

# Part II

*“Entrepreneur, design thinking is the ability to create, portray, and deliver tomorrow's distinction today.”*

(Anyado)



## Find a Book! Unpacking Customer Journeys at Academic Library

Alma L. Culén and Andrea A. Gasparini  
Department of Informatics, Group for Design of Information Systems  
University of Oslo  
Oslo, Norway  
almira@ifi.uio.no, a.a.gasparini@ub.uio.no

**Abstract**—Academic libraries are especially poised to serve knowledgeable and technologically advanced user population: students and researchers. The technological advances are dictating significant changes for academic libraries. This paper is concerned with building awareness within the library around the need to re-think its role in academic life, its use of technology and willingness to co-innovate with users. The paper reports from four workshops that aimed to explore existing and future services offered by the academic library. Library employees, students and researchers were participants in all workshops. The participants were first informed about service design and its tools, and then engaged in creating customer journeys, using service design cards. The set of cards used was an of-the-shelf product, modified for the purpose, introducing images specific to the library and allowing for rating of services in terms of their importance. The paper reports on our findings from these workshops. One interesting finding is that librarians still focus mostly on physical space and personal services, such as organization of courses in the library, while students and researchers almost exclusively think of digital services, related to literature they need for their work.

**Keywords**—service design; service design cards; touch points; innovation; customer journeys; academic libraries.

### I. INTRODUCTION

During the last decade, the Internet has been a game changer [1] for academic libraries. It created a challenge for academic libraries by providing access to articles anytime anywhere through, for example, Google Scholar and other open access publications sites catering to academic communities. In the past, the main issue with Internet access to academic literature has been the lack of credibility. In [2], credibility is considered as a multifaceted concept with two primary dimensions: expertise and trustworthiness. Academics have trusted for centuries the expertise of the library to provide good and credible information. Yet, the same are now trusting Wikipedia, Google Scholar, and similar, to provide them with credible academic information [3]. In addition to the Internet, the appearance of disruptive technologies, such as eBooks first, and tablets later [4]–[6], has posed further challenges. In combination with cloud computing, interested students and researchers are able to create their own collections of teaching and research materials, always at their fingertips. The libraries are practically forced to re-think their role in academic life, their use of technology and willingness to innovate.

An academic library is a place where serving academic community, cultivating, preserving and expanding knowledge is *raison d'être*. However, due to technological developments and changing habits of the academic communities, the services, as well as the ways of delivering them, are changing. The changes also imply the need and interest in ways of evaluating library services [7] and designing new ones. Looking through a variety of definitions and concepts regarding service and service design, see [8]–[10], we consider the following characteristics of a service to be useful also for discussing the library services: intangibility, heterogeneity, inseparability and perishability (IHIP). *Intangibility* is often cited as the most important distinction between tangible goods (products) and intangible services. For example, the help to a student by a librarian, in form of information, is intangible. *Heterogeneity* addresses the fact that services, even when the product obtained through the service is the same, for example, a book, is depending on different service providers and thus may be experienced in variety of ways. For instance, an experienced librarian may provide a different service and customer experience than a new librarian, when a customer inquires about a book. The experienced librarian may be able to offer similar titles, supplementary references etc. It is, thus, often difficult to achieve uniformity of the service delivery, a ‘standard’ service. *Inseparability* of service addresses the fact that it is impossible to separate the supply or production of the service from its consumption. The interaction between a provider and a customer in an act of offering/consuming a service may also be seen as an act of co-creation of the customer experience with the service, and thus, the customer may be identified as service co-producer [11]. *Perishability* of a service is addressed in the literature in multiple ways. Many consider a service to be something that happens in the moment and thus cannot be saved for later. For example, even though a student can borrow a book from the library for 4 weeks, the service takes place at the time of checking the book out. Alternatively, one may consider the service as ending at the time when the book is returned to the library. Similarly, in a new library database system, one may not be able to make certain inquiries which were possible in the old database, and thus some services related to those may perish.

One fundamental attribute of services is that they have value only when they are used [12]. Other relevant attributes are trust, fast delivery (speed) and consistency of the service [13]. These attributes have a crucial impact on the customers’ experience of a service, but do not have to be equally relevant for the provider. For example, Amazon has

built on trust, while McDonalds on the speed of the service. Services offered by a private and public sector differ in some important ways. In the public sector, the motivation to innovate services or to co-create them with users is often reduced, since the public sector services are actually intermediaries between the state (the actual service provider) and the user [14]. This makes it more difficult to influence improvement of existing, or development of new services [14]. It is more difficult for providers to understand and evaluate customer's experience of the service [15]. Finally, public sector customer services design may involve some paradoxes [16] that are difficult to resolve. Thus, working with services in public sector may be more challenging than working with services within the private sector.

In this paper, we examine how the academic library views service design and co-creation of services with users. To this end, we have organized four workshops with library employees, students and researchers. Part of the time during workshops was used to introduce concepts from service design, as well as methods and techniques used in service design. This content is presented, in its condensed form, in Section II. The remaining time was split equally between creating customer journeys in today's library and exploring future services. The main tool used to create customer journeys was a set of service design cards. The use of cards and card sorting is common in human computer interaction; see for example [17]. More on specific cards used is also provided in Section II. The paper reports on tool modification in order to collect more meaningful data from workshops, as well as insights gained and lessons learned.

The paper is structured as follows: Section II introduces design thinking, service design, customer journeys, touch points and service design cards. Section III describes our case and presents the workshops. The discussion is provided in Section IV, and it is followed by a conclusion and future work in Section V.

## II. SERVICE DESIGN

This section presents, very concisely, the material used as a theoretical background during the four workshops that were conducted in order to initiate the envisioning and re-thinking process around services in the academic library.

### A. Design Thinking

In contrast to analytical thinking in science, designers have developed another way of thinking, called design thinking. Design thinking involves building of new cognitive patterns to grasp multiple knowledge and multiple perspectives, related to the context at hand, that are to be synthesized and transformed into new products or services. It combines the empathy for the context of a problem, knowledge and understanding of others and designers' creativity in generation of insights gained around the problem. The entire process, including the translation of all insights towards solutions, often happens with stakeholders within the context of use. In practice, it is a method of finding solutions by going through certain stages, typically very similar to those of interaction design: formulate the problem, investigate it, brainstorm, make prototypes, chose

one, implement and find out how well the solution solves the problem. Design thinking has also allowed designers to move from a post-production and branding place and become active participants in the making of new products and services [18].

Using design thinking in design of services offers a possibility to better meet customers needs [19], based on understanding of their behavior, motivations and other responses while interacting with services.

### B. Service Design

It seems straightforward to define service design (SD) as a design of new services or re-design of existing ones. Design of services is not new; services have existed for millennia, but the recent popularity of service design may be attributed to design thinking approach to service design (see [18], [19]).

Service design differs from product design in the act of "doing" of the design [12]. Service design also differs from interaction design in that it uses more explorative ways to challenge the problem area, as opposed to interaction design with its more analytic approach [20]. Our understanding of service design is in line with that of Schneider:

*"Service design is an interdisciplinary approach that combines different methods and tools from various disciplines. It is a new way of thinking as opposed to a new stand-alone academic discipline. Service design is an evolving approach; this is particularly apparent in the fact that, as yet, there is no common definition or clearly articulated language of service design".* [21]

Ideally, the service design teams should include all stakeholders related to the service context, as well as service designers, and other professionals, as needed for a specific project. The first step in the process of SD, an equivalent to defining a problem space in human-computer interaction, is an agreement on the context and interests. Different research methods such as ethnography, immersion, shadowing, sense-making methods such as mapping (including blue-prints, Giga maps and customer journeys), safaris, expert interviews and self-directed tools such as diaries are all part of the SD toolkit.

For the purposes of this paper, customer journeys and touch points are central.

### C. Customer Journeys and Touch-Points

One of the most effective processes in service design is being able to visualize a service offered by an organization or a company using a tool called a *customer journey*. Koivisto explains:

*"Services are processes that happen over time, and this process includes several service moments. When all service moments are connected the customer journey is formed. The customer journey is formed both by the service provider's explicit action as well as by the customer's choices",* [22].

The 'service moments' Koivisto talks about are called *touch points*. Touch points, as stated above, comprise a customer journey and provide understanding of the service over time. They are thus a central aspect of service design [23], [24].

D. Service Design Cards

A good tool, helping to understand and address touch points in the initial stages of service development, is a set of service design cards. The card set that we chose was developed as part of AT-ONE method, a practitioner-based method for service-design, aiming towards maximization of the innovation potential at early stages of service design, see [23]. Clatworthy provides six different use contexts for the card set and evaluates the usefulness of cards in these contexts and in relation to their intended function. The cards were found to help with team building in cross-functional teams. Further, they were found to be helpful in assisting with the analysis and mapping of existing situations, generating ideas for new solutions or approaches, needs elicitation and facilitation of communication. In addition, Clatworthy says that the cards “afford embodied communication and embodied cognitive processes”, [23].

III. THE CASE

As stated in the introduction, our goal was to re-think services offered by the academic library. The establishment of User-Driven Innovation project in the context of academic library at the University of Oslo approximately three years ago, started us on a research activity concerned with investigation and experimentation around users’ involvement in innovation processes within the library. We have considered students’ potential as innovators [25], as well as the living lab approach [26]. In this work, with students as innovators, we have found that images facilitated initial communication well, and they helped established common understanding of the problem area. Thus, our experience was similar to findings reported in [23]. The natural course of action was to buy the card set from [23], as shown in Fig. 1.

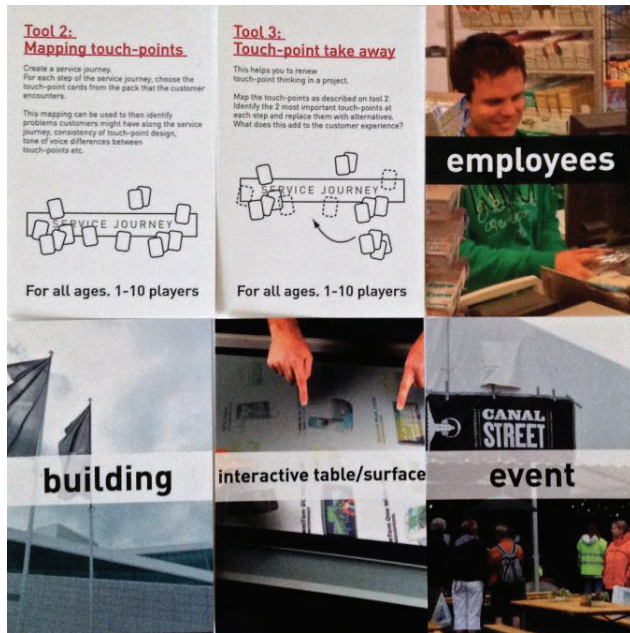


Figure 1. A sample of SD cards [23], including cards describing the two ways in which the cards were used in pilot workshops.

The set was then tested in couple of pilot workshops focusing on the library context and using the cards in two different ways: to map touch points and to remove a touch point from a customer journey. We chose to focus on customer journeys only, the removal of the touch point was deemed too specific. We quickly realized that some library specific cards would be helpful. This resulted in a modified set of cards which included vital touch points for the library, such as books, e-books, academic papers. Furthermore, we introduced two non-touch point cards, a critical point and a decision point, meant to be placed next to the touch point card in order to provide a clear visual clue related to the importance of the card. Then the set was tested one more time and we found out that differently colored dots placed next to the touch point card would be more useful in providing a graded importance clues. In addition, we found that colored arrows could provide further visual information, helpful in visualizing choices in the flow of the customer journey, again graded by importance. Thus, the set of cards used in workshops consisted of the original deck, plus added touch and non-touch point cards as described, and many dots and arrows in different colors, see Fig. 2, and Fig. 3 – Fig. 6, showing the cards in use.



Figure 2. Cards suitable as touch points related to library services. Dots helped visualize degree of relevance of a touch point, and arrows the flow.

When the cards were ready, we organized a series of four workshops, about 2 hours long, with similar set up. During the first hour, we introduced the concepts presented in the Section II: service design, design thinking, customer journeys, touch points and touch point cards. During the presentation two simple questions were asked in order to engage everyone in thinking about the library and innovation, and to invite the participants to be creative. The two questions were: “Can you give an example of a library

service?” and “What does innovation in the library mean for you? Give an example.”

During the second part of the workshop, service design cards were used to discuss a specific task. The task was to create a customer journey based on the following service provided by the library: find the literature relevant for a research or student project. When the journey was mapped, the new task was to envision this same journey in the future. During the first workshop, the same task was repeated using visual language in the making [27] for service design. This has not been done in other workshops.

The choice of the task was motivated by the sense of difficulty that users have when considering the role of the library in this particular process today (as explained in the Introduction, users often search Google Scholar and similar sites). It turned out to be a good choice for all participants. In fact, one of the researchers in the workshops admitted that she did not know that e-books purchased by the library are available for all university users, free of charge. The library employees could see that users did not have easily available information on this important new service, e-books access.

The same questions and the same task were used in subsequent workshops. While the first workshop involved many library employees, the remaining three workshops were predominantly composed of students, with at least one researcher and a library employee present.

Our main analytic tool was photo documentation [28]. A large number of photos were collected during workshops, so that we could analyze similarities and differences in processes with different groups, as well as how they made their journeys, for both present and the future service.

#### A. The First Service Design Workshop

The first workshop was held in May 2013, with 25 participants. 17 participants were library employees (included library leaders, librarians, subject librarians, digital services management, digital services support, e-resources consultants, open access consultant and others), 4 were students and 4 researchers. The participants were divided into four groups of six (seven in one of the groups) people, each group having at least four librarians, a researcher and a student. All four groups had their own deck of cards, dots and arrows, a large sheet of paper, and colored pens. The participants took some time to become familiar with cards, to discuss them and negotiate both the touch points and how to proceed with thinking about customer journeys. After 10-15 minutes, all groups decided on what touch points they would have on their journeys. Changes in the order of touch points and discussions became faster, as common understanding got established. Soon, all groups started using arrows and dots, Fig. 3. In one case, the paper under the cards was used to mark new paths between touch points that arrows could not reach. Also, some groups felt the need for additional card or two, or to document the process. Those were made using Post-it notes on the fly, and participants (mostly library employees and researchers) took pictures with their own mobile phones, showing engagement and importance of the subject discussed for their own work.

Looking at journeys made, we could notice that multiple starting points were deployed, usually from the physical to the digital. If the journey started in the digital world, it generally ended back in the physical world, in form of a visit to the library. This shows that meeting up at the library in person was regarded as vital in order to gain access to services.

The journey making allowed for relating anecdotes around how library services can be experienced by users. For example, in one of the groups, a student related a story of being charged a fee after the return of a book, which was long past due. For the library, the charge, as a source of income or compensation, is minimal and insignificant. For the customer, it provided for a really negative experience.

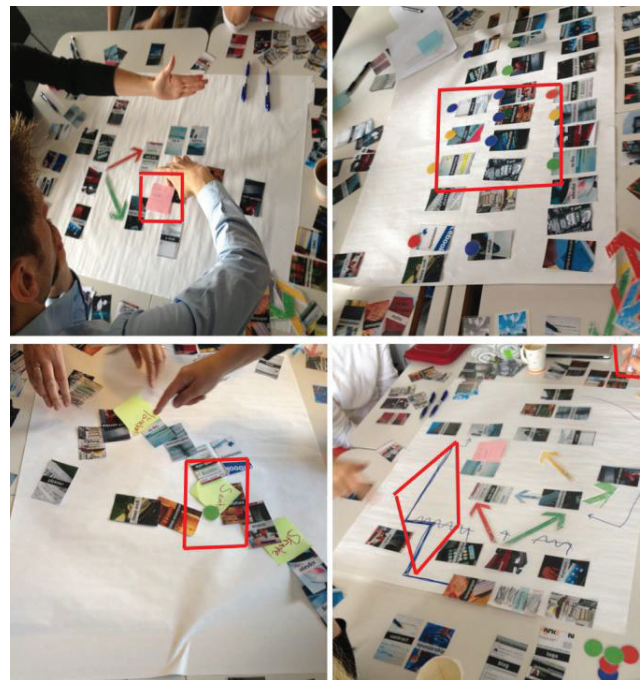


Figure 3. The workshop in the library. Each small picture shows the customer journey made by one of the four groups.

