of the major challenges attributed to multidisciplinary collaboration in fast-paced contexts. In addition, our results show that the co-design mindset can easily accommodate IMs.

This study identifies the specific environmental and organizational conditions under which co-design enables creating meaningful innovations within fast-paced environments in a mature company. Although the way the innovation infrastructure should be designed needs further research, this study provides a good foundation for understanding how joint co-creation sessions with employees (possibly with other companies and passengers) should be structured and facilitated.

Last but not least, although specifically designed for this context, the results discussed in this paper can be translated to contexts similar to this one and thus advance the understanding of how behaviour, mindset and methods can support the implementation of co-design in fast-paced environments.

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## Building Design-led Ambidexterity in Big Companies

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Organisational ambidexterity is considered a crucial capability for long term firm survival and development. However, adopting and successfully implementing it presents multiple challenges. Furthermore, despite being increasingly popular in the last two decades, the role design can play in achieving it is notably missing from the discussion. This paper analyses the attempts to accelerate the innovation pace of two large international companies in the consumer electronics and healthcare and airline industries. Both attempt to combine design and agile elements in fast-paced environments, while working in multidisciplinary teams early in the NPD process. However, one is guided by designers, the other by people with a background in operational functions. As such, they provide a good foundation to study design's role and its implications in achieving ambidexterity in two large international companies. The collected insights helped us to define a new form of ambidexterity and devise a model for building ambidextrous organisations through design.

keywords: design-led ambidexterity, capabilities, Lighthouse Model

### Introduction

In today's turbulent business environment, organisational ambidexterity is considered a crucial capability for long term firm survival and development (Oehmichen et al., 2016). Defined as "the ability to simultaneously pursue both incremental and discontinuous innovation... hosting multiple contradictory structures, processes, and cultures within the same firm" (Tushman & O'Reilly, 1996), organisational ambidexterity allows companies to be aligned and efficient in order to manage current business demands and adapt to



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environmental changes (Mom et al., 2015). As such, the construct has become increasingly popular in the last two decades. Since its introduction in 1996, it has been addressed in hundreds of empirical studies, theory papers, special issues of journals devoted to the topic (Academy of Management, August, 2006; Organization Science, July-August, 2009), review articles and a large number of symposia at professional meetings (O'Reilly & Tushman, 2013). In fact, the articles addressing "organizational ambidexterity" in Google Scholar for 2016 only are 894, which implies it has a significant presence in the academic context.

Early studies on ambidexterity focus on its outcomes. More recent ones have shifted to its antecedents at industries, business units and senior manager level and its implementation in companies (Oehmichen et al., 2016). However, to our knowledge, notably absent from this discussion is the role of design and its influence on the construct. Therefore, the purpose of this paper is to advance the understanding in this field and to discern how design can help in building ambidextrous organisations. To do so, we discuss the innovation efforts of two big international companies. The first is one of the largest manufacturing firms in the world in the area of consumer electronics, lighting and healthcare. Their new innovation approach, X1, is created and led by the design department of the firm and has three main pillars: co-creation, multidisciplinary teams and reflection. The approach was established as an attempt to accelerate the innovation pace of the company. It ensures, through fast iterations, that ideas are feasible, viable and desirable early in the New Product Development (NPD) process. In addition, the firm has both a long-standing tradition with design and a large presence of designers in-house. The second is one of the oldest commercial airlines in the world. Their new innovation effort, X2, was created to check ideas' feasibility and desirability early in the NPD and thus accelerate the firm's pace of innovation. Based on principles of Lean Startup (LS) (Ries, 2011), Scrum (Schwaber & Beedle, 2002) and Design Thinking (Brown, 2008), the department was established together with the local airport a year ago. The basic premise of X2 is to conjure up ideas, prototype them in a matter of days and test as soon as possible with real passengers and employees either at the Departure hall, one of the three dedicated gates at the airport or during flights. However, unlike X1, neither the company nor the team has affinity with design (yet) and design skills were brought in by the first author of the paper.

This paper is structured as follows: first, the existing literature on different types of ambidexterity is reviewed. In addition, design's possible role is briefly reviewed, as well as three factors challenging its implementation. Then, the methodology of the research and the collected results are described. This is followed by a discussion of the results, concluded in a new model for achieving ambidextrous organisations through design. Last but not least, the article discusses possible limitations of the study and indications for future research.

## **Organisational Ambidexterity according to Literature**

To achieve ambidexterity organisations have to undergo both exploration and exploitation activities (March, 1991). On the one hand, exploration is characterised by search, experimentation, play, flexibility and investigation, and can result in new knowledge (Tabeau et al., 2016). This new knowledge is essential for developing radically new solutions (Atuahene-Gima, 2005) and achieving [brand] relevance (Beverland et al., 2015).