#### B. The Second Service Design Workshop

In this workshop, only three bachelor students from interaction design course participated, and one library employee/researcher. The same program, as described above for the first workshop, was followed.

The difference between the customer journey made at this workshop, and those that resulted from the first workshop, was where the service start points were, see Fig. 4. For the three participating students, it was not conceivable to start the journey elsewhere then with digital interfaces as touch points. The only reason that they added the physical library in the journey was because the library employee wanted to introduce it. The students added the card, and then quickly added a critical point card, from which an arrow lead to the library building card (Fig. 4), signaling clearly that only in times of absolute crisis would they venture into the building.



Figure 4. The journey always started from the digital: PC, a tablet or a phone.

Asked what kind of crisis they are thinking of, they exemplified with network failure, or the library site being down. An interesting outcome of envisioning the future service was the “book-to-door” service, a delivery of a physical book at home address, for which they were willing to pay.

C. The Third Service Design Workshop

The third workshop was carried out in the context of a graduate course in experimental design, with 18 participants divided into three groups. The journeys made are shown in Fig. 5.

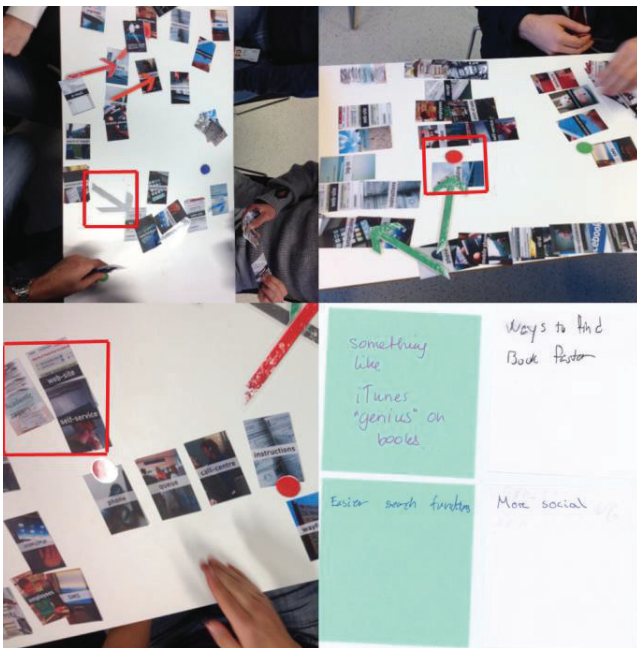


Figure 5. The three journeys and Post-it notes on new services.

In this case, too, all customer journeys (present and future) had starting points in the digital world. Similar to the previous group, as shown in Fig. 5, upper right image, the red dot was placed over the card depicting the building. Here too, the building became a touch point only in the case of an emergency. This group, however, would not opt for visiting the library at all, but would make a phone call instead.

Even though participants had ample time and seemed engaged in envisioning future services around finding academic literature, journeys they made remained quite conservative in terms of how far the ideas were from today’s solutions.

D. The Fourth Service Design Workshop

The fourth workshop was also conducted with students taking a graduate course, but with ten students. The course had design and design thinking as a theme, thus little in terms of introduction was needed. We had expectation that these students would be more creative. This expectation was not met. The outcome was rather similar to journeys made in workshops two and three.



Figure 6. Students taking the course with focus on design and design thinking working on their journeys.

The use of the myths card is worth mentioning. A student related that she was afraid of visiting the library, since the library is a quite place, and she sees herself as being loud. She thinks that the library is not the right environment for her (see Fig. 6, the bottom right corner).

IV. DISCUSSION

After the last workshop with students, we felt that we have gotten much information on one hand, while on the

other hand, for further development of ideas, a different team composition and format of workshops is needed. The workshops have shown that the card set worked well. It indeed engaged participants in discussions around touch points, and served as ground for building common understanding. They served well as a visual tool for understanding today's services and envisioning the future ones. The added cards worked well, and the participants considered the use of color-coded dots useful. In negotiating the touch points, groups sometimes added touch points that some members of the group were not convinced needed to be a part of the journey (like the library building in workshop 3). Placing a red dot on that touch point gave it a meaning (emergency only, for example). The color-coding was done by negotiating the meaning of the color within the group, and thus, was not the same across all groups. Arrows were used similarly. The participants were not encouraged to use either dots or arrows in any way, but most groups found them to be helpful in visualizing the journey.

Although all workshops were including library employees, researchers and students, the first workshop was the one where library employees accounted for a vast majority of participants. The outcome of that workshop was distinctly representing the library view of its services. It was very interesting to observe that most suggestions for innovation had to do with physical space and face-to-face communication, even if later had to be done using video. Fig. 7 shows a sample of what library employees gave as examples of innovation during the initial part of the workshop. As it can be seen, several suggestions had to do with avoiding queue in the library, while equally many were suggesting a video call center. Later, while thinking about touch points and customer journeys, variation in envisioned journeys was greater. Yet, it was evident that the decision power in negotiations around customer journeys clearly belonged to the library employees.

On the other hand, the remaining workshops strongly represented users' point of view. The journeys, both present and future, show mostly digital touch points and digital services. Even when they were not digital, like the 'book-to-door' service from the second workshop, they did not involve the library building or face-to face communication. Even in cases of emergency, as in the example from the workshop three, the students seem to prefer other forms of contact, such as the phone, over the visit to the library.



Figure 7. Post-it notes with answers to the question “What does innovation in the library mean for you? Give an example”.

From what we could hear and observe during the workshops, the perception of what a service should be characterized by (intangibility, heterogeneity, inseparability, perishability) also differs between the library employees and the library users. The students in the workshops were in favor of automated online services, in part, due to the equality in the delivery of the service and its independence of either the librarian, or the librarian's perception of the user. The customer journey in the second workshop (see Fig. 4, in the red box), describes the aforementioned book-to-door service, possibly inspired by Amazon [29]. Even though the service delivers a tangible object to the door, it still eliminates heterogeneity. The heterogeneity was not the characteristic that students valued. The librarians, on the other hand, consider their knowledge as extremely valuable, but highly dependent on the inseparability of the service. While the explicit part of their knowledge may become part of some system, the tacit knowledge and the long and rich experience in working with academic community is transferable only at the moment of service delivery in the physical world. If this experience and tacit knowledge are not valued enough by users, this kind of service is indeed in peril of perishing. From the outcomes of the workshops we can see that value and meaning of IHIP characteristics of services needs to be further negotiated among the stakeholders. The gap that exists needs to be bridged by design of services that better suit user ways of doing things, but do not lose the extremely valuable assets that the librarians have.

## V. CONCLUSION AND FUTURE WORK

The paper described the case of exploring the present and the future academic library services, focusing on finding literature relevant for some student or research project. Four workshops were organized. The first featured a large number of library employees, while the remaining three focused mostly on student population. The main tool for engaging stakeholders in the process of creating customer journeys was a set of service design cards, modified to best fit this very specific context. The process was photo documented.

First, we remark that that our extension of the service design cards was meaningful for our participants, as were the tasks. Several groups have explicitly and unsolicited mentioned that it was nice to be able to use the colored dots and arrows and ‘grade’ the importance of certain touch points. Only 2 groups have chosen not to use this possibility.

Our main finding shows that the library still focuses very much on physical services, while the students are nearly exclusively concerned with digital services. A very positive outcome of the whole process for the academic library is increased awareness of just how large this gap is and its recent commitment to engage in a long lasting user centered project focusing on user experience and design of services with users.

The ideation and thoughts around new services that started in some of these workshops have already been carried a step further. One new service that helps find e-books has been designed and implemented. The future work involves participation in the afore mentioned project, which is now at



its start, and deepening understanding of the role of human-computer interaction research, its methods and techniques, in design of user experience and services for the academic library.

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## Understanding the role of design thinking methods and tools in innovation process

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Andrea Gasparini

Department of Informatics and University of Oslo Library, P.O. Box 1085, Blindern, Oslo, N-0373, Norway.

E-mail: [a.a.gasparini@ub.uio.no](mailto:a.a.gasparini@ub.uio.no)

Dimitra Chasanidou\*

SINTEF ICT, P.O. Box 124, Blindern, Oslo, N-0373, Norway

E-mail: [dimitra.chasannidou@sintef.no](mailto:dimitra.chasannidou@sintef.no)

\* Corresponding author

**Abstract:** This paper presents the results of an ongoing qualitative study with employees working with innovation in a Scandinavian company. Using Design Thinking as an approach, the paper analyses how different tools are used to initiate innovation processes. Issues like innovation drivers, team structure, creativity, information flow among teams, usefulness and challenges of using the methods and tools are discussed. The role of different design tools in innovation processes opens the discussion for possible future directions. The results suggest that many methods and tools could generate value in regards with the innovation processes, while there are many challenges that need to be considered. The findings could be beneficial primarily for companies that facilitate DT methods, designers, developers, managers and other involved members in innovation activities could gain insights on how to implement DT methods and tools.

**Keywords:** Design thinking; Design thinking methods; Design thinking tools; Innovation.

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### 1 Introduction

Innovation in companies often has different and complex paths from the idea development until the final product or service, while companies use different types of design methods and tools for innovation. Due to increasing demands of the markets, companies need to react faster in these demands and to innovate in response to the competition. Therefore, the role of innovation becomes a central part of the daily action in companies. Design methods and tools should be assistive for various companies’ processes, such as from the idea generation phase to the final product/service development phase, and should facilitate the development of innovations. Also, problems with information and activity silos seem to be the norm. This research problem has received little attention from researchers and practitioners. Our focus is to investigate the existing situation of the aforementioned problems with innovation in large companies,

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using the Design Thinking (DT) approach (Brown, 2009) as a methodology to understand how different design tools are used.

Our paper contributes with an empirical study where the main contribution of the paper lies into the analysis of how innovation processes are supported by different design tools, and how those tools are related to the different phases in DT when used in the company in the context of reported innovations. Moreover, the study suggests how DT methods and tools could be used most effectively within company's processes.

The paper is organised as follows:

## **2 Related work**

The process of innovation and the way it is managed constitutes a key strategic issue for companies. For this purpose, a large number of design methods and tools are available to facilitate the DT process and innovations (Curedale, 2013). DT has emerged as a multidisciplinary, human-centered innovation approach inspired by the ways designers think and work (Brown, 2009; Kimbell, 2011). The core idea in DT is that any discipline can take inspiration and learn from the way designers think and work, and apply this to their operations not only in innovation efforts but also in strategy, innovation or organizational renewal (e.g. Brown and Katz, 2011; Brown, 2009). In addition, the stages of DT, namely empathy and insight, definition, ideation, prototyping and testing (Brown, 2009), provide a structured step-process for implementation of DT. Innovation is developed when all three perspectives of DT - business, technology and user's perspective- are addressed. Additionally, often innovative ideas do not manage to be realized by the company. The flow of information for innovation seems to stop during internal processes (Hippel, 1994), and it is questionable how methods and tools will ensure that the elaborating forces of innovation will be more fluid inside the company. The implementation of DT methods and the integration of DT in a company's context have received little attention. Existing knowledge focus on the adoption of DT methods (West et al., 2003), as a mean of strategic governance of innovation, letting out some of the holistic needs inbound in the real DT approach. More studies in organizational settings that provide insights for an optimal implementation and successful use of DT for innovation are needed. A framework to address creativity is also needed to understand better how the design thinking tools can function optimally, and the use of the concept of divergent and convergent thinking is interesting. In fact, both types of thinking are required if creativity shall be obtainable (Crompton, 2006).

Group dynamics is also relevant as companies often use different design tools that gather people to work with each other. Although workshops and like produce several outputs, there are several issues needed to be addressed. For example, social loafing in creatives groups can be problematic (Runco, 2010). In fact one of the possible and undesired outcomes can be the unwillingness of sharing risky and creative ideas as they can be misunderstood (Runco, 2010).

This paper aims to describe the existing status regarding innovation processes in companies and how DT methods and tools facilitate innovation processes. Also, the study aims to explore if the use of the design methods and tools for innovation can be helpful for the information flow and communication among departments or groups.

### 3 Methodology

We organize a case study with Scandinavian companies in order to understand the internal company processes that lead to innovations and change, and the implementation of DT methods and tools. Interviews were selected as a data gathering method, because they reveal rich information and details. The ongoing case study includes interviews with a variety of companies, where at least three employees who work have been involved in innovation related projects are interviewed. This allows us to explore at least three perspectives of innovation processes: one design, one technical and one managerial perspective. In this paper, we report on the pilot study with a Scandinavian company in service sector. The company was selected as a representative case because of its long experience with innovation projects, its capacity to absorb innovation practices and its size.

The study conducted on January 2016, where three employees were interviewed in semi-structure, recorded interviews. The national data protection official for research authority has approved the interview guide. The participants in the study were working in the same projects but having different work positions and roles, where one reflects the managerial perspective of the projects and two are involved with the design-technical perspective. Designers, managers and other employees involved in the innovation projects reflect their views on internal processes, revealing examples of innovation projects and how they work with innovation across departments and groups. More in detail, the interviews lasted 45min and they were transcribed verbatim. We then developed a coding schema consisting of the following main topics: definitions and drivers for innovation, innovation process and phases, assistive methods and tools, team's structure and roles and other involved parties. More detailed themes coding schema was defined during the analysis. Similarities and differences in responses were found and systematized.

### 4 Findings

In order to understand the methods and tools that are being used in innovation processes in companies, it is important to draw the context where those methods and tools are applied. Starting from the definition and drivers of innovation, the process of innovation and the team's structure is described, while the methods and tools are analysed according to the phases with the corresponding challenges.

#### *Defining innovation and innovation drivers*

According to the participants, innovation is regarded as small steps to change the mindset of a company. It is related with the resources, and company's ability to generate and support innovation activities. The participants explained what innovation means for their company, reflecting their perspectives and roles in innovation projects:

“Innovation doesn't need to be a huge idea, I believe that innovation is something that changes the way you do things basically. And that you are able to make it work.” (Interview 2)

“Innovation for a company [...], is not only the radical innovation, but also working smarter, and incremental innovation. [...] Innovation happens every day, in every corner of the company. [...] So a big part of innovation is just working smarter, find new solutions to old problems.” (Interview 3)

The drivers for innovation are considered both customers and company employees. Company employees who work as department leaders or in other work positions have been identified as key persons to initiate innovation projects in the company. Customers are also driving the innovations. The dynamic nature of customers' preferences affects the company's demands that try to adapt to those changes, and aligned with the market needs. In addition, examples of other companies that focus on a specific area constitute an innovation driver as well. Accordingly, the focus on a specific part of the value chain is considered the main company's focus, and not in the whole value chain.

“We have found some key persons that really like working with these things and everyone is in different departments” (Interview 1)

“Well, I think [...] that the department is the most dynamic area where the customers basically change preferences each month. So, we have to be ready for those changes and adapt.” (Interview 2)

In line with the DT approach, the design process can look like fuzzy in the start, and accordingly make the innovation process difficult to monitor and administrate.

“For the moment it is about make it work on the practical level before we organize too much” (Interview 3)

### *Innovation process*

The innovation process in the company refers to two types of innovation: sustaining and disruptive innovation. According to the participants, in sustaining innovation the ideas come from the customers. This is a customer-driven approach and the ideas for innovation come from customers' needs and feedback on existing products or services. For example, the company received more than 10000 posts from customers who gave feedback through one application. Additionally, feedback that is collected either from face-to-face meetings or through electronic means is used as a basis for both sustaining and disruptive innovation. The innovation process in sustaining innovation starts with customer feedback and data that generate a corresponding concept development that provides value to the customers in regards with this need. After the concept becomes concrete, the available resources and the company's acceptance need to be ensured. The value proposition and the evaluation criteria, such as attractivity, are established in this phase. The concept should be in a presentable way that allows feedback from others, like partners and colleagues. The feedback helps the concept to be further developed and starts a pilot where the value propositions are tested together with as many hypotheses as possible. Iterations among phases help the company to confirm more hypotheses and to decide whether to invest resources, such as money and time, for the project or not. According to participants, the duration such projects is 3 months approximately.

“We are dividing in disruptive innovation and sustaining innovation [...]. We are looking all the markets around how things are changing, how we can take a role in everything that's out there. [...] We get a lot of ideas from both customers, internal, sales people, everything they stuck it up and prioritize what they seems to have biggest value and test it to customers to see if they respond the way we think they will respond. [...]” (Interview 1)

In disruptive innovation the ideas come internally from the company. A digital platform that target to gather employees' and other partners' ideas supports this type of innovation. As a market-driven approach, the ideas for innovation come internally from the company,

for example the department leaders, based on the market-driven needs, specify the needs for innovation. The corresponding departments develop concepts that answer the calls and prioritize what will generate the most value for customers. Many iterations in early phases help to establish the main path for innovation and focus on the concept that will generate the most value, both for the company and the customers. The disruptive innovation should be based on small, iterative steps and specific metrics, such as the cost reduction. For example, the duration of such a project is approximately 1 year.

“We want to have a quick time to market we do not want to spend resources without knowing what’s out there so we want to try things fast, test it and put money to that as it goes.” (Interview 2)

“In disruptive is more like Hans-Petter and his position that something about the market and changes and we help him developing concepts that answer the needs in the markets.” (Interview 1)

### *Team structure and external parties*

The collaboration across company's departments and teams depends on the projects, where the department that is responsible to develop the concepts leads the team building in most of the cases. Resources such as involved people, costs, and other external, involved parties are defined in order to develop the project. Depending on the projects' topic, people from corresponding departments lead the project after the team building. The collaboration and the involvement of people from other departments in innovation processes is considered a necessary step for sanity check, where the realization of innovation is ensured. Departments have also their internal, smaller teams for innovation with specific needs and innovation segments.

“So I have to find people in each division [...] and then make sure that they are onboard with what we are doing.” (Interview 1)

“We all have to check if any innovation or idea it can be easily [...]. So, we always have to involve people in the process early.” (Interview 2)

Other external partners are involved in innovation processes, such as developers, following the process from the early phases until the launch of the product or service. The external partners become part of the decision team, where the project team as a whole decides on the solutions and delegates the tasks among project members.

### *Design thinking methods and tools*

We described the innovation processes in the company, according to participants' views. Many methods and tools were mentioned that are actively utilized in the company, and some of those methods or tools are used for research, design, management or presentation purposes. In order to understand how the DT methods and tools are used in various phases, we mapped them according to the DT phases: empathize, define, ideate, prototype and test.

### *Empathize and insight*

Empathy is a central phase in the human-centered design approach. The empathy step refers to understand the users and their needs within the context of a design challenge. The participants replied that methods for understanding the users include observations

that are utilized mainly during other phases, such as to get user insights and test prototypes.

“We use observations each year [...] first we get user insights, that people say "were you able to do what you came to our website to do" and then we ask 5-10 people in our lab when they do the tasks and we observe.” (Interview 1)

Other methods to understand the users include the personas method, to understand the target user, either in the beginning or in later phases, for example in ideation phase. According to participants, three main sources are used to collect customer data, through online survey tool (Questback), direct feedback with customers, and focus groups. As mentioned in the introduction, insight and how the information flows inside the company can make innovation difficult to happen. Information can be “sticky” (Hippel, 1994) in one department, making more expensive and difficult to enact innovation. In the first phase of the creativity, divergent thinking needs to gather as much insight as possible. The participant mentioned different ways they worked with this topic, whilst several alternative possibility of improvement was requested.

“There should be a system where you can collect and where people could place [...] like the e-lab or discuss with me [...] or an open innovation platform.” (Interview 3)

### *Define*

The phase of problem definition refers to the focus on specifying the problem, while a problem addresses the need for a change. For the company, the need for a change is generated from two main sources, as it was discussed above, the customers (sustaining innovation) and the company (disruptive innovation). The participants replied that methods in use for this phase include brainstorming, surveys, co-creation with customers, interviews, workshops, customer journey map, prototyping, design scenarios, and focus groups. One example is customer journey maps that are used in early phase to define a problem and find the pain points of a product or a service. Other examples are interviews and workshops.

(Participant talks about the co-creation with customers) “[...] Well, we have used it to define and get user insights, and in the project where I am the project leader they will create and test the prototypes with the customers.” (Interview 2)

Digital tools are used for gathering ideas from any source. A digital platform is used internally for company’s employees to submit and/ or discuss ideas, while other digital tools– such as Trello and Slack– have been utilized as a digital space for managing and prioritizing ideas, but also to generate discussions for a topic.

### *Ideate*

The ideation concerns the generation of ideas and it’s a creative phase among participants. The participants commented about ideation that it could be part of the previous phase– the definition phase– or any of the next phases– such as prototyping and testing. Several methods are used to generate ideas for the company, but not necessarily answering the previously defined problems. Methods for ideation include survey, co-creation with customers, interviews, workshops, observations, focus groups, and personas. Additionally, participants reported that other methods to generate customer-



driven innovation include a forum and an advisory board, where important customers and partners provide input to ideas. A sub-step of this phase is to ask for feedback on ideas. For example using interviews, participants get user insights for concepts or ideas and prioritize them, although it is considered challenging to predict future activities. This happens especially in disruptive innovation. In addition, the need to get user insights varies among company's departments. For instance, participants mentioned that in one department they use a forum and an advisory board as tools to get feedback on ideas. The internal digital platform for gathering ideas is believed that will lead the innovation process in the future, in terms of prioritizing and managing ideas and innovation activities.

**Table 1** Overview of the methods and tools in use.

Phases	Methods and tools
Empathize	Observations, Personas
Define	Brainstorming, Surveys, Co-creation with customers, Interviews, Workshops, Customer Journey Map, Prototyping, Design scenarios, Focus groups
Ideate	Surveys, Co-creation with customers, Interviews, Workshops, Observations, Focus groups, Personas
Prototype	Prototyping, Design scenarios, Storyboards, Personas, Co-creation with customers, workshops, Focus groups, Scenarios, Stakeholder Map
Test	Design scenarios, Storyboards, Co-creation with customers, Prototyping, Workshops, Focus groups, Stakeholder Map

“So this platform will be lead most of the innovation in the company hopefully in the next years.” (Interview 1)

In this phase, other tools for gathering ideas in a digital space, such as Trello and Slack, are considered very important project management tools for managing ideas. Either using some kind of tools or discussing ideas face-to-face, the company's culture is believed to be open for ideas

### *Prototype*

This phase refers to the creation of prototypes, by any means that visualize ideas, created in the previous phase. Depending on the project, prototypes could be presented either in paper format or as tangible artefacts. The participants reported that they use methods such as prototyping, design scenarios, storyboards, personas, co-creation with customers, workshops, focus groups, scenarios, and stakeholder map. One prototyping tool for sketching is InVision that was used after a workshop to put ideas in an online space. The prototypes have assigned hypotheses and metrics that will be used in the next phase of the testing. Hypotheses and metrics assume that a prototype will work, for instance:

“We would like to test X by doing this and in order to understand if it will be accepted we measure this and if this metric is above X or Y is accepted.” (Interview 2)

Examples of metrics refer to the value proposition for the company, the customers and/ or the partners. For end users, different prototypes are created, for example when launching new actions in a webpage and there is a need to create a non-fully functional buttons, without any action behind.

### *Test*

Testing is a part of the iterative process, where the purpose is to learn and iterate if it's needed. Prototypes are evaluated according to value propositions that were developed, for example the value proposition for customers, the company, partners, etc. According to the participants and in relation with methods and metrics for prototyping, the testing will provide explanation to what will be developed, what should generate, and how it will be measured. Prototyping testing with end-users of the company requires different approaches, such as experiments and hypotheses testing. The participants reported that methods for prototype testing include design scenarios, storyboards, co-creation with customers, prototyping, workshops, focus groups, and stakeholder map. An additional method for testing is a digital panel with 150 users, registered to test out ideas. Other methods that were used to test the hypotheses include the Lean Startup method, which supports a quick approach to get products into the market.

“So we are working on a method called Lean Startup how we can to get products out in the market, to test before use a lot of money and develop it.” (Interview 1)

The selection among various prototypes could be achieved with methods such as A/B testing, during the first iterations and before the full development of a product or a service. Depending on the cost, multiple prototypes might be developed.

### *Usefulness and challenges of the methods*

The participants discussed the usefulness of the methods in relation with testing in early stages of the product development. Meetings with partners and long discussions might be time consuming, focusing on the wrong direction. For example, the use of methods in early stages might help the fast development of the projects in terms of time, resources and focus on the important things. Furthermore, structured processes are considered appropriate for specific phases, for instance when presenting ideas and in order to convince other people, but not for the idea development where there are various needs depends on the project. For example, workshops was mentioned as a method that is hard to follow due to lack of structure and it does not provide detailed analysis.

“[...]I have hard time to get something valuable with workshops [...] but I don't think that create as much value as others.” (Interview 2)

The Lean Startup method is considered a good example of method that helps participants to get quick results, as well as the hypothesis testing which provides clarity of results and suggests the right direction. Focus groups is considered a method that was used for presentation purposes to other partners, but it depends on what it is tested.

According to the participants, there are many challenges related with the alignment of the methods with the company's internal processes to innovate. One challenge is to utilize methods and tools that offer quick and trustworthy results. Especially in early stages of the product development, the company decides on the projects that fulfil certain values

and finding specific methods for this purpose is often a challenge. The participants discussed that the Lean Startup method provides quick results for companies in an innovation process. Second, there is a challenge to find methods that support both qualitative and quantitative data, as both types of data are important for the decision processes with multidisciplinary teams. As it was mentioned, finding methods that support convergent and divergent thinking with multidisciplinary teams is also a challenge. The third challenge can be found in the organizational processes, where the application of the methods should be adapted to the short or long development processes. For example, there is a challenge to utilize methods when bureaucratic processes of a company interfere the application of the methods. Forth, there is a challenge to establish the same methods and tools in the organization's culture. Different departments or teams work with different tools that are a personal choice at some extent. Lastly, it depends on the individual skills how to make the utilization of the methods beneficial for the project or a team. For some projects, the use of methods and tools is considered as a way to convince other people for the value of an idea or a project.

“If you have an idea will most likely get the answer "ok define it" [...] that's the culture in here. But after it is defined, there is more bureaucratic process, so if its cost you have to have it through, an investment committee and those things.” (Interview 2)

## **Discussion – Conclusions**

In this paper, we presented the results from an empirical study with a company and how various methods and tools are being used in their internal innovation processes. The DT approach served as a methodological and analytical tool for mapping the applied methods in various design phases. The results suggest that many methods and tools could generate value in regards with the innovation processes, while there are many challenges that need to be considered.

Innovation processes are characterised by iterative phases, measurable factors, leadership, digital space. Accordingly, we believe that the utilization of DT methods and tools should adapt to these characteristics. The DT methods should allow many iterations, especially when they are applied in early phases. In other words, the methods of the early phases should generate rich data that will be used in later phases, in every direction. Additionally, the DT methods and tools should incorporate some kind of metrics that will help the decision processes. Metrics are important for innovation processes and DT methods should combine qualitative and quantitative results. Various kind of data are useful to different partners, in order to decide on the development process. Furthermore, methods that support convergent and divergent thinking allow the communication of people with different backgrounds. Regarding the leadership of innovation processes, bottom-up and top-down methods should be combined. The bottom-up methods, where the department leaders utilize to support their decisions, and the top-down methods, where everyone in a company could utilize in order to support the ideas/projects, should be jointly affect the innovation processes. Also, DT methods could be applied easier in a company when the methods work in a digital space as well. This allows to share the working space with other partners, but also to have everything online, in one place. Especially in big departments where it is up to individual skills to develop and present his/ her ideas, a digital space gives visibility to everybody's voice. Learning barriers of the digital tools should be limited. For example, simple digital tools for project

management are considered very important for innovation processes and accordingly, DT tools could be more functional if they are online. Lastly, building organizational culture for the use of the DT methods and tools, it will eventually generate value. The company will have access to every innovation activity that is growing and how it is developed.

“We don't know of everything that happens in the company. In many departments, they have their own innovation team [...] As I said we will never get control of everything.”  
(Interview 1)

The findings could be beneficial primarily for companies that facilitate DT methods and want to get insights from other companies. In addition, designers, managers and other involved members in innovation activities could gain insights on how to implement DT methods and tools. Finally, designers and developers could benefit and inform the design of these tools and methods or suggest combinations of methods and tools for the DT phases.

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# WHEN DESIGNERS ARE NON-DESIGNERS: OPEN ENDEDNESS VS. STRUCTURE OF DESIGN TOOLS

Alma Leora Culén<sup>1</sup>  
Andrea Gasparini<sup>1</sup>  
Pavla Minaříková<sup>2</sup>  
Roman Novotný<sup>2</sup>  
Sumit Pandey<sup>1</sup>  
Ladislava Zbiejczuk Suchá<sup>2</sup>

<sup>1</sup>*Department of Informatics, University of Oslo  
P. Boks 1080, 0316 Blindern, Oslo, Norway*

<sup>2</sup>*Department of Information and Library Studies, Masaryk University  
Arna Nováka 1/1, Brno, Czech Republic*

## ABSTRACT

In this paper, we explore types of toolsets that are suitable for design thinking processes, when design teams consist of non-designers. We have conducted a series of workshops to experiment with open-ended, semi-structured and structured tools, using design thinking for libraries as a research case. Our results clearly indicate that semi-structured tools fare best regarding variety of outputs, breadth of ideas and engagement of participants.

## KEYWORDS

Design thinking, team creativity, tools for design thinking.

## 1. INTRODUCTION

Design thinking (DT) provides a tremendous opportunity for designers and non-designers alike to create new and sustained creative and innovation-oriented practices. Design thinking has been advocated across many areas of business, e.g., (Brown, 2009; Lockwood, 2009; Martin, 2009) and has emerged as a desirable orientation towards innovation within many organizations. DT has been outlined as a co-design method in teams, often multidisciplinary and including users and other stakeholders. It has been framed as a process, both in the academic literature (Björgvinsson et al., 2012; Cross, 2011, 1982; Schön, 1983) and in the commercial design practice (IDEO, 2014). While framing of the process as a design practice may differ among authors, it can be described as a sequence of actions related to problem definition (understanding of the problem space, users and their needs), ideation, prototyping, and evaluation. These practices that are based on DT processes are supported through use of diverse methods, tools and techniques, frequently including design ethnography, different forms of mapping (affinity, mind, concept), brainstorming, visual representations of ideas (sketching, storyboarding), prototyping and evaluation techniques (ranging from rapid idea evaluation, to prototype testing).

The design thinking approach to innovation has been in focus within several different academic fields, design (Buchanan, 1992; Cross, 2011), service design (Polaine et al., 2013; Stickdorn and Schneider, 2012), management (Johansson-Sköldberg et al., 2013; Lockwood, 2009) and interaction design and HCI (Culén and Følstad, 2015; Finken et al., 2014) among others. However, findings from these diverse fields, especially when it comes to multidisciplinary teams, their creativity and tools that should support it, are still not fully explored. In particular, little research is drawn from fields such as psychology or creativity studies that address team compositions and tools that support design-thinking practices in organizations. The importance

of team composition and tools that the team works with grows when teams include non-professional designers or are even exclusively composed of non-designers.