However, its results are often distant in time, uncertain and ambiguously connected to the current context. As such, exploration is associated with looser controls and structures, more flexible processes and search behaviours (Duncan, 1976). Hence, the exploration subunits are organized to experiment and improvise. Exploitation, on the other hand, allows the firm to improve [brand] consistency (Beverland et al., 2015) and already present knowledge by performing “refinement, choice, production, efficiency, selection, implementation and execution” (Tabeau et al., 2016). Thus, it is associated with tight controls, structures and culture, and disciplined processes, carried out by units organized to be efficient (March, 1991). These activities improve present returns, which are relatively certain and closely related to the organisation’s current actions (March, 1991). Thus, they are more likely to contribute to cost efficiency, profit gains and incremental innovation (O’Cass et al., 2014). Hence, there is an existing bias in companies favouring exploitation over exploration since it provides greater certainty of short-term success (O’Conor, 2008). Due to the different roles and influences on innovation outcomes (Tabeau et al., 2016) of the two activities, it’s imperative that the tension between them is managed well (March, 1991) so balance can be achieved. Such balance is both feasible and beneficial to organizational performance (Jansen et al., 2009).

O'Reilly & Tushman, (2013) and Chebbi et al. (2015) define three types of organisational ambidexterity in regards to the interaction between exploration and exploitation. The first one, sequential, is a form of temporal separation. This type of ambidexterity is more useful in stable, slower moving environments. It occurs when companies shift from exploitation to exploration and vice versa by realigning their structures and processes to reflect the context they are in. Hence, the firm goes through periods of centralization to enhance cost efficiencies and decentralization to emphasize innovations (Raisch, 2008). Some scholars claim that overall decentralization followed by reintegration generates the highest organizational performance (O'Reilly & Tushman, 2013). Therefore, being able to develop process mechanisms and relationships that can enable the switch between exploration and exploitation is crucial with sequential ambidexterity (Wang & Rafiq, 2012).

The second is simultaneous or structural ambidexterity. Achieved either through spatial separation or parallel structures, it requires autonomous, structurally separated units for exploration and exploitation. Each unit has its own alignment of people, structure, processes and cultures managed in its unique way (Duncan, 1976). However, the spatial separation creates physical boundaries between the exploration and exploitation activities (Benner & Tushman, 2003). It also protects the former from the firm's existing inertia and thus allows to achieve both simultaneously (Jansen et al., 2009). Next to this, parallel structures can be used also by defining primary and secondary structures to carry out key tasks (Raisch & Birkinshaw, 2008). Primary structures are used for incremental innovation and for maintaining stability, while secondary structures such as project teams and networks are focused on exploratory activities (Raisch & Birkinshaw, 2008). Both mechanisms enable each unit to focus on its tasks more effectively (McDonough & Leifer, 1983). For this type of ambidexterity, integration and sharing knowledge and resources among the units is needed (Burgers et al., 2009) to ensure sustained growth (Durisin & Todorova, 2012). In order for the results of each activity to be well-integrated, they should be held together by a common strategic intent and dedicated leadership (O'Reilly & Tushman, 2013).

Both sequential and structural ambidexterity attempt to solve the exploration-exploitation tension through structural means. Contextual ambidexterity (Gibson & Birkinshaw, 2004), solves it on individual level. Such is achieved by creating a set of processes or systems,

which allow and support each individual to make her own judgement in regards to dividing her time between conflicting demands for alignment and adaptability. The ability to balance exploration and exploitation depends on the organisational context, characterized by “an interaction of stretch, discipline, and trust” and requires a “supportive organizational context” that “encourages individuals to make their own judgments”. Contextual ambidexterity can be clearly differentiated from the others in three ways. First, the emphasis is on individuals making the adjustment rather than on units. Second, ambidexterity is achieved when individuals agree that their unit is aligned and adaptable. Third, the organizational systems and processes are never concretely specified. According to O'Reilly & Tushman (2013), the most common example of such is workers being able to perform routine tasks (exploitation) but also continuously to optimise their jobs (exploration). This type, however, does not address the simultaneous and systematic conduct of exploration and exploitation (Kauppila, 2010).

As already mentioned, ambidexterity's implementation, regardless of the type, continues to be challenging (Oehmichen et al., 2016). This calls for a different approach to it. Design and its role in creating ambidextrous organisational structures has not been examined yet. Nevertheless, we believe it to be a perfect match to guide firms in both their explorative and exploitative activities due to its proficiency in dealing with uncertainty and wicked-problems (Tabeau et al., 2016) and its user-centredness respectively. Furthermore, despite the documented challenges of implementing it in big companies, the popularity of design-based approaches such as Design Thinking and Design Sprint (Knapp et al., 2016) continues to grow (Carlgren et al., 2016). Moreover, relatively little is known of the specific mechanisms through which the use of design might improve innovation outcomes (Liedtka, 2015).