In this paper, then, we focus on how to make tools that are suitable for DT processes when design teams consist of non-professional designers, supported by at least one researcher experienced in DT, and with at least one member with background in either design or art. As all authors are researchers engaged with design thinking and design thinking practices in the context of libraries, DT tool set design for libraries was chosen as a case for this paper. The paper describes reflections and lessons learned from three workshops that were conducted with four matched teams of participants. The teams included library employees, students in library and information sciences, graduate students in interaction and HCI design, researchers experienced in DT, designers or artists (not necessarily familiar with innovation through DT processes). At least one library employee on each team was familiar with DT, and at least one participant was a novice to DT. What is important to mention is that, in addition to findings from the literature on DT and team work, e.g., (Toh and Miller, 2015) that support similar choices, this team composition corresponds to how we commonly compose teams in our own innovation through DT library work.

Multiple toolkits, e.g., (“Design Kit”; “frog Collective Action Toolkit | frogdesign.com”; “Use our methods”) have been designed to support DT processes in organizational settings, where more frequently than not, novices to design thinking are part of the design team. Some of the toolkits were made specifically for supporting design thinking within libraries (“EN | Libdesign”; IDEO, 2014). While these toolkits on design thinking may be useful on occasions of starting a new project(s), they are not enough to create sustainable innovation and prototyping practices in the library (Pandey, 2015). In his paper, Pandey suggests that these toolkits are too abstract and too far removed from actual organizational work practices to be adoptable for sustained organizational innovation and to become a source of change in non-design practice (ibid.). Therefore, he argues that DT tools and methods need to be kept semi-structured by design, allowing for collaborative co-shaping, appropriation and improvisation during use by participants involved. Extending this line of argumentation, our concern was the level of open-endedness vs. structured guidance that the tools that we designed afforded during the DT process. However, as we consider tools to be inseparable from the group of people using them, we also were concerned with how concepts of openness to experience and conscientiousness, correlated to abilities of divergent and convergent thinking within the field of personality psychology, trying to use this research to make team compositions that support different styles of thinking. At the same time, the teams were to have approximately the same sets of skills and abilities. Their work, then, could be used to discuss how tools mediate interactions within teams and how are expected outcomes related to the use of more structured vs. more open tools when working with multidisciplinary teams.

Our paper contributes to better understanding of design thinking tools, when multidisciplinary teams composed of non-designers use them. In particular, open-endedness opposed to fully structured tools was explored. We also make a contribution by actively using the research from psychology and creativity studies. We believe that both fields have much to contribute in helping shape creative practices when working on design with non-designers. Findings indicate that semi-structured tools work best with respect to generating outputs, breadth of ideas and engagement of participants.

The paper is structured as follows: the next section provides a short background for this paper. Section 3 presents our case, including methods, participants and tools. Section 4 presents findings and discussion. Conclusion ends the paper.

## **2. BACKGROUND**

Amabile (Amabile, 1983) conceptualized a framework for creativity, consisting of domain-relevant skills, creativity-relevant skills, and task motivation, which represent a set of necessary and sufficient components of creativity. These cognitive abilities, personality characteristics, and social factors were seen as contributors to creative process. In line with Amabile’s framework, recent research in psychology shows that there is increasing evidence suggesting that individual differences in creativity reflect particular combinations of thinking styles, affective dispositions, and motivational preferences, e.g., (Soroa et al., 2015). Some researches also addressed issues of creativity within design teams, e.g., Toh and Miller (Toh and Miller, 2015) who used personality traits and risks attitudes on creative concept selection to study creativity of engineering teams. Since (Costa and McCrae, 1992) introduced the five factor model (openness to

experience, conscientiousness, extraversion, agreeableness, and neuroticism) of basic personality traits, the model has been subject of discussion, refinement, attempts to quantify, correlate and measure diverse related characteristics. Some of this research has direct relevance for design thinking processes. For example, divergent and convergent thinking, both crucial to successful outcomes of design thinking, have been strongly correlated to openness to experience and conscientiousness, respectively (Kaufman et al., 2013; Kaufman, 2013; Mussel et al., 2011). Kaufman refines the concept of openness to experience, and looks at how its four facets (explicit cognitive ability, intellectual engagement, affective engagement, and aesthetic engagement) affect creative achievements.

Furthermore, recent discourses on creativity include not only balancing of spontaneous (divergent, open) and controlled (structured) processing of creative cognition (Mok, 2014), but also how creativity expresses itself in everyday life. In her paper (Tanggard, 2013), Tanggard goes beyond considering convergent and divergent thinking, anchoring creativity in social practice and suggesting that 1) creativity is an everyday phenomenon resulting in continual processes of “making the world” 2) there is a close relationship between human beings and material tools in the creativity process and 3) there is a close relationship between continuity and renewal, meaning that materials, tools, things, institutions, normative practices and “ways of doing” already in the world are taken as starting points for new creations. The second point that Tanggard makes was of a particular interest for this paper, as we wanted to deepen our understanding of how to work best with tools for DT and also how to design them for other non-designers to use as tools for sustained innovation practices, in line with Tanggard’s points 1) and 3). Similar findings have also been made by Pandey (Pandey, 2015), where the author states: *“for catalyzing sustained reflexive and collaborative transformation of work practices, design thinking practices need to be transformed into proto-practices, i.e., design methods novel to an organization need to be integrated with familiar elements from the context and the practice of the organizational communities involved”*. Pandey has explicitly studied prototyping practices in the library settings, and appropriated the sustainable practice design framework from (Kuijjer et al., 2008) with the DT approach to frame new practices that can take root at the library. Involving bodily performances, creating crisis of routines and generating a variety of performances are highlighted by both Pandey and Kuijjer et al. as means of configuring new practices and hence are also considered in this paper as tools that help creative processes. We describe the use of these factors in detail in the context of our case study in the following section.

### **3. DT IN LIBRARIES: INTERPLAY BETWEEN TOOLS AND PEOPLE**

This section describes our case, which focuses on the use of design thinking in libraries, and presents our method to explore the relation between tools, group composition and both creative and new knowledge production related to the process. Recently, design thinking has become one of the important ways that libraries try to use to innovate their services and improve user experiences. Libraries are also in the process of re-evaluating their role in community lives, affected strongly by the recent advances of technology (Culén and Gasparini, 2015, 2014; IDEO, 2014). Therefore, libraries are, a very good case for methodological and work-practice related studies examining the implementation of design thinking as a way of fostering changes and establishing innovative practices that are not disruptive, but rather sustainable over time.

#### **3.1 Method**

In this research, we have used a workshop format to explore expected outcomes of DT processes when tools used for DT varied in the degree of open-endedness. Three workshops were carried out, the first one using the structured and semi-structured tool set, the second used completely open-ended tools, and the third workshop repeated a session with semi-structured tools, but used a different research facilitator and new participants. All workshops gave 15 minutes long introduction to DT, for participants who were not familiar with it; followed by 45 minutes of DT process work based on a given task.

The first workshop was run in two sessions. Two teams (5-6 participants per team, including facilitators) participated in each session, see Figure 1. The first session was facilitated by the research team one (RT1), while the second session was run by the research team 2 (RT2). The team with 5 participants had one facilitator, and the larger team two. Both research teams have long experience with DT, but are not trained as professional designers, exception being one of the researchers on RT2 who also has design background.



Figure 1. The participants of the first workshop. Method cards on the right, one card per team, were used to formulate a design brief: use the card, as a departure point of DT process, to create an online presentation of the method on the card

During the first 45 minutes session, both design teams were led by RT1 and both used *structured* tools inspired by (IDEO, 2014), see Figure 2. The method cards shown in Figure 1, right, were designed by some of the authors (Zbiejczuk Suchá et al., 2015). The cards were used as part of the design brief. The design teams were to use DT to find out how to best represent one of the method cards on some digital platform. After a break, the second 45 minutes session, facilitated by RT2, was carried out. This time, both teams used a *semi-structured* approach that incorporated diverse bodily performances, creating crises of routines and generating variety of performances. Subsequently, RT1 and RT2 facilitators joined for a reflection on actions and discussion of outcomes. RT2 facilitated the second workshop couple of weeks later. The workshop had a total of 6 participants, whose skills and background matched participants of the first workshop. The format of the workshop and the design brief were the same as for the first workshop (15 minutes long introduction in DT for novice team members, followed by a 45 minutes long design process). This time an *open* approach was used. Reflection and discussion of achieved results concluded the workshop. RT1 facilitated the third workshop, with total of five participants. This workshop took place at the same time as the second one, but they were not co-located. Everything was done in the same way as before, but the *semi-structured* approach was repeated in order to see how well it worked under different facilitation.

### 3.2 Participants

20 individuals in total, divided into four design teams, participated in the above-described workshops, and as specified in the Table 1. Two teams participated in two design sessions each, while the third and the fourth team had a single design session. Teams were matched by their background as follows: 1 participant on each team had art or design background (although some, at present, were pursuing different education), at least 1 was a library employee with prior experience from at least three DT workshops, at least 1 team member was a novice to DT and was either a library employee or a student, and finally, at least one (and at most 2) members were research facilitators. These background combinations were intentional, ensuring that each team would have a person skilled in divergent thinking, and a person skilled in convergent thinking. Since research facilitators were familiar with those who had previous experience with DT in libraries, their engagement level, motivation and cognitive skills observed during other workshops were also taken into account. Teams were to be as equal as possible regarding skills and personality traits, so that the differences in outcomes could be co-related with qualities of tools and, as little as possible, differences among teams.

### 3.3 Tools and Sessions

As mentioned, the main differentiator between sessions 1-3 was openness of tools and support they provided in creative processes. Session 4 was carried out to verify results from the first workshop.

What we call tools in this paper, are objects, such as method cards, verbal and written instructions to follow, canvases providing a way to organize input or ideas, visual tools, such as sketches, post-its and other things that influence productivity and creativity during the design process.



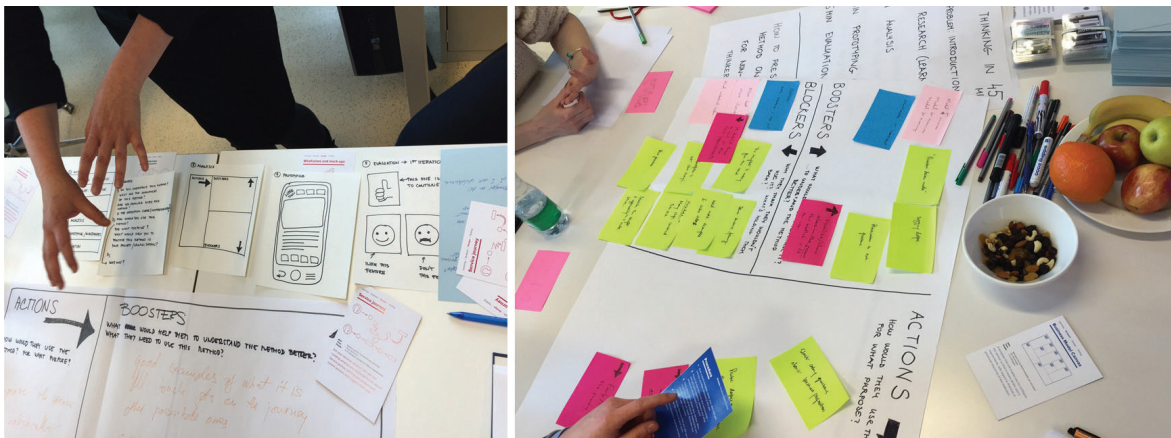


Figure 2. Guided work during the Session 1, with the tools inspired by IDEO: a set of method cards by LibDesign, an interview guide, boosters, blockers and actions map, a quick evaluation of generated ideas guide

A set of tools used in conjunction with different sessions is provided in Table 1.

Table 1. Summary of workshop sessions, approach and tools used

	Facilitators	Approach	Participant teams	Tools
1 <sup>st</sup> session Workshop 1	Research team RT1	Structured approach	T1 (5): 3 researchers, 1 novice student, 1 librarian. T2 (6): 3 researchers, 1 librarian, 2 novices	Focused sheet with research questions, post-its, markers, pre-designed canvas, cards
2 <sup>nd</sup> session Workshop 1	RT2	Semi-structured approach	T1 and T2, same as above	Post-its, whiteboard, index cards, markers, cards
3 <sup>rd</sup> session Workshop 2	RT2	Open approach	T3 (6) 3 researchers, 2 librarians, a novice student	Markers, paper, whiteboard, cards
4 <sup>th</sup> session Workshop 3	RT1	Semi-structured approach	T4 (5) 2 researchers, 1 librarian, master students (novice and some experience)	Post-its, whiteboard, index cards, markers, cards

Method cards (Zbieczuk Suchá et al., 2015) were given to each team in all sessions. The card set is to be digitized and the activity in all sessions focused on how to represent the method cards digitally. Each team got one card to work with. Participants were to use quick ethnography and interview someone outside the workshop on how they understand the method card. Are images clear? Are they self-explanatory? Is the text clear, do they understand the essence of the method? Workshop participants had 10 minutes to complete this task. As the workshop took place at the university, potential interviewees were sitting in their offices, just outside the workshop location. The team members could interview people in any constellation they found desirable, either individually, in pairs or the whole team, if that was preferred. After the interviews were done, the teams were to work on a canvas inspired by the Value Proposition Canvas (Osterwalder et al., 2014) with booster, blocker and action fields. This type of coding and categorizing could be labeled as a “structural coding” or “protocol coding” according to Saldaña (Saldaña, 2013). It is based on the categorization of data according to the pre-established system represented here by the canvas. This type of coding is appropriate for some disciplines with previously developed coding systems, something that was field-tested, but the pros and cons of its use in design thinking are still unexplored. After the use of Canvas, the teams shifted to prototyping.

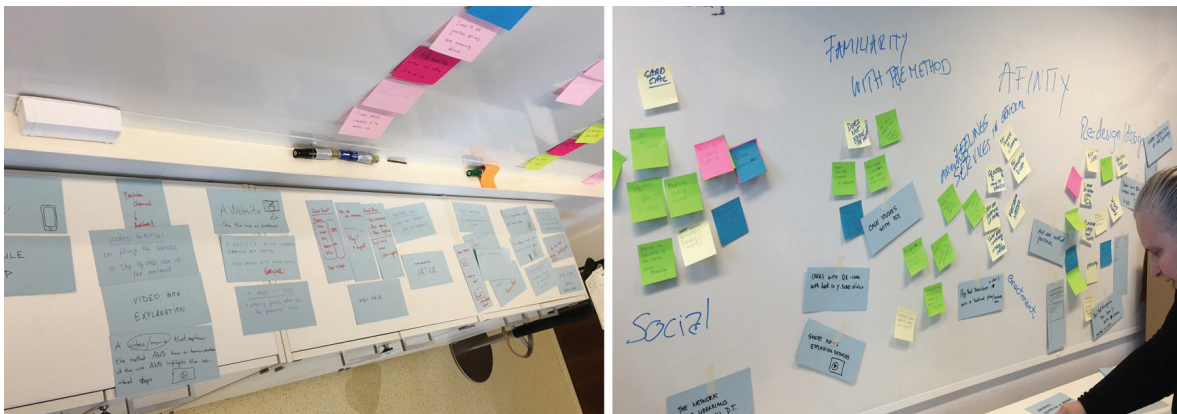


Figure 3. Session 2 had much less structure. Each participant was to think of some ideas individually, then all were to cluster them, standing, moving, discussing – using the space also vertically

While the second session closely followed the structure of the first session, the tools and methods used were changed to a semi-structured format. Using the ethnographic data from session 1, the participants were taken through a series of rapid design exercises that used constructive materials like post-its, index cards, whiteboards and markers rather than pre-defined templates. The form and structure of the outcomes from these exercises was largely generative while the nature of content expected was briefly introduced at the beginning of each exercise as opposed to highly directed and regulated actions. In other words, participants were provided with materials for each exercise and ‘what’ outcomes they were expected to generate with these materials but not directed on ‘how’ they should generate these outcomes. This was in line with the notion of generative materials and semi-regulated actions used in conjunction with specially configured spaces (Pandey, 2015). Some functional constraints were also suggested as appropriate for each exercise. This helped in eliciting a variety of improvised performances from the workshop participants due to a crisis of routine that was triggered by an absence of a formal structured process directing each exercise. The first exercise started with identifying all possible insights and putting them on post-its, which were finally put up on a vertical surface, to stimulate bodily engagement, see Figure 3 and Figure 4, and a fuller range of movement from the participant’s side. Participants were asked to put only one insight on each post-it so they could be moved around and clustered, following the principles of open coding, into emergent categories corresponding to themes brought up by the informants. Using these themes as points of departure, each participant was asked to work individually using index cards and generate 6 or more possible solutions to the design brief under consideration. Most participants kept standing up while ideating so as to be able to move through the identified themes and notes from the previous exercise. The ideas generated during this exercise were also clustered collaboratively after discussions, highlighting possible explorations and directions that could be incorporated into the final concept. Finally, relevant ideas and themes explored and clustered were combined together into possible feature proposals for a digital platform, as in session 1.