We base our research on three organizational challenges of design's implementation we consider interconnected and amplifying each other: methods, mindset and infrastructure. First, due to their iterative nature and requirement of hands-on means (Sanders et al., 2010), design methods clash with the linear exploitation processes of a firm (Carlgren et al., 2016). Second, the existing mindset should be considered since radical innovation is only possible if the company is able to break out of the existing (old) mindsets and routines (Carlgren et al., 2016). Such mindsets and the inability to unlearn are some of the major barriers to design's adoption (Assink, 2006) as well as to that of change processes within organizations (Lorsch, 1986). Finally, an infrastructure that allows for such methods and mindset has to be built. Providing collaborative structures and processes and connecting innovations with existing businesses is crucial for sustained innovation (Dougherty & Hardy, 1996). Furthermore, large organizations struggle with a lack of appropriate processes and/or routines for radical innovation (Carlgren et al., 2016). Therefore, our research is focused on better understanding the role of design and these three factors in achieving ambidexterity.

## Method

This paper reports the result of an action research study in the already discussed two firms. The first author was embedded in both studies and acted as a participant in developing X1 and an action researcher in X2. The duration of the research in each entity and the freedom the researcher had differ. On the one hand, the research on X1 lasted 5 months. The methods, mindset and infrastructure were already established and the

researcher had no influence on their further development. The results of this are reported in Stoimenova et al. (2015). On the other hand, the research on X2 lasted for 10 months. The role of the researcher was to introduce and implement fundamental principles and values of design in their largely based on LS and Scrum way of working. As such she had the opportunity to influence the selection of methods, the formation of the desired mindset and the development of the infrastructure. The efforts on developing these are reported in Stoimenova, et al. (2016). In addition, interviews with the key stakeholders of both X1 and X2 were carried out and analysed in accordance with the Grounded Theory Method (Charmaz, 2008). The two studies will be discussed at the stage they were in while the researcher was embedded in them, not their further development, as there was no continued involvement.

## **Results**

As already mentioned, the two companies are discussed on the basis of methods, mindset and infrastructure. The notion of ambidexterity is not used as none of the firms deliberately tried to achieve such. In Table 1 there is an overview on each of these factors paired with quotes, illustrating the findings.

### *Methods*

Both X1 and X2 make use of participatory and traditional design methods. On the one hand, X1 uses design methods of discovery, ideation and rapid prototyping, carried out in quick iterations and in co-creation with other departments of the firm. To achieve that, they use tools such as sketches, models, demonstrators and videos to clearly visualize the idea and then test it with users. The approach is sped up with 3-to-5-day workshops resembling sprints. On the other, X2 uses ideation techniques and methods typical for co-design (with either their employees or passengers). However, their main emphasis and guidance comes from Scrum and LS and thus, they make use of methods typical for these approaches such as hypotheses testing, sprints and customer development (Blank, 2006).

### *Mindset*

Both approaches receive executive support, but team members in X2 and participants in X1 and X2 face difficulties as the way of working of each approach is very different than the one in the rest of the company. Furthermore, the approaches' core teams are selected to have slightly different mindsets. On the one hand, the team members of X1 should be able to think on a more conceptual and abstract level and in the same time should "really master a certain aspect". On the other hand, the team members of X2 are "not people who like to keep talking or thinking about what can be but... think 'let's do it'". In addition, stemming from the design methods they use, X1 and X2 have a different degree of exploratory mindset. Due to their background in design, the X1 team exhibits a mindset with an emphasis on search and exploration, while the X2 team's mindset is still shaping. Regardless, in the course of this research, there was a clear shift in X2 towards mindset that allows a certain degree of exploration and inclusion of users' ideas. Last but not least, each team mainly relies either on qualitative (X1) or quantitative (X2) data, which also affects accordingly their (initial) mindsets.

### *Infrastructure*

As seen from Table 1, there are both similarities and differences between the two. First of all, the duration of X1 project varies from 3 days to 3 months, while X2 works in sprints of 2 weeks without a set duration for a project. The projects of X2 are in accordance with