Figure 4. Standing, sitting varying positions around work, and the room. Freely drawing, ideating.

## 4. DISCUSSION

In our work to prepare for the workshops, we have thought of the necessary and sufficient components of creativity given by (Amabile, 1983). Domain relevant skills were represented well by including librarians and researchers and students in information and library sciences. Creativity-relevant skills were taken care of by including people with art and design background, as well as interaction design researchers and practitioners. The task motivation, we hope, was provided by interest in innovation in the library at the first place, meeting between different disciplines and, perhaps, somewhat by a really good pizza. These task motivations were in part intrinsic (for some participant) and extrinsic only for others.

The outcomes of the first three sessions were really interesting, in terms of numbers and variety of ideas, broadness of ideas and engagement of participants. Although discussions during Session 1 were interesting, people have remained fixed to their seats and to instructions and canvas provided. The session gave some outputs and some paper prototypes were made, but it was clear that the output was constrained by the Canvas tool used. Session 2 provided most diverse ideas, the most interesting prototypes and has engaged people both mentally and physically.

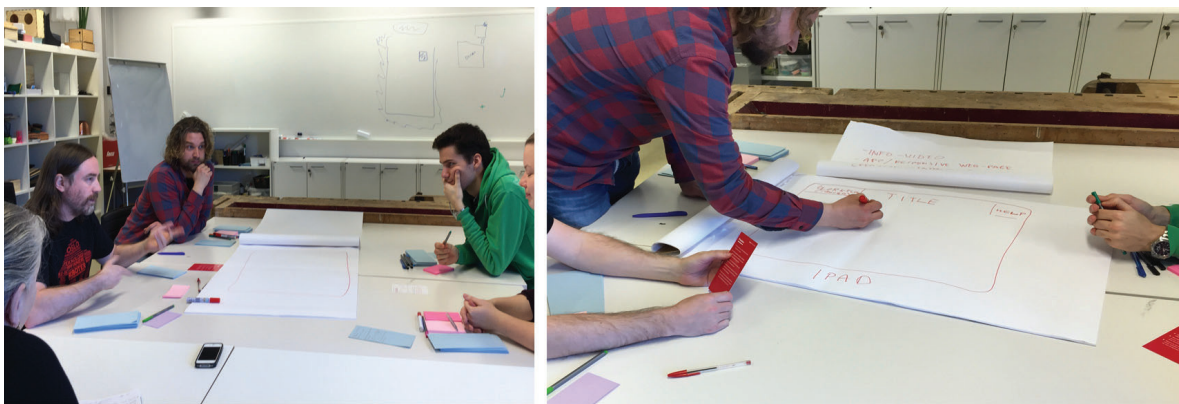


Figure 5. Session 3 did not use pre-made tools or instructions. Total lack of structure actually hindered creativity

Session 3 provided no particular instructions for participants on how to proceed after the quick ethnography session (instructed in the same way as in the workshop 1, lasting 10 minutes). The facilitator did not lead the ideation, but rather participated in line with others. The mini ethnography session was done in two groups. One group had two novices who had problems understanding the method card themselves. “How are we going to interview people, when we do not know what this is about ourselves?” one of them asked. In the end, the results of their interview corresponded to how they felt – their interviewee did not understand the sketches on the card, and in 10 minutes did not manage to make sense of it. The second group though, had interview findings that were about that we saw earlier. This example shows that one group did not have a proper motivation for mini ethnography. During ideation activities, many short stretches of silence broke discussions that were barely trickling. In spite of facilitators’ encouragements to freely use the space, write on the blackboard, use flip charts, only after direct prompts, one librarian with DT workshop experiences stood up and tried to use flipchart to put down the ideas. 45 minutes did not suffice to finish making a paper prototype. When the workshop ended, a short (3 minutes) paper prototyping session was introduced. A structure for prototyping (a drawing of an iPad), was provided, and the participants were asked to quickly sketch and interface for the method card they worked with. Suddenly, participants had many ideas and in less than 3 minutes, one reasonable paper prototype was made. This last exercise showed that the problem was not with the team, but with the openness of the process when all participants were non-designers. At least, a small guidance through the process was required. Figure 5 shows well the contrast between this session and the previous ones.

In Session 2, a researcher with design background led one of the design teams. This team performed better than the other one in terms of the range of ideas considered, and the ability to converge to solution that was subsequently prototyped. Both teams, though, outperformed results from Session 1 in terms of variety,

breadth of ideas. In order to make sure that results similar to those of the first workshop, if conducted with a matched team but with another facilitator team, were obtainable, workshop 3 was organized, see Figure 6.



Figure 6. Session 4. Semi-structured workshop. Verifying the 2<sup>nd</sup> session

Also in this workshop, engagement was excellent, and the ideation broad. These findings indicate that indeed semi-structured approach works well, confirming Pandey and Tanggaard assumptions (Pandey, 2015; Tanggaard, 2013). Thus, as predicted by (Toh and Miller, 2015) no structure does not work for non-designers, while a strict structure bounds them to only what is asked of them.

## 5. CONCLUSION

Whenever working with design thinking, one should consider the composition of design teams, as well as tools that are to be used in the process. Cross-disciplinary research may be challenging, but it also hides a lot of potential for design processes, as people often have different thinking styles and different affinities towards analysis or synthesis. In this paper, we focused on how tools, in terms of their open-endedness, influence the design process, when the attempt is made to keep design teams as similar as possible. Three workshops with matched teams were conducted. Both convergent and divergent thinking were represented in each team, as well as novel influences by including novices to DT. Semi-structured tools have given the best output.

## ACKNOWLEDGEMENT

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# Temporality and Innovation in Digital Humanities: The Case of Papyri from Tebtunis

Andrea Gasparini and Alma Leora Culén

University of Oslo, Department of Informatics,  
Gaustadalléen 23 B, N-0373 Oslo, Norway  
{andreg, almira}@ifi.uio.no

**Abstract.** Temporal aspects of Design Thinking (DT) innovation processes have not yet received enough attention. This paper discusses their importance in complex design situations involving non-located, multi-disciplinary design teams. We focus on three aspects: 1) awareness of temporal trajectories in the process and how to bring continuity to an otherwise fragmented workflow, 2) temporality of learning through such processes and 3) discussing opportunities for DT concerning temporal aspects of the process. As a research case, we use a project from digital humanities that aims to develop an innovative proposal for *Virtual Tebtunis*, a digital research platform enabling effective cooperation across organizations in possession of papyri and other articles from the ancient city of Tebtunis. Four workshops were organized in three locations, with varied groups of participants to carry out the Design Thinking process. The timeline of orientation, incorporation, and identification phases was used as an initial time framework. In the aftermath of the project, we were able to identify a richer framework for engaging with temporal aspects of DT processes.

**Keywords:** Design Thinking; Temporalities; Innovation; Digital Humanities.

## 1 Introduction

This paper is concerned with temporal issues when Design Thinking (DT) approach to innovation is used, engaging non-located, multi-disciplinary design teams in the design process.

Designerly ways of thinking and working are increasingly taking hold in diverse domains, from digital educational research [1, 2] to strategy and management [3–5]. The way designers explore problems [6], and how they approach solving them, has been used as a basis for design-led innovation approach [7]. Within the scope of this paper, DT is understood as a design *process* that is user-centered in its core, based on multi-disciplinary design team work, and supported, at least in the initial phases, by diverse methods and techniques that promote effective ideation and idea visualization, fast learning, creativity, rapid idea prototyping, evaluation of ideas and prototypes, synthesis and a concept definition that sets the direction towards a solution.

DT processes also raise epistemological questions related to how and why novel concepts emerge, develop, grow or die over time [8]. The time and the temporal aspects of design processes have been understudied and perhaps not reported on

accurately [8, 9]. Langley et al. state that empirical studies of changes in processes versus in things may be more challenging to operationalize:

*“The language humans use to talk about our everyday world is naturally dominated by nouns, with verbs associated with action and change taking a secondary role. This may be one reason why so many process studies retain, to some degree, the language and ontology of substance even as they explore activity, event sequences, the unfolding of practices, enactment, and the dynamics of change”* [8].

Referring to temporality in interaction design, Huang and Stolterman point out that the way stories around interactions are articulated, there is a risk of omitting, possibly significant, smaller events:

*“In many cases, interaction designers and researchers describe an interaction just like they would tell a story. When people tell their own story, they describe the story details as a sequence of continuous events. ... Those descriptions, however, focus often only on some major events (particular sessions) during an interaction”* [9].

Through our work with DT-led innovation processes at the University of Oslo Library [10–12], we have noticed that design teams need time for orientation, incorporation and identification phases, especially so when they are new to design and DT. The orientation phase relates to the initial, sense-making stage of the DT process, where learning about the design context, learning to relate to other participants in the team, and ways to capture and frame opportunities for innovation are central [13]. The orientation phase is the time of uncertainty, creativity, and exploration, unfolding through broad and divergent ways of thinking. The incorporation phase starts when, from the messy creative process, clarity emerges and the pieces of design puzzle begin to fall in place. Rigour, precision, and analytical abilities are needed to propose a small set of jointly shaped concepts that have a potential to lead to an appropriate and meaningful solution. Loosely, the orientation and integration phases follow the divergent and the convergent thinking. However, from the time perspective, many other factors influence the time needed for orientation or incorporation, e.g., level of experience with DT teamwork, the expertise of participants, their communication abilities, mindset, motivation, and attitude. The identification phase has to do with seeing values of the final concept, holding responsibility for it, identifying with it and evolving it further, with a sense of ownership. Fig. 1 shows one possible unfolding of orientation, incorporation and identification phases of the process and their relation to a model of DT. These three phases also appear in the work of Karapanos, Zimmerman, Forlizzi, and Martens [14]. These authors reflect on user experiences of interactive products over time and describe temporality of use experiences with digital artifacts as a timeline crossing the orientation (becoming familiar with the product), incorporation (prolonged use) and identification (how the product becomes meaningful in one's life). Although the meaning of these phases in the DT process is different than in the experience of use, there is a relation between the two that can guide the design process. In addition, at the macro level, when an organization engages in DT-led innovation processes, the organizational changes can be described as a timeline across these phases. The organization gets exposed to DT (orientation), integrates relevant practices (incorporation) and finally, recognizes (identifies with) a set of new values shaping an innovation culture within the organization [15].

The temporal view of actions in DT processes is particularly relevant when carried out in distinct multi-disciplinary teams, across several locations. The three



temporal aspects of main interest for this paper are: i) awareness of temporal participation trajectories in the process and how the repeated participation can bring continuity to an otherwise fragmented workflow, ii) temporality of learning through fragmented processes and iii) opportunities for design thinking researchers and practitioners to open and apply temporal concerns in design processes in general.

Many academic libraries are looking at DT as a strategy towards a sustained innovation. Among them, several are exploring how to become knowledge hubs [16, 17]. The University of Oslo Library was directly inspired by the Stanford d-school model [18] and other organizations, public or private, that run similar hub-like, structured design processes. The case presented in this paper is a case of such engagement within digital humanities, supported by the University of Oslo Library. This way of working is still novel for the library and represents the direction that the library wishes to explore further.

The first author of this paper, in particular, has been engaged in seminars, workshops and design interventions that were organized as means of introducing Design Thinking, and later, supporting its integration with everyday work practices at the University of Oslo Library. Exploring DT in the hub-like setting was desirable from the library perspective, as the library could contribute in several ways, also by drawing in the appropriate human resources to discuss innovative solutions to problems of relevance for the academic community. Thus, when the first author got contacted by one of the two main investigators on the *Towards a Virtual Tebtunis* project, Design Thinking and a hub structure for organizing the project work were proposed to the investigator and accepted.

This paper describes what we learned about temporal aspects of DT processes, based on the case of *Virtual Tebtunis*. *Virtual Tebtunis* was a multi-disciplinary effort to use DT to propose an innovative digital research platform for studying artifacts from the ancient Middle Egyptian town of Tebtunis. The DT process was organized across three different organizations, aiming to propose a joint concept for the *Virtual Tebtunis*, to be further developed through the next collaborative project. Thus, we expected the orientation and the incorporation phases to cover almost the entire timeline of the project. We aimed to explore the interdependence of participation trajectories for selected participants and the timeframe for orientation and incorporation. The identification phase was to take place only towards the end of the project. The formulation of the proposal that is satisfactory for all participating research groups could lead to identification and feelings of ownership.

A time dimension could also be added to material findings, from the ancient times and life as it was in Tebtunis to the time that could be designed along very different principles within the *Virtual Tebtunis*. The material findings are predominantly papyri, but also other objects, such as vases, dishes, and jewelry. The Tebtunis site is still being excavated. Thus, as mentioned in [8], the project could be talked about both in terms of verbs (activities) and in terms of nouns (artifacts). We focused on the former, but the later emerged through the process organically.

The paper is structured as follows: In the next section, we provide the needed background for DT, dialogical space, creativity and digital humanities. In Section 3, we provide a short review of temporal aspects in interaction design and design thinking processes. In Section 4, we address the case of Tebtunis. Discussion on temporalities is presented in Section 5, which is followed by the conclusion.

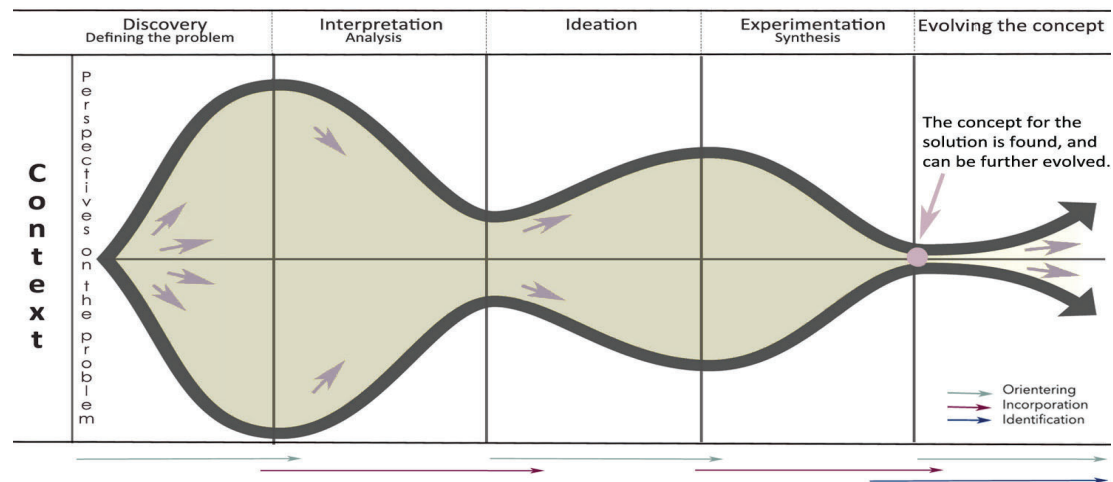
## 2 Background

This section is divided into four themes: design thinking and innovation, dialogical spaces, creativity and digital humanities. These, together, set the stage for this work.

### 2.1 Design Thinking and Innovation

Design thinking has been defined in many ways, and there is still no universally accepted definition. The one provided by Brown is frequently used and describes design thinking as “a human-centered and collaborative approach to problem solving that is creative, iterative and practical” [19]. Noweski positions knowledge and change as more central concepts: “design thinking reproduces knowledge through action with the goal of changing existing situations into preferred ones” [20]. Rubin’s view of DT is that of a “model of design as a means of enactment in which norms are tested against the complexities of particular temporal situations” [21].

In relation to innovation, a series of successful examples of the use of DT have been mentioned [22], but how to adapt this approach for longer-term processes and particular kinds of situations, is little discussed. The innovation processes are usually seen as the alternation between different thinking styles, most importantly divergent (broad investigations) and convergence (the ability to analyze and focus), see Fig. 1.



**Fig. 1.** Innovation using design thinking and alternating cycles of divergent and convergent thinking. The arrows at the bottom of the image show the phases of the process: orientation, incorporation, and identification.

When DT is introduced in organizations as an innovation strategy, a concept of innovation capability of the organization is often used [23]. As expressed in [24], it is the “preparedness of the firm, or its ‘muscles for innovation’.” According to Schreyögg and Kliesch-Eberl [25], organizational capabilities are close to the action and cannot be separated from acting and practicing: “They are brought about by social interaction and represent a collectively shared way of problem-solving”. While the organizational capabilities can be framed in different ways, we adapt Cristensen’s

model to a year-long work on a complex project like *Virtual Tebtunis*, in the context of the University of Oslo Library:

1. Available resources, seen as resources in people, their competence and knowledge, technological resources, networks, space, products and services, information, financial resources, and relationships with external partners that the project has.
2. The capability to organize processes, structures, people.
3. Values, norms, culture, and criteria used for decision-making.

Furthermore, Assink [26], speaks of adoption barriers to innovation within the organization. From the five main barriers presented (*ibid.*), we could, prior to the start of the project see how the following three could affect the outcome of the project: mindset barriers (towards leaving known areas of expertise at both the individual and the organizational level), nascent barriers (lack of skills and motivation for innovation, learning how to think like a designer), and infrastructure barriers (related to the feasibility of the technology).

## 2.2 Dialogical Spaces

Design thinking often involves teams of people working on a problem. It is thus, regarding capabilities (also barriers) highly relevant to use their skills and knowledge appropriately when working on a set of possible solutions to a given problem.

The type of competencies each of the participants has is essential and needs to be taken into account. In fact, while there is a general understanding of the dynamics of the teamwork, e.g. [27], we believe that time aspects here too were understudied. Using the DT approach in teams gives the participants new competencies, learning happens fast, and shared understandings are built over time. Moreover, creativity in teams [28] needs to be better understood within the DT approach, especially where most team members were novices to DT and non-designers, as is the case in *Tebtunis* project.

Scholarly knowledge exchange needs to unfold, [29]. The process of exchange needs to be arbitrated, facilitated or moderated to ensure that the participants are building on their collective knowledge and that they jointly define the meaning and values related to the project [30]. A common project language is usually created through this process [31]. As more than one dialogue can be taking place simultaneously within a team, we named a space for these exchanges a dialogical space. A dialogical space includes ways of articulating explicit, tacit, observable, and even latent knowledge of the participants.

During the design process, mutual learning happens, based on a team-reflexivity [32], hands-on engagement, careful articulation. Thus, forming teams, creating and cultivating a common project language, sharing and arbitrage of knowledge, making sense of the problem in a given context and meaning construction all belong to the orientation phase of the process, and demand both shared and individual time for catalyzing teamwork and establishing good conversations underway.

### 2.3 Creativity

Different phases of DT process are supported by different methods, including brainstorming, visualization, gaining of user perspectives, rapid prototyping, and evaluation. As mentioned earlier, the DT approach needs divergent ways of thinking, to allow a broad spectrum of insights. The convergent ways of thinking help to sort out less relevant ideas and allow the better derivatives to arise. Therefore the DT approach positions creativity as one of its core activities [33]. Both divergent and convergent thinking are necessary for the activity of defining and solving problems. Table 1 provides a list of typical ways in which divergent and convergent thinking are supported. Column one gives an understanding of the activities typically used to build a sensibility of the insights needed to define the problem area. How a person is more or less “*sensitive to problems*” [34] is a critical factor, and connected to the ability of participants in design activities to think outside their knowledge constraints. The aim of divergent thinking is to produce multiple and unexpected combinations, as doing several iterations of the problem definition, complement the problem solution effort [35]. Column two describes characteristics of convergent thinking. It requires an analytical and precise act, narrowing the possibilities using rigor.

**Table 1.** Characteristics of divergent and convergent thinking, based on [33].

<b>Divergent Thinking</b>	<b>Convergent thinking</b>
Being unconventional	Recognizing the familiar
Seeing the known in a new light	Combining what “belongs” together
Combining the disparate	Being logical
Producing multiple answers	Honing in on the single best answer
Shifting perspective	Reapplying set techniques
Transforming the known	Preserving the already known
Seeing new possibilities	Achieving accuracy and correctness
Taking risks	Playing it safe
Retrieving a broad range of existing knowledge	Sticking to a narrow range of obviously relevant information
Associating ideas from remote fields	Making associations from adjacent fields only

Addressing tension and the common alternation between the two ways of thinking, especially with participants who are non-designers, but researchers of high standing as is a case in *Tebtunis* project, some issues may occur. Firstly, the “fixations” may be encountered, where some ideas at first are simply blocked [36, 37]. Alternating divergent and convergent thinking may mitigate this issue. Alternating between radically new suggestions and conservative views is generally seen as beneficial to the process. For instance, “Seeing the known in a new light” requires a shift in perspective to foster possible new understandings. These characteristics are also relevant for the choice of participants, for example, selecting some participants with

domain-specific expertise (such as expertise on papyri in the case of Tebtunis, or in archeology) and some with expertise in design, ancient languages or technology may help with shifting perspectives, taking risks and the ability to retrieve a broad range of relevant, existing knowledge within the team.

## 2.4 Digital Humanities

As Monson and Taie point out in [38], only recently systematic attempts have been made at the site of Tebtunis to relate texts written on papyri to the archaeological contexts from which they came. The role of libraries and museums is interesting in this process since they have not only access to old items in their collection, but also quality checked information online. Often, libraries and museums need to deal with systems that combine their resources and different types of technologies designed for specific needs. Digital Humanities is a field that studies this kind of intersection with technology in humanities. However, solutions for digital humanities were, and still are, very often implemented by the researchers in humanities themselves, possibly with the help from an IT person working at the institution. The consequence is that the technology platforms developed in this way only loosely follow the epistemological path the researcher had in mind [39]. Recently, use of external IT consultancies became more commonplace in digital humanities projects, increasing the focus on technical aspects of projects [40]. *Towards a Virtual Tebtunis* is an example of a digital humanities project, where the researchers wanted to, together with others, bypass these problems.

## 3 Temporality in DT Processes

In [41], Lundgren and Hultberg propose to use temporal themes as thinking techniques. Although their interest was in exploring time as a design material, they outline several time-related themes to draw on in their explorations that can be appropriated as ways of thinking of time in the process organization. In this context, the unbroken or continuous time (the time that runs in unbroken intervals, but its speed can be altered), sequential time (implying the chronological order of events), fragmented time (shuffled in time, making random sequences in relation to chronological time) and juxtaposed time (overlapping sequences of time) can all be of importance. In [42], the authors propose to distinguish between the 'feeling' or perceived time and the real-time, Chronos and Kairos. In [43], Velt et al. explore the use of trajectories in Human-Computer Interaction (HCI) literature, focusing on their use, and exploring the potential of trajectories to form a 'native' HCI theory. These papers are all highly relevant for understanding the temporal aspects of DT processes.

### 3.1 Finding out how DT Practitioners and Researchers Think about Time

As we could not find much relevant literature on DT and temporal influences on the process, we decided to try to understand the relation between time and both

capabilities and innovation adoption barriers in relation DT processes by inquiring how other researchers and design professionals deal with temporal issues. To that end, we organized a workshop to explore this theme. We wanted to find out from those working with design thinking how they think about time in DT processes, learning and acquiring skills and mindsets needed. The workshop had seventeen participants, including interaction designers, social media researchers, librarians from academic and public libraries implementing DT in their organizations, design consultants, product designers and design researchers.

The participants were asked to use post-it notes and describe their design thinking projects regarding time (short, intermediate, long), reflecting on what was done in that time. Alternatively, they could place methods on the timeline and point to how much time was need to implement them correctly, see the top image in Fig. 2. As can be seen from the middle image in Fig. 2, the vast majority of participants engaged in short time activities, the few examples on the long side had to do with the use of products or services and their evaluation. A more thorough analysis of this workshop findings is outside the scope of this paper. It suffices to say that it helped us to become more aware of time aspects in design processes, but we still did not know how to instrumentalize this.



**Fig. 2.** The participants, in groups of 3-4, placed post-it notes on a DT timeline. The top two images feature the workshop with researchers and designers and the bottom one is from the session with librarians. Source: authors.

### 3.2 Finding out how Librarians Think about Innovation and Time

Subsequently, we organized a second workshop, with six participants, three of them librarians that were to innovate services within a library. They were asked to reflect on organizational capabilities and time, see the bottom image in Fig. 2. They considered organizational changes to take a long time, changes in culture were deemed to be mid-range, while value changes, economy, and technology were viewed as more variable and shorter-term changes.

In general, the two workshops helped us to empirically confirm what the existing literature states: time and temporality are underused, and our participants, in general, were not engaged with temporal concerns, many times not at all beyond the time management and process planning. Moreover, if they were, it was because temporal issues were in the forefront already, e.g., they worked with scheduling problems, the design of collaborative tools, or notification services.

## 4 The Case of Tebtunis

The project was first proposed by the Center for the Tebtunis Papyri at the University of California, Berkeley and The Papyrus Collection project of the University of Oslo. These organizations possess the most significant assemblages of Greco-Egyptian papyri in their respective regions (North America and Scandinavia) and are internationally recognized leading centers for papyrological research and instruction. Nearly the entire Berkeley collection and a significant part of the Oslo one come from the Middle Egyptian town of Tebtunis. Tebtunis is one of the best-documented settlements from the ancient Mediterranean world due to the tens of thousands of texts and other archaeological objects that the site has yielded. Moreover, objects continue to be unearthed each year in ongoing excavations. In particular, the site's temple dedicated to the crocodile god Soknebtunis has generated the most interesting papyri library to survive from Antiquity. Tebtunis has been subject to extensive illicit excavations, and as a result, objects from the settlement are literally scattered across the globe: beyond Berkeley and Oslo, they are to be found in Ann Arbor, Berlin, Cairo, Copenhagen, Florence, Lund, Milan, New Haven, Oxford, Padua, Peterborough (Ontario) and Turin. Access to these collections is not always easy, and the fragments are difficult to collect. Besides, papyri are written in difficult scripts. The number of people possessing the philological and paleographic skills necessary to work with these papyri is rather small, and experts are not present at some of the institutions holding the texts. The aim of *Towards a Virtual Tebtunis* is to overcome these difficulties, that is, to begin the work necessary to realize Tebtunis' unique potential as an object of historical inquiry. Researchers at papyri considered digitalization, an appropriate digital platform, as a possible solution towards this end. Many of the Tebtunis papyri are already available in various forms (texts, images) through digital resources (papyri.info, tebtunis.berkeley.edu, and Oslo Papyri Electronic System). Much work remains, however, e.g., over 10,000 Berkeley papyri are entirely "off the web," and electronic access to other archaeological objects is significantly behind the papyri.

Taking the DT approach to engage with the project like *Towards a Virtual Tebtunis* implies organizing teams and the process workflow, based on the needed expertise. We started the process by forming a core group of researchers for the project. This group included two principal investigators (papyrologists), authors (researchers on DT), and a subject librarian responsible for the papyri collection. Methods were proposed for discussing themes related to what *Virtual Tebtunis* could be, the feasibility of existing technological solutions to support the *Virtual Tebtunis* proposal, and how it could be opened to audiences beyond researchers. It was decided that a preparatory workshop would be conducted in Oslo. The expertise of teams, workshops lengths (in relation to innovation potential), tools and techniques were to be tried in preparation for the three main workshops in locations possessing a substantial amount of Tebtunis papyri: Berkley, Oslo, and Padua. Workshops were to be similar in all three sites so that findings could be related to overarching goals, and generate solutions, including the digital platform, that all involved institutions would be willing to use and collaborate across. For most participants, this project was the first meeting with design thinking, and for others, even if they had exposure previously, designerly ways of thinking and working were still not familiar grounds. The time allocated for the project was one year, but the workshops were conducted within four months.

#### 4.1 The preparatory workshop

The preparatory workshop, held in Oslo, engaged ten participants: two librarians, two design researchers (the authors), a papyri subject librarian, two papyrologists, a research assistant on the *Tebtunis* project, a web-editor and a researcher in Egyptology. Only four of the team members were having a direct interest in the project itself. The others were chosen based on perspectives they represented, their potential to contribute towards the goals of the project, time availability and an open mindset and interest to partake in a workshop using DT [10, 44].

The workshop started with a brief introduction of the DT approach, as well as the *Towards a Virtual Tebtunis* project and its goals. The technique to set everyone thinking about the design was based on cards (At One cards [45], and a set of 28 self-produced ones to discuss Tebtunis artifacts, languages on papyri, and technologies, or games such as Minecraft, that could be of interest), see Fig. 3. Further, exemplars of papyri, post-it notes, and pens were provided. As an ice-breaker, each person was invited to take a card that they relate to their current understanding of the project. In turn, participants explained how they could engage with the project, and explained the choice of the card. Subsequently, two groups were formed, one with focus on the perspective of museums and libraries (papyri owners), the other on the research perspective. The groups were encouraged to create user's journeys on the future platform. What could users do with a platform (as researchers, visitors, or interested papyrology armatures)? Some ideas that emerged were to make online representations of ostraca (writings on pottery pieces) on all sites and allow people to collate them together. The collated pottery could help the scholars to place the findings both in time and place. Variation of this idea involved the 3D printing of ostraca pieces and constructing a physical puzzle.





**Fig. 3.** The use of cards during the preparatory workshop, examples of papyri. Source: top and bottom images, authors; the middle images are from the OPES collection, used with permission.

Suggestions emerged on how to combine existing sources of information, like papyri.info (a large textual database with images of papyrus), with other databases. This, it was argued, would allow for richer and more innovative ways to work with existing data. One of the ideas was to combine geocaching [46], with advanced scholarly systems. As one of the scholars pointed out, “*we should be allowed to pin papyri data on a map*” using the textual information of the papyrus to locate the place where the item was found. Enriching map spots with relevant metadata, including library information about different types of publications, could be a valuable new resource for scholars. Several suggestions were based on a combined insight from different participants and their competence areas. The workshop took approximately two hours.

In summarizing what we learned from the workshop, we could say that group composition and competencies of participants worked well in the sense that different perspectives were really used in the discussion, and participant’s knowledge and skills contributed to broadening the design domain. The activities were experienced as creative. We could also observe that participants did not push own ideas to the point of the group becoming fixated on one idea prematurely. The new understandings and co-created meaning of the project that started to emerge appeared to be based on a ‘fair’ (equal) participation. Epistemologies of different research fields that were represented were discussed. Also, the participants engaged in the discussion of how and what the technology can potentially contribute towards the desired outcome of the project. The new framing of the problem space was agreed upon, and new language was learned (e.g., concepts from DT, concepts related to the technology and

interaction). For example, two participants shared their own experiences with digital humanities and how they learned that it was necessary to reflect over the connections between their understandings and experiences and the process that was unfolding at the workshop. From this, we could say that a dialogical space was being formed, and had a potential to be further evolved. We could also see the seed of innovation capabilities.