Table 1 Results Overview

X1			
Methods	Quotes	Methods	Quotes
<p>Co-design methods; Rely on user research upfront; Rapid prototyping methods; Regular user testing; Design workshops from 3 to 5 days;</p>	<p><i>“... we had the walls covered with brown paper and tried to externalize all the time, just draw continuously, write down everything they said continuously and it’s completely trivial, but that really helped them to structure their thoughts.”</i></p> <p><i>“Getting the context known and [establish] shared knowledge among [people] you’ve never met before..., so everybody knows what the context is, who are we dealing with, what the region is, what the issues are...”</i></p> <p><i>“...make people enthusiastic to create things, because a lot of people are just used to write mails, PowerPoints, Excels ... and be sure that you’ve done some field research – consumers and internal stakeholders”</i></p> <p><i>“They have to understand what is the goal, you want to define valuable value proposition.”</i></p>	<p>Co-design methods; Following the principles of LS and using Scrum as a project management tool; Minimal viable product (MVP) building; User testing through qualitative and quantitative data; 5-day design sprints;</p>	<p><i>“We give ourselves the room to really try to understand the problem... and not jumping to conclusions and we also involve others to do that...but the focus also lies on validating hypotheses.”</i></p> <p><i>“We work with learning milestones, we really make our learnings explicit and every learning leads to adjustment or an ideation session or [quantitative] research. And eventually when the learning dries up... you probably have something that works and we validate it with data.”</i></p> <p><i>“You have all those methods and ways of ideations and I don’t know if this is design... but we definitely use the tools to come up with ideas...”</i></p> <p><i>“But if we already have an idea, maybe not involve the user [upfront], but just go and do it with the users and get some speed and learnings as soon as possible... but I believe you still need research upfront.”</i></p>

Mindset	Quotes	Mindset	Quotes
<p><i>Team:</i> the team of designers has exploratory mindset;</p> <p>Presenting themselves as non-experts, not designers;</p> <p>Rely on user research;</p> <p>Doers who are able to think conceptually;</p> <p><i>Company:</i> difficult to convince other departments;</p> <p>Requires paradigm shift;</p> <p>Executive support;</p>	<p><i>"They [the team] have to be able to think on a ... conceptual level, abstract level.... open-minded and ... they should have clear opinion but not be forceful. They should not be such strong characters that they blow others away in a meeting... They should be able to listen to other people as well and be knowledgeable – they should really master a certain aspect."</i></p> <p><i>"So what I try to do is not playing the designer in the beginning. Then I'm neutral ... and I'm not protecting the design community or any other program. It's just – you have some room to facilitate this process. And this works quite disarming."</i></p> <p><i>"But for some rational people... who think about step by step, A to B or A to D via B and C and not M or L and we are actually telling: I can define B but I cannot define C, we will find out – that's not comfortable."</i></p> <p><i>"... for some people feels uncomfortable, even annoying that you do it again and again and again."</i></p> <p><i>"It's against some people's paradigm that you cannot make prototypes if you have just started; it's impossible:</i></p>	<p><i>Team:</i> Development in their mindset from <i>"we already have the idea, why waste time"</i> to mindset favouring a certain degree of exploration;</p> <p>Rely on quantitative data;</p> <p>Doers;</p> <p><i>Company:</i> difficult to convince other departments;</p> <p>Requires paradigm shift;</p> <p>Executive support;</p>	<p><i>"I'm looking for people who are emotionally very strong, who dare, who really want to get results... not people who like to keep talking or thinking about what can be but really people who think let's do it, combined also with that you can kill your darlings very quickly ... we don't have the people who dare to dream like that and who dare to do it."</i></p> <p><i>"... we don't know what the right solutions are, so we need to give ourselves the room to explore and it's pretty difficult because if we tend to just explore without a focus or a reason why, we tend to stay there too long."</i></p> <p><i>"So basically, it's [convincing other departments] about trust and about politics, but the trust is the most important thing."</i></p> <p><i>"The biggest change we've made in the past 2 months, we got [executive] support and now we have the confidence we're allowed to explore. And because we have that, we have more room to think and use [design] methods..."</i></p> <p><i>"What you see right now every department has their own goal, and this is strange as we as a company</i></p>

Infrastructure	Quotes	Infrastructure	Quotes
<p>Led by designers in the role of project lead and/or facilitators;</p> <p>Strong emphasis on exploration;</p> <p>Each project lasts up to 3 months and makes use of regular workshops;</p> <p>The project lead coordinates the team, which meets only when enough input is generated;</p> <p>Different teams for each project</p> <p>Using multidisciplinary teams (from all relevant departments of the firm);</p>	<p><i>it's like doing the interior design of the house before you have even built the house."</i></p> <p><i>"It's quite a struggle to get people to use it and to overcome their unwillingness to sort of start playing with materials: sometimes they feel it's childish; they feel they are not qualified or capable."</i></p> <p><i>"They can think: why is this building doing it when this belongs to our sector and he is just a designer.... And then we say: we are not doing it, we are collaborating."</i></p>	<p>Led by people with operational background in the role of product owners (PO);</p> <p>No designers;</p> <p>Trying to find the balance between exploration and exploitation;</p> <p>Working in 2-week sprints, no time limit per project;</p> <p>POs dedicated to a certain problem, supported by a team of part-time employees with operational background;</p>	<p><i>should have 1 goal or the same goals, at least and we don't have those. That's tricky."</i></p> <p><i>"... I always made the comparison between Star Trek and Indiana Jones. They both do exploration. Star Trek – it never ends. They always keep on exploring, it's all about the exploration itself. Indiana Jones – it's not about the exploration itself. The exploration is a tool, it's a way to eventually get to the goal, that's still unknown at the moment."</i></p> <p><i>"I want to create a space where people [customers and employees] together with smart people can co-create the next thing themselves and also as an infrastructure where startups can be innovative with having as less meetings as possible with as much freedom."</i></p> <p><i>"... you build the infrastructure, but you're not the one who per se comes up with all the new ideas, you give other people the opportunity to be innovative in your environment, but they can only be as successful as they</i></p>