**The summary on time.** We experienced that people we asked to participate in the workshop were willing to commit two hours of their time. More time was hard for some. However, materials on design thinking that we sent in advance were not read by anyone. The motivation to learn about DT and find time for reading, was not present before the workshop. After the workshop, the interest in the methodology increased, and several participants came back with further questions related to the approach. We found that, overall, the workshop was too short. Most of the time was spent on orientation (what is design thinking, establishing what knowledge and skills were available, how to communicate across disciplines, how to understand the design domain and on ideation). A small amount of time was used on the incorporation of discussed ideas, mainly through preparation for in plenum presentation of the group work. Referring to the Fig. 1, the workshop timeline covered the discovery phase.

Post-workshop, a rapid prototype of a Tebtunis site was made in the Minecraft application [47], loosely based on the real map of Tebtunis. This was done to discuss the potential that the collaborative environment building offers, including a possibility of using the gamification approach, see Fig. 4.



**Fig. 4.** Tebtunis prototype in Minecraft - a tool to think about how to represent places where artifacts were found, possibly including gamification, on the one hand, and crowdsourcing the building of the site on the other.

## 4.2 UC Berkeley Workshop

This workshop was conducted at the Bancroft Library, at UC Berkeley, only days after the preparatory workshop in Norway. For the first time, the two principal investigators, the Norwegian and the American professors in papyrology, the core group members, participated. Given that most of the time in Oslo was spent on

orientation, we wished to shorten the time it takes to introduce DT. Therefore, two meetings were scheduled and held before the workshop, one with the papyrology professors, and the second one with the librarian from the Bancroft Library, with expertise in digital humanities, and specifically, metadata. In both meetings, DT was briefly explained. Subsequently, the epistemological trajectories [39] were discussed in relation to the creation of new knowledge and innovation in both research and technology.

Given the experience from Oslo, a whole work day was scheduled for the workshop. Participants, from the core group, were the two papyrology professors, the subject librarian, and a design researcher. The new participants were a Ph.D. student of design history from Norway, a design researcher, two Ph.D. students in papyrology and the metadata librarian. The participants were divided into two groups, the first focusing on papyrology research and new opportunities created by technology, and the second one considering other possible contributors to the research.

This time too, the ideation phase was exciting for all participants. A rich set of ideas was proposed. For example, Google Street View with the 'time machine' slider was proposed for Tebtunis. This idea was liked and presented an option to be considered for the new platform. By moving the slider, one could see how the 'street' view was changed in time. The items discovered at a specific time could appear and then fade as the time changed. This idea was based on the concept of a timeline and historical trajectories. This was also a beautiful example of temporality in 'nouns' as discussed in the introduction.

Some participants were inspired by The London Street museum App [48], as an additional option for the *Virtual Tebtunis*. Users could collate photos, maps, and positions on the maps. It was suggested that it would be cool if users could, for example, toggle a building, switch to a 3D mode, walk inside the building. Several conversations were started around different approaches to help the person in situ. Furthermore, ideas included two-dimensional aspects of the future *Virtual Tebtunis*, such as the Minecraft based one, or, accessing Flickr images of buildings, enriched with narratives related to specific places. In conjunction with the user perspective, a navigator was proposed for referencing people whose names were found on papyri. Their names could be pinned on the Tebtunis map. This was an expected input since UC Berkeley was working on a prosopography project [49]. A sort of the 'Library mode' was discussed, e.g., a text search could show articles and books on the map, introducing or discussing different items. Other ideas included making the site function as a peer-reviewed journal, making a closed user group for adding relevant metadata. Solutions for engagement of interested amateurs were partially based on the ones from the preparatory workshop, but new ideas were added. For instance, placing a museum artifact into the context of Tebtunis was desired. A possible solution was an app that could render a 3D image from the photo of the museum object and place it in the *Virtual Tebtunis* site. Many rapid prototypes were made, including mascots for the service, video streaming from the excavation site, and various apps.

What we learned, in summary, is that with more time, it was natural to engage hands-on. Participants constructed and visualized representations of high-level user journeys articulated their knowledge well and used the cards as a tool to construct and cultivate an adequate common project language and the dialogical space. We could observe all characteristics of divergent thinking listed in Table 1. Analysis of data

gathered through this workshop shows how new participants added new inputs into the process and in doing so, used more creative, unconventional and out of the box approaches, e.g., the introduction of a mascot could be understood as quite unconventional, taking into account how highly classical the subject of papyrology can be. The workshop process was viewed by participants as engaging, and an overall positive experience. One of the principal investigators pointed out: “... *it helped me really to reframe my thoughts*”. The innovation capabilities demonstrated by this team during the workshop were excellent.

**The summary on time.** Even though the workshop took the whole day, time was experienced as just right. The workshop ended at the moment where all participant could project in time the vision of the future *Virtual Tebtunis*. They could envision real, possible, alternative, and achievable solutions. This time, the team went beyond the orientation phase. They prototyped and evaluated ideas, applied convergent thinking and synthesis to present a few concepts that they would want to continue to work with. Thus, the orientation and incorporation phases roughly followed the arrows at the bottom of the image in Fig. 1. Some participants also showed a tendency to identify with a few selected ideas that were not their own, thus also engaging, at least partially, in the identification phase.

### 4.3 Oslo Workshop

This workshop was carried out some months after the Berkeley one, and a few days prior to the Padua one. In total, ten participants were present. There were some repeat participants. The only newcomers, invited by one of the principal investigators, were an archeologist and a dramaturg, versed in ancient languages. Since many participants were now familiar with the methodology, the time for the workshop was reduced to half a day.

The participants, just like in Berkeley, were divided into two groups, with identical themes to explore. The memos from the Berkeley workshop were shared. We were unsure how this sharing would affect the process. The concern was that the participants could get too focused on the memo, thus, reducing the creativity. Alternatively, it could shorten the time leading to ideation. During the workshop, an archeologist showed how Autocad could be used to render ancient buildings using accurate data. A project from the Humboldt University was shown, where students had plotted in data to reconstruct a 3D representation of the Forum Romano [50], see Fig. 5. This was also an example of the use of technology otherwise intended for other purposes, and it could be used for Tebtunis. The technology gave more visually impressive results than Minecraft, Fig. 4, but Minecraft had the advantage that anyone could use it. The archeologist was interested in making 3D representations of smaller items that are typically found in Tebtunis as well. He had experience with Agisoft software that can combine several photographs of an archeological object, resulting in a 3D digital representation of the artifact. Minecraft and Autocad (Fig. 4 and Fig. 5), and ideas around timelines from Berkeley workshop were opening up many possibilities for synthesis and building on a combination of a portal for interested amateurs and a portal for researchers.



**Fig. 5.** Digitales Forum Romanum, an example of what can be done in Autocad. Source: [50].

The group working with solutions for other possible contributors to research on papyri came up with a broader range of audiences, from high school students to retired adults, using learning resources for schools, open lectures for the broader public, and papyrology games and apps for older adults related to possibly tedious research tasks. In this context, more general concerns around technologies for digital humanities were discussed, articulating the desire for a slower rate of changes in technology and less disruption, in particular, if older adults were to use the research platform over time.

What we learned, in summary, is that experienced participants did influence the outcomes positively. The findings from the workshop show that the work was more complex and richer in terms of bringing in new perspectives, as well as including technological aspects more explicitly.

**The summary on time.** Regarding the timeline phases, they were similar to the Berkeley workshop, with identification phase a bit stronger in relation to the potentially interesting idea of technologies for humanities that would change slower. This workshop clearly demonstrated that repeat participant trajectories not only shorten the time but enrich the outcomes, i.e., the more experienced team members were, the better time usage was possible. This is as expected, but very clearly demonstrated.



**Fig. 6.** The image shows how the memo from Berkeley, digital and paper maps, cards and digital tools such as Autocad were used in this workshop. Source: authors.

#### 4.4 University of Padua Workshop

Workshop at the University of Padua had four core team members (the papyrology professors from UC Berkeley and Norway, the subject librarian from Norway, and one of the authors) and two other participants who attended one of the previous workshops. Although researchers from Padua had no representation in the core team, they were an essential stakeholder in the process. Therefore, several informal meetings before the workshop were held, so that all three research groups could exchange concerns related to the project. The University of Padua, besides papyri from Tebtunis, has an extensive collection of objects, as well as excavation images and other data. Therefore, new participants in Padua besides archeologists, papyrologists, a design researcher, included representatives of museums that owned papyri, and other objects, a total of eight persons. The workshop time got extended to a full day again so that there will be enough time for orientation, incorporation, and identification. Post-workshop, a meeting with the core group and researchers from Padua was scheduled to synthesize observations, ideas, concerns – both the methodological ones and those related to the technology.

The process during the workshop was the same as in the previous ones. However, the group distribution was determined by senior researchers, that decided to work together. Thus, one group had all the senior researchers in papyrology, archeology and the museum field, while the other group gathered together young researchers, librarians, and designers.

The first group brought forth concerns regarding copyright of artifacts that were not yet studied and their representation in the *Virtual Tebtunis*. The group also engaged in rapid prototyping of user journeys using cards. Many ideas emerged, some inspired by cards, and others by situated knowledge. For example, the possibility to export 3D representations of the virtual city to other formats engaged participants in a discussion of issues related to the accuracy of digital reconstruction. Similar to Oslo workshops, other more profound and more difficult questions emerged. This time, for example, how to cope with museums' sometimes bureaucratic conduct. Finally, problems with competing values regarding artifacts, when researchers were from different fields (archeology vs. papyrology), showed the complexity of issues one needs to deal with to find solutions. This was a positive experience for participants since the group was then able to identify possible future problems and note that these need to be solved.

The second group generated a record number of ideas, 26, ranging from conferences in the *Virtual Tebtunis*, to securing the sustainable development of services for the site. The second group generated a record number of ideas, 26, ranging from conferences in the *Virtual Tebtunis*, to secure the sustainable development of services for the site.

The participants also this time were very positive regarding their experience of the workshop. Comments like “*This was a change in how we think and the way research can be done*” were given.

What we learned, in summary, was that even though the approach used was very similar to that of previous workshops, the experience of this one was very different. It allowed for deeper rooted issues between the research fields to emerge. The particular division into groups and similar seniorities of researchers perhaps enabled a more in-

depth and heated debate. They also influenced the amount of time needed to reach some form of consensus. However, the workshop indicated significant innovation opportunities also affecting museums.

**The summary on time.** Concerning the project timeline that the core group had in mind, this workshop was to be the one that would end in one or two possible proposals for the *Virtual Tebtunis* that all three research groups could identify with. In other words, our aim for this particular workshop was to pass through all three time-phases. However, although we could claim that orientation and incorporation phases were present, the identification phase was clearly absent. Many factors could have contributed to this situation, and some do not have to do much with time.

The most important lesson from this workshop for our research was that we need to address time and temporal issues in a richer and more holistic manner. Also explicitly engage design teams with this material.

## 5 Temporality lessons from the *Virtual Tebtunis*

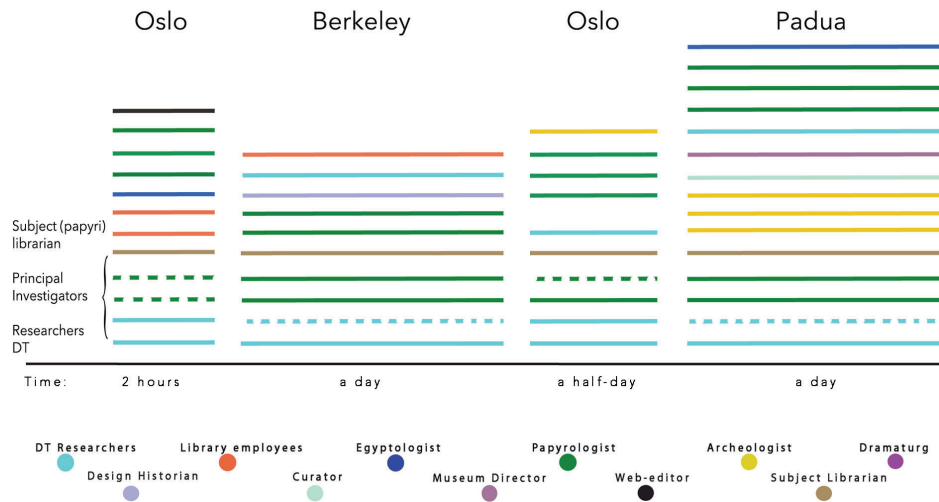
Our thinking about temporal aspects of design processes, at the start of the project, were related to very simple concerns about the use of time in the workshops, and how much time was needed to properly time-manage the DT process for innovation in digital humanities. Specifically, we were interested in three aspects: 1) awareness of temporal trajectories in the process and how to bring some continuity to an otherwise fragmented workflow, 2) temporality of learning through such fragmented processes and 3) discussing opportunities for design thinking that arise in conjunction with temporality concerns.

### 5.1 Trajectories, Continuity and Segmented Time

The nature of the project was such that we had a sequential, yet fragmented process because main stakeholders were not co-located. They also had different academic cultures even within the same field (papyrology). Thus, our concern was how to provide some continuity in the otherwise fragmented workflow. The solution that we found was to use the notion of participant trajectories and their orchestration [43]. Those were interleaved in such a way that one papyrologist, one DT researcher and a special librarian were present at all workshops. The core group, except the preparatory workshop, was represented by four participants in Berkeley, Oslo, and Padua workshops, see the bottom five trajectories in Fig. 7.

Furthermore, the intentional similarity in conducting workshops was to provide an opportunity to juxtapose the workshop activities and lengths of time they required for different phases of the process. This was to help analyze both emergent similarities and differences. Similar ideas and concerns, we reasoned, could facilitate articulation of the proposal for the *Virtual Tebtunis* that all stakeholders would feel the ownership over. Differences could show ‘pain’ areas to address, such as the quality and ‘reality’ of cooperation. However, we allowed for variations, as can be seen from descriptions of the workshops, e.g., sharing of information (Berkeley memos), use of digital tools,

the length of workshops, and from Fig. 7, which shows differences in numbers of participants and participant's profiles. Still, even if not applied with rigor, awareness of different times (continuous, segmented, and juxtaposed time, [41]) was helpful.



**Fig. 7.** The image shows the workshops and profiles of the participants in each one. The bottom five trajectories of participation represent the core project group.

Even more valuable were reflections over noticed similarities between the timeline concepts (orientation, incorporation, and identification) and the DT process outline from Fig. 1 with divergent and convergent thinking. This led us to a much more explicit engagement with time, that subsequently, allowed us to think in terms of temporalities, both in concrete and project relevant terms and regarding theoretical concerns that led to establishing a framework for temporal aspects of DT.

First, the concrete repercussions. As is common, everyone involved was having an intensive workload. While for the core group, the time put in the project was directly useful, all others involved came to share their expertise in the hope that it could be of good use, but they also were curious about DT. As described in the preparatory workshop paragraph, we have first tried to have people read material tailored to the needs of the project. This did not work, but using a hands-on approach within a clearly defined time interval, worked well. DT researchers often report that rapid learning happens, but just how much time would be enough for this in a project where most participants were novices to the approach? The two-hour period used in the preparatory workshop showed that for the project of this scope, that time interval was not sufficient. Thus, the strategy for learning and informing about DT changed from trying to have participants read about it, to short face-to-face meeting with key persons before the workshop. This worked well. As long as the key participants were on-board, mastered basic vocabulary and understood the process, the remaining participants were indeed able to learn fast and use their skills and knowledge in dialogs, as well as ideation, interpretation, and synthesis of ideas.

The creativity of the process, in conjunction with the difference in relation to the habitual work practices, made the time 'appear' to pass faster (Chronos, perceived time [42]). As described, we have also made efforts to reduce the real participation



time (Kairos) as much as possible, in appreciation of participant's otherwise busy schedules and without compromise in the quality of workshops. What we could experience then, about temporal structures of the DT process, are different timeframes:

1. The underlying layer of a timeframe for the whole project
2. Timeframe for scheduling of workshops
3. Timeframes of different experiences of engagement in the workshop (e.g., orientation, incorporation and identification)
4. Timeframes between workshops (when other kinds of work took place, such as networking, prototyping, e.g., Fig. 4.)

Our understanding of the temporal structures became richer, and we derived the framework that we intend to explore further, see Fig. 8. As the figure indicates, the horizontal basis is about attitudes and mindsets, where the vertical basis for temporal work is the awareness of time – real time, but also all those other time concepts like continuous time, segmented time, individual time, shared time and more. Questions like how to represent time, what it means in the process, for who is this time, what can be done in this time, how to extend the time, consequences of too short or too long time allocated are natural questions to ask.

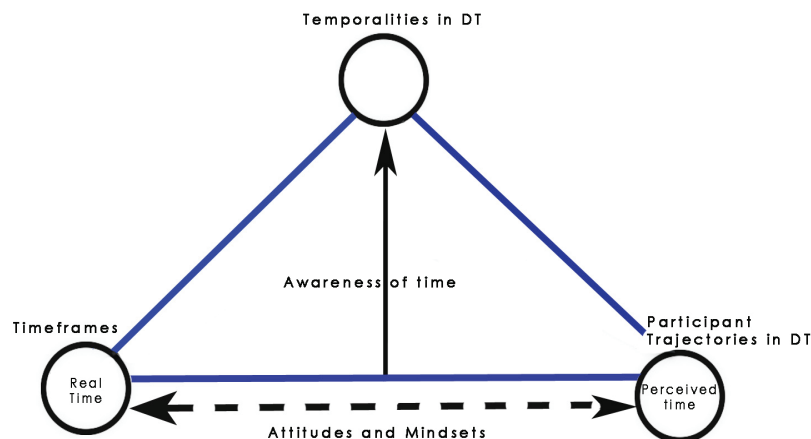


Fig. 8. Temporality framework for DT processes.

## 5.2 Learning Trajectories

The temporality of the learning process was interesting. Our previous experiences with applying DT were often related to projects involving computer science students and projects. One of the main issues in those context has always been a desire to ideate only until a reasonable solution was identified, and then solve the problem. This experience has been different. As described in individual workshops, different workshops focused on different issues, but they never converged prematurely and did not exclude potential future problems or philosophical discussions, e.g., the rate of change in the technology field and its impacts on digital humanities. Many participants have commented in the aftermath of workshops that they gained some new skills that they can now apply in their work, including both principal

investigators and the subject librarian. Learning in this sense was the most valued outcome of participation. We have facilitated rapid learning that, according to the participants, will be long-lasting and used again in the future. In line with [13], we argue that the frequency of repetition plays a role in integrating DT as a skill and ability to apply it in regular work. We have observed qualitative differences in applying DT among core members across time and repetitions of DT in various workshops. After the initial introduction to the methodology, they needed little time for orientation as they were familiar with the context for design, and curiosity and time to find out things were mostly related to the platform choices and opportunities for lifting the research.

The reason for accepting DT approach to making a virtual representation of the ancient city of Tebtunis was, according to the two principal papyrology researchers, precisely the opportunity to gain a closer understanding of the space between their knowledge and technologies that are feasible to use as a support for their research practices. In other words, they were seeking a closer entanglement with digital humanities, through new means (learning trajectories).

### 5.3 Opportunities temporal aspects provide for DT processes

We argue that understanding time and learning about time offers new possibilities for DT processes. The DT approach was new for most participants in Tebtunis project. We believe that our focus on time has made it a better experience in practice for all participants.

For us, as DT researchers, the involvement in the project has helped us to grow our understanding of how time can be used (creatively, critically and theoretically) in DT processes, much inspired by the empirical work described and by articles within HCI, such as [43, 51, 52]. We list some examples.

Firstly, it allowed a closer look at time aspects required to accomplish activities related to the initial phases of DT. We have allocated a rather short time to the preparatory workshop (just two hours). It was enough time to understand what DT is about, how the context is approached and experience broadness of inquiry. However, there was not enough time allocated for incorporation phase and either deeper or rigorous analysis of the problem space.

Secondly, dialogical spaces needed to be supported better, and that needs to allocate live time [41]. When so many researchers are involved, clear communication, articulation of views, reaching consensus and making decisions that satisfy all becomes difficult. Especially so when many good researchers are involved in the process, as was the case in *Virtual Tebtunis* project. The exchange of knowledge is crucial [9], and needs to be addressed accordingly. Some pre-analysis of how the combination of competences could unfold under the actual run-time of the event is important. We argue that arbitrating knowledge in the context of the DT process is a key factor for the success. The creation of knowledge [39, 53], where technology and the humanities are more integrated, should be based on solutions that “*require the combined expertise of technical, professional, and scholarly personnel*” [54].

Thirdly, while the *orientation* phase could be shortened by making sure that core competencies are represented, the *incorporation* phase was supported by interleaving

participant trajectories for the core group of researchers and other key participants. In general, some simplifications of the process could not be avoided when people are novices to the methodology, and also come from different academic fields. Only with deeper understandings, the perspectives can be fluently changed, shifted and explored. This is a point that offers possibilities for further research on how to use timeframes to make the process more efficient.

Fourth, the interaction between researchers in humanities and technology is important. Discussing and showing diverse platforms and technologies has been very important for the process as well as the development of digital prototypes as shown in Fig. 4 and Fig. 5, although it did require time that was potentially wasted.

Fifth, we could, in the last workshop notice some socio-temporal manifestations, shared in a social group with similar academic status. The group worked on their own subjective time, sometimes unstructured and unrelated to the workshop time or the clock time. This led to both depth of emerging themes, while also including tensions that needed to be sorted out. This aspect of time is certainly not subject to the linear scheduling of activities, but demands its own, unpredictable, evolvement in time. We did not have a prior understanding of what the effects of this could be, so this was a new finding for us as researchers, and also a potential direction for further explorations.

Sixth, as could be expected given that a connection between the past and present needed to be established through the *Virtual Tebtunis*, many suggestions were focused on a timeline [9], and how to best visualize and utilize timelines.

Seventh, although explorations we did with other DT professionals shown in Fig. 2, were made within the context of the library as a hub for digital humanities innovation, the research process around different temporal frameworks and patterns, serving as analytical and critical perspective at the end of the project, has been crucial. While the workshops are in the short-term range here too, processes that need to be integrated take longer time and vocabulary that we adopted as this project evolved has been very valuable. This vocabulary was relevant for addressing dialogical spaces, knowledge exchange, values, and common meaning. For example, working with timeframes can help discern levels of importance of some tasks and phases of the process. However, the time should not be imposed. In other words, if, e.g., ideation and opportunities for innovation are seen as the top priority, time should actually not be assigned to activities (as much as possible) that generate these. Preferably, the activity should be allowed to go on for as long as relevant new ideas and thoughts are unfolding.

Eighth, working with participant and other trajectories opens possibilities for planning and analyzing processes, in particular when things do not work out as planned (Padua workshop).

In proposing this framework, we certainly do not wish to create a *procedure* for working with temporal aspects in DT. We intend to support reflections around time, towards increasing flexibility in processes, along with the lines of organic processes [55]. Treating time as a design material in DT innovation processes, gives some new ways to talk about participation in innovation processes, interventions during the process, oscillations between different modes of thinking and working.

## 6 Conclusion

In conclusion, for DT processes, the influence of time and timing is important especially when insights from different efforts need to be integrated into a coherent whole. Also, the DT approach itself, traditionally, incorporates design practices and explorations to a great extent, the relationship to theoretical perspectives can be strengthened. This paper, thus, suggests an initial framework for including issues related to temporalities explicitly in the DT process and working with timeframes and trajectories (in our case only participant). The case of Tebtunis offers an account from our empirical and practical work, showing how temporal aspects emerged. More research into temporal aspects of DT is needed. We consider our work to provide a step in this direction. How temporal issues affect innovation capabilities is left for the future research.

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# Building Design Capabilities in Academic Libraries

GASPARINI Andrea Alessandro

Department of Informatics, University of Oslo, Norway  
andreg@ifi.uio.no  
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While design-led innovation may have huge potential to change both tangible outcomes of design, such as products and services, and the intangible ones such as values, mindsets and organizational cultures, the approach has not been broadly investigated in the organizational settings, especially when it comes to building in-house design capabilities. The paper reflects on both practical and theoretical concerns around building of design capabilities in academic libraries. The making and sustaining design capabilities was supported by design interventions in the form of design workshops and other design activities, and repeated re-enforcements of constructivist and experiential organizational learning leading to integration of design proto practices with daily routines and established work practices. The findings are articulated as a set of guidelines toward building design capabilities in academic libraries through design thinking. At the conceptual level, the work highlights the importance of openness, dialogical spaces and temporal aspects of such processes.

Keywords: Design capabilities, research through design, design thinking, knowledge brokers, design interventions

## Introduction

In the past decade, we have witnessed extensive changes in the roles of libraries in general, and academic libraries in particular. Academic libraries have been challenged, on the one hand, by the emergence of new technologies and devices (e.g., e-book readers, smart phones), digitalization (e.g., Google Scholar) and new ways of research and knowledge management (e.g., Research Gate) (Saunders, L. 2015). On the other hand, academic library users are often competent and are early adopters of new technologies and digital tools. They also have ever increasing demands for good user experiences and services and solutions that support their dynamic work patterns, both in physical and digital environments (Sennyey, Ross, & Mills, 2009). This situation requires paying continuous attention to the role of the library in an academic community, including consideration of the services on offer. In other words, academic libraries must be ongoingly concerned with institutional visions and strategies for the future, and develop innovative practices that allow them to be active and agile forces within the academic communities they serve. One approach to tackle this challenge is based on adoption of designerly ways of thinking in an organization, and building design capabilities toward sustained innovation and strategic reflection efforts.

We make a distinction between designerly ways of thinking and working and design thinking as commonly appropriated in business management. The former has been tied to design research and understanding of how designers think, reflect and act, see for example, (Buchanan, 1992; Krippendorff, 2006; Margolin & Buchanan, 1996; Schön, 1983, 1992). The latter has been praised as one of the best approaches to innovation and organizational transformations, for both public and private sector. The literature here is extensive, but we refer to early research such as (Brown, 2009; Brown & Wyatt, 2010; Kimbell, 2011; Martin, 2009; Stewart, 2011), emphasizing how design thinking creates opportunities for design to enter new fields like business management



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and strategy, or education. The main 'active' ingredient in design-led approaches is creativity (Kimbell, 2011). Design thinking in business has been criticized for suppressing this ingredient by streamlining the process into a procedure consisting of four main phases: empathize (with users), define (the problem), ideate (consider and rapidly prototype a broad range of ideas), prototype (one or two of the most promising ideas from the previous stage), and evaluate (to what extent the proposed solutions solve the problem and how well they work for users), see (Nussbaum, 2011, 2013). Even so, just how to implement and sustain design thinking efforts in organizations without the presence of professional designers or design consultancies becomes a crucial question, and represents an identified research gap (Carlgren, Elmquist, & Rauth, 2014, 2016). Furthermore, if an organization opts for hiring designers or consultancies for specific tasks, the issue of how to continue working on these tasks after the work of a professional design is done (ibid.), presents a continued challenge.

Later examples in entrepreneurial and managerial discourse around design in institutional settings (Malmberg & Wetter Edman, 2016; Malmberg, 2017) point in the direction of building institutional design capabilities.

Given their need to innovate, libraries have also turned toward design thinking. Consultancies like IDEO (IDEO, 2014) developed a set of methods for working specifically with library's visions, strategies and responsiveness to external challenges. However, these tools were useful when professional designers guided the work. When their work was done, the design thinking and innovation efforts would often stop.

Thus, in this paper, we propose an approach that aims to provide for sustained (over time) abilities to work with design-led innovation by building *in-house design capabilities*, so that academic libraries can respond to both external and internal challenges more appropriately. This does not imply that professional designers and design consultancies cannot play a role in innovation any longer; it just scaffolds forces within the organization to understand design and be able to work with or without professional guidance more effectively.

The research presented in this paper is of an explorative and experimental nature, aiming to inquire into how to approach developing in-house design capabilities at an academic library. Research through Design (RtD), see (Bowers, 2012; Dalsgaard, 2010; Fallman, 2008; Gaver, 2012; Höök et al., 2015; Koskinen, Zimmerman, Binder, Redstrom, & Wensveen, 2011; P.J. Stappers & Giaccardi, 2012; Zimmerman & Forlizzi, 2014) was chosen, inspired particularly by the work of Fallman (2008), as it focuses on how design practice, design explorations and design studies combine to address the research positioning towards discovery of best practices, tools and methods that support emergence of design capabilities within an academic library. Other approaches, such as action research could have been a good alternative. However, experimental quality, flexibility and openness of RtD, as well as continued insistence on reflection, were characteristics that led to choosing the RtD for this work.

The library as an organization had no prior orientation towards design or design thinking. Methodologically, we use designerly ways of thinking and working to introduce design thinking processes and enable library employees to gain design capabilities that can, in turn, sustain the use of design-led organizational transformations and innovation of products and services. The research was carried out through design of a series of sixteen design interventions, in the form of design workshops or other design activities. The interpretation of the design practice, exploration and studies in the context is presented in detail in the methodology section of this paper. Constructivist and experiential organizational learning were used to gain design capabilities and establish designerly practices. This learning was re-enforced by repeated interventions (each having a different design goal), and over time, led to integration of these ways of thinking and working with daily routines, transforming the work practices in the library (Pandey, 2015). The contribution of this paper is a detailed presentation of how design capabilities were introduced and incorporated into everyday practices, with general guidelines as a starting point for knowledge transfer to other settings.

The paper is organized as follows: the next section presents a selection of literature focusing on design capabilities and tools for building them. We proceed by presenting sections on the methodology, the case, and the findings, which led to the set of guidelines.

## Background

In this section, we first provide a brief reflection on previous work regarding building of design capabilities. Then frequently used tools that support design thinking, such as cards or mappings, are outlined.

Building design capabilities has been a recent topic of interest and described by, for example, Malmberg & Wetter Edman (2016) and Malmberg (2017). They put emphasis on how design capabilities are sustained within the organization, after project activities end. Malmberg (2017, p. 218) has observed that participants of design projects are often, after the project ends, not followed any further, and no attention is paid to strategies that



enable them to spread design capabilities in the organization. This led to the conclusion that projects where skilled designers have learning-by-doing-based design workshops does not support “sustained innovation capability through design knowledge” (Wetter Edman & Malmberg, 2016). As pointed out in Malmberg & Wetter Etterman (2016), there is a gap to be addressed: “...and we see issues when it comes to structures that support diffusing and upholding new knowledge, for example, a lack of managerial activities that can support assimilation”.

Service designers, along the same lines, found that the design tools and methods they try to use in organizations do not produce “the kind-of high-level transformational thinking in managers” they hoped for (Junginger, 2015). These findings were also true for libraries as organizations, and some researchers, e.g., Bell (Bell, 2011) argues in favor of including design thinking as a subject in librarianship education, and a way to gain design competence. In (Booth, Schofield, & Tiffen, 2012; Tiffen & England, 2011), the authors propose inclusion of design activities within the library through cooperation with the School of Design, which facilitated the use of design thinking approach on a more continuous basis. In (Luca & Narayan, 2016), design activities within the library were supported by an artist-in-residence, and in-house designers. A design thinking project at an academic library, described in Whang et al. (2017), explores its concrete applications to specific services, such as support of transfer students. The service focus is the one that is the most frequently reported on regarding library services innovation, see (Scupola & Nicolajsen, 2010), or (Trischler & Kelly, 2016). The latter used co-design with users at three different academic libraries in Australia. However, in line with findings from Malmberg & Wetter Edman (2016), when co-design activities stopped, so did the projects.

One of the largest design consultancies, IDEO (2014), focused on tools and methods for innovation in libraries. The toolset has been developed through a large project concerned with design for a Danish public library. The