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<p>Emphasis on reflection and learning;</p> <p>Act as the bridge among the different disciplines;</p> <p>Introduce the approach to the rest of the firm through workshops;</p> <p>Focus on continuous user research;</p> <p>Difficult to manage the collaboration;</p> <p>Difficult to have the right people on board (lack of resources);</p> <p>Problems handing-over a project to the company;</p>	<p><i>getting serious and then we can fit into the organization.”</i></p> <p><i>“... but then again, my comment was that the [project] was really well, but the hand-over to the business afterwards... was more difficult, because we were so quick and solid in the [project] and the business couldn’t keep up.”</i></p>	<p>The same team;</p> <p>Involvement of employees through interviews and ideation sessions;</p> <p>Reflection carried out during Sprint Reviews;</p> <p>Introduce the approach to the rest of the firm through 5-day design sprints;</p> <p>5-day design sprints to kick-off a project or overcome obstacles together with users (employees);</p> <p>Focus on incremental changes;</p> <p>Difficult to manage the collaboration;</p> <p>Difficult to have the right people on board (lack of resources);</p> <p>Problems handing-over a project to the company;</p>	<p><i>are, because you have the environment.”</i></p> <p><i>“... I don’t think it will change top down, it also won’t change bottom-up in the sense that if we ask the employees, then suddenly will become very innovative. We have to give people the room to just do what the hell they think is the next step and take the leap of faith.”</i></p> <p><i>“We incorporate that [handing over] in the ideation phase, where we do the roast to involve the main stakeholders.”</i></p> <p><i>“So it [the solution] has to be linked to a division... and you need a multidisciplinary team. If you have both those things, it will radically shorten the time between ideation and implementation.”</i></p>
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strategic ambitions defined by the company's CEO and thus present a strong fit with the company. In comparison, although X1 works on strategic projects for the company, it takes time to explore topics and then seeks the fit with the company's roadmap.

Second, they follow similar phases in their way of working. On the one hand, X1 goes through a (qualitative) research phase, followed by framing and reframing activities in multiple iterations, concluded by prototypes and demonstrators and user testing.

Reflection is an integral part of this approach. Designers facilitate the process, but never present themselves as such. Nevertheless, the stages in their approach have design jargon names. X2, on the other hand, carries mainly quantitative research to better understand the problem upfront. Once this is done, the team goes through an ideation phase in several iterations and regularly involves users (employees). After the ideation phase is done, the team employs both LS and (participatory) design methods to build Minimal Viable Product (MVP), test and reflect on it. In addition, each stage is named after a cartoon or book character that best reflects the nature of the respective activity. For instance, the ideation phase is called "Mickey Mouse" and the testing phase – "Dummy".

Third, both approaches involve parties external to the company. X1 involves design agencies and software companies, while X2 only recently started working with a software startup. Both use design-led workshops as interventions. However, the workshops in X1 are carried out regularly when enough new insights are generated. X2 carries out such workshops (5-day design sprints) in the beginning of a project or when stuck. Both interventions serve as a great conversation starter on what the respective approach can achieve. As such, they are also used to convince the company in the power of each approach since the threshold for performing it is lower and results are achieved in 3 to 5 days.

Forth, the principles, on which they build the teams for each project also differs. For instance, in X1 designers play the role of facilitators and project leaders. Each team is constructed by interested parties from the company and evolves over the course of a project. There is a core team of four to five people who continue to work on the project between the workshops. There is also a business owner, who provides financial support. On the other hand, X2's team consists of four product owners and several part-time team members with operational background that work together on different topics each sprint. Other company employees are involved directly only during the design sprints. Design was brought to them by the first author, another designer and the tools they created for the team. In addition, both approaches make use of multidisciplinary teams, however the emphasis on multidisciplinarity is much stronger in X1.

Fifth, in their efforts to scale up, X1 is carrying out company-wide facilitation trainings and using their workshops as a means for people to get acquainted with the approach. X2 carries out the design sprint for this purpose, but also to implement the way of working in other parts of the company. To do so they use metaphors and easily understandable and relatable names for the phases of their way of working. They also spend time to create awareness among the company's staff by using them as participants in their tests.

Last but not least, the way they deal with the handing-over of a validated idea (project) to the organisation is different. X1 involves business owners early on. Sometimes, at the end of a project, they also involve people from the departments that will work on its further development. X2 turns to company stakeholders to critique the developed ideas during or

after the ideation phase. Here the stakeholders “should also give the support that... they’re available for the hand-over”. Regardless of their differences, both X1 and X2 experience difficulties to successfully hand over validated ideas.

## Discussion

In this paper we discussed the innovation approaches of two large companies. Neither X1 nor X2 was created to achieve organisational ambidexterity. Their intended emphasis was on accelerating the initial stages of NPD and thus the overall pace of innovation in their respective company. As such, they mainly carry out exploratory (design) or accelerated exploitative (Agile/LS) activities, followed by the exploitation activities of the firm. Despite the many differences and similarities, however, the main distinction between them is that X1 carries out exploration with very few elements of accelerated exploitation, while X2 carries out accelerated exploitation with a few elements of exploration. Hence, they do provide a solid foundation to achieve ambidexterity since most of the ambidexterity elements are present.

However, none of them clearly fits into the ambidexterity types described in the literature review section of the paper. On the one hand, they can be categorised as secondary parallel structures, since their teams are (mainly) tasked either with exploration or accelerated exploitation. On the other, they regularly shift from exploration to (accelerated) exploitation, and thus also fall into the contextual ambidexterity category. Such is especially visible in X2 where the team carries out both exploration (e.g. gathering user insights) and applies the methods of LS and Scrum. However, unlike the contextual ambidexterity, the teams do not decide whether to switch between the two activities entirely on their own. They are guided by a specified way of working. Thus, to fill this gap, we propose a new type of ambidexterity we call design-led, since both approaches use design methods throughout their processes. In addition, while design is an obvious fit for the exploration phase, it can also contribute to exploitation activities such as building prototypes and user testing. Therefore, it can play the role of the common denominator across different types of activities.

Using the theory of ambidexterity as a prism, the design-led ambidexterity consists of five main elements, combined in what we call the Lighthouse Model (Figure 1). First, there’s the wheel of Exploration, in which X1 excels and X2 has only elements of. Second, the Exploitation wheel, as in the other categorisations, represents the activities big companies usually carry out. Both companies are very good at that. However, when two wheels are put together, they turn in opposite directions. Thus, the results achieved during exploration will be counteracted by the exploitation structures. This is what happens when both approaches try to hand over Exploration projects to the Exploitation phase. Therefore, just like in a gear train, a wheel combining elements of both activities can ensure rotation in the same direction. We call it the Catalyst, as it not only ensures such rotation, but also increases the rate of collaboration between the two. Methods, which play this role well are LS, as it is based on the Lean and customer development methodologies, which accelerate exploitation, but also shares similar mindset with Design Thinking (Mueller & Thoring, 2012) or the Design Sprint, combining elements of Design Thinking and Scrum. These three wheels will not work unless a strong Executive Support is present. The last crucial element is Users (both employees and customers), who will trigger Exploration. Once all these elements are present, we believe the Lighthouse will work.

# DESIGN-LED AMBIDEXTERITY

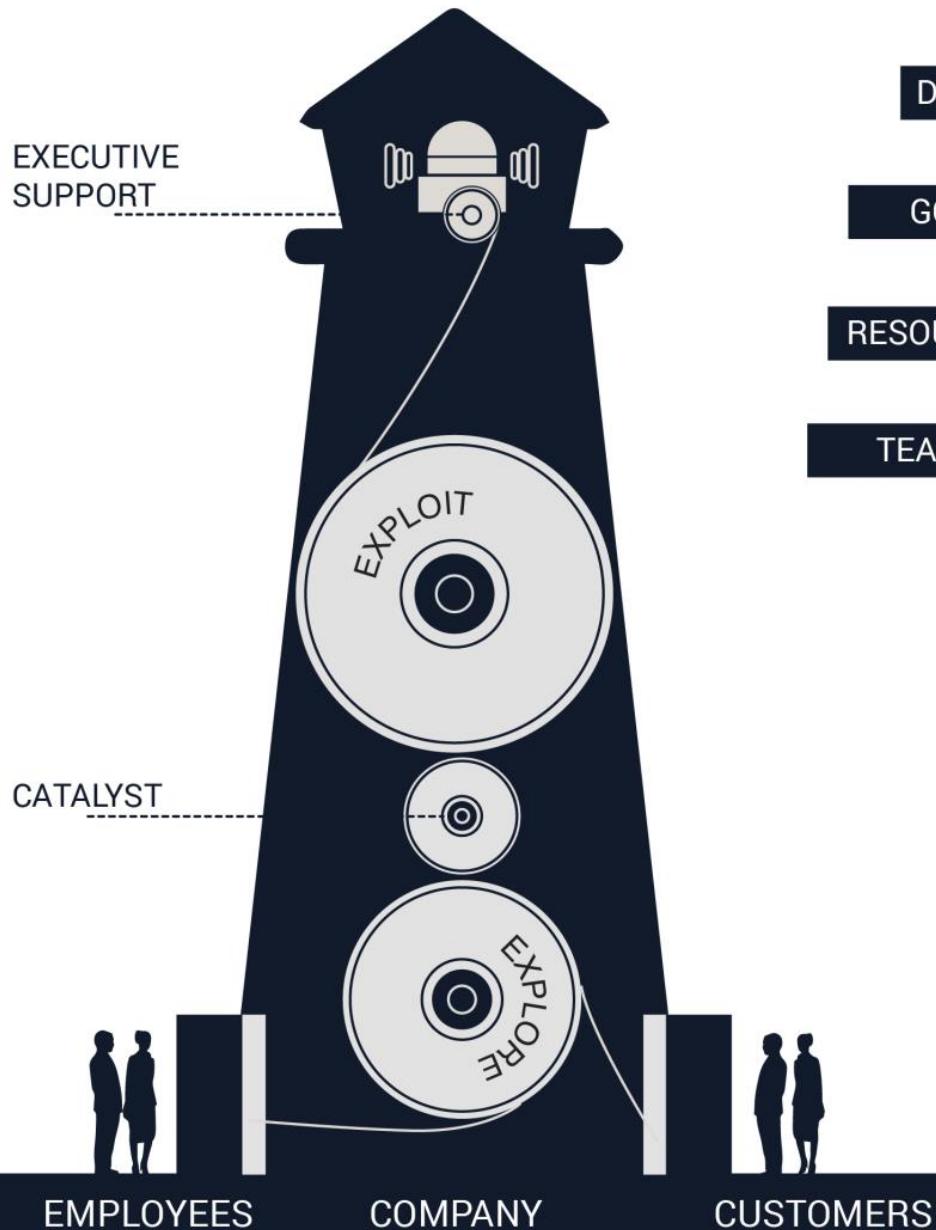


Figure 1: Lighthouse Model

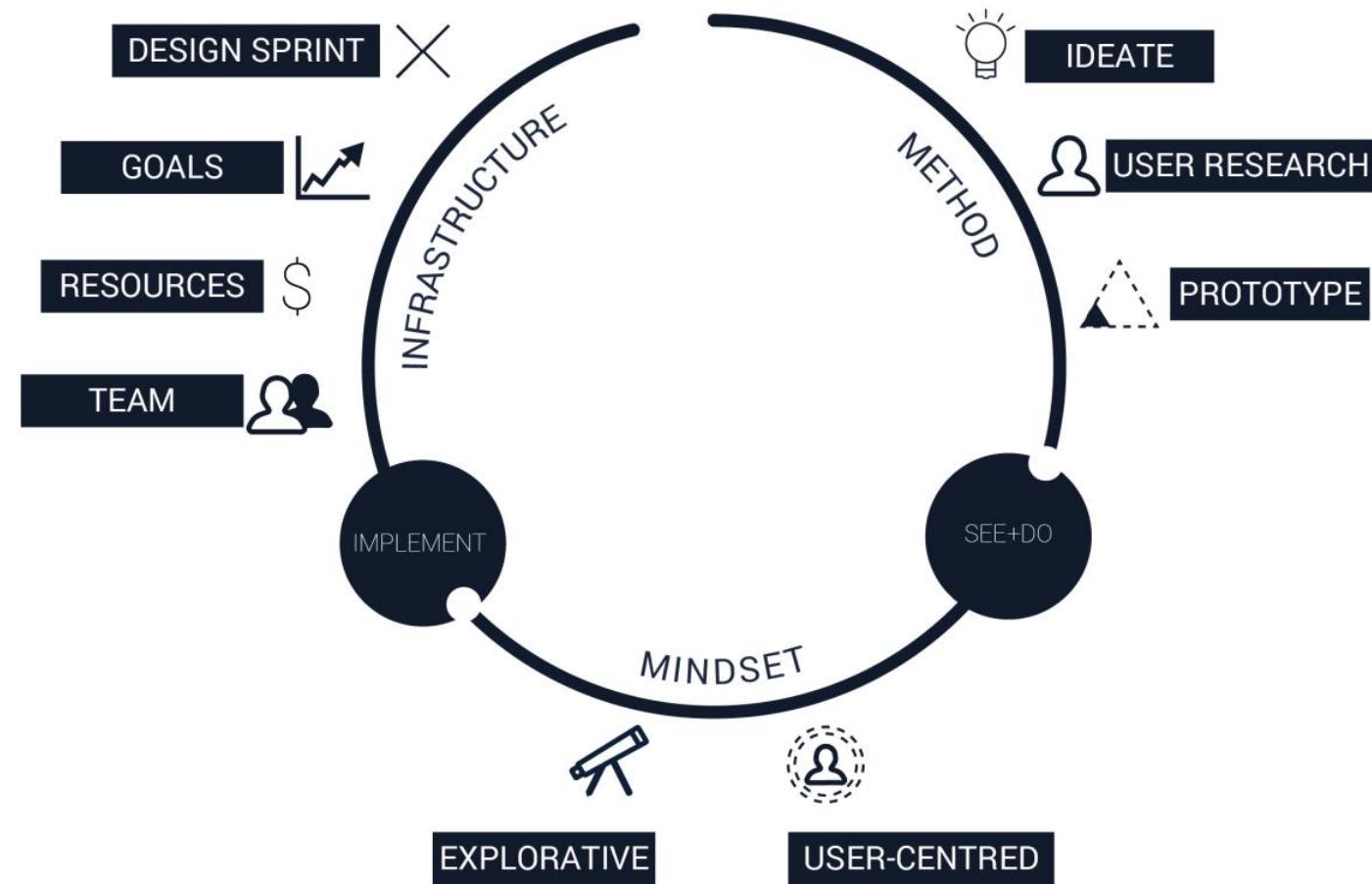


Figure 2: Design implementation and impact

Although the model is still in its inception phase, we believe it gives an initial indication and explanation of the main obstacles these two approaches face to achieve ambidexterity. For instance, the problem X1 has with hand-over: they have mastered the exploration phase and the company has well-developed exploitation structures. Although they implement Agile elements in their way of working and have a dedicated business owner, they're missing many of the exploitative elements of the Catalyst. On the other hand, X2 has the Catalyst figured out, but lacks a dedicated business owner and involves company stakeholders only at the end of the ideation phase. Furthermore, they lack truly multidisciplinary teams and miss some exploration elements and full involvement of their users.

Last but not least, initially X2's way of working was predominantly based on Scrum and LS principles. Therefore, we started by slowly introducing design methods by combining them with the ones they already used. After a few months of seeing and doing the methods on their own, we noticed a shift in their mindset. While at first they had an exploitative one due to their background, they adopted a mindset typical for co-design (Sanders & Stappers, 2008). Once the mindset was implemented in their day-to-day activities, the infrastructure also started changing – above all, the way they involve employees in their teams and a new element to their way of working (the 5-day design sprint). As such, both the infrastructure and the methods have to be flexible and open in order to react to the ever-changing environment (Figure 2). The only constant is the desired mindset that supports such development and the notion of design and design-led ambidexterity. Similar development was observed with participants in X1 workshops. However, the effect was less significant, possibly due to the little exposure time. The lack of influence of the researcher on X1's development and its later stage of development make it difficult to discern whether similar process occurred in X1. Regardless, these observations suggest the influence the three factors can have on establishing an optimal foundation for ambidexterity.

## Conclusion

None of the reviewed approaches was developed to achieve organisational ambidexterity. Nevertheless, they do provide a solid foundation and a starting point for implementing such in their respective companies since most elements of ambidexterity are present. However, the way they approach it does not fit into any existing categorisations of the construct. Based on our insights, we created the Lighthouse Model and proposed a new type of ambidexterity – design-led – giving an initial indication on how to build such in mature companies. The diverse backgrounds and contexts of the two described situations give a solid foundation of the model. However, the aim of the model is to move from describing organisational ambidexterity towards prescribing design-led ambidexterity. As such, further research in other instances has to be carried out to validate it and make it applicable to a wider context.

To do so, despite the fact that this paper discusses mature companies, startups in a process of scaling up should be addressed, as they face fewer organisational constraints compared to established firms (Chen & Kannan-Narasimhan, 2015). Such companies deal with considerably less inhibitors to disruptive innovation such as excessive bureaucracy, unlearning the old processes, status quo and the risk-averse climate (Assink, 2006). In

addition, all startups start with an exploration or an idea of the founders. However, due to the adoption of Agile and LS methodologies, the focus quickly shifts to accelerated exploitation (Mueller & Thoring, 2012) to become a viable company. Therefore, in order to grow, sustainably scale up and create ambidextrous infrastructures, the balance between exploration and exploitation has to be found. The role of design in this is yet unexplored, too. Furthermore, since both X1 and X2 behave like startups within their organisational structures, we believe a better understanding of how such can be built in smaller scale could be later translated for mature companies as well.

In conclusion, although this paper reports two attempts to accelerate the pace of innovation early in NPD and lacks an insight on the longer term implications of such, it gives initial directions on how to achieve organisational ambidexterity. Further research on design-led ambidexterity and its implementation can yield interesting insights for startups and mature companies alike. Consequentially, it will improve our understanding of the role design can play in building organisational structures that can successfully carry out and balance both exploration and exploitation activities, expanding our body of knowledge on the strategic value of design.

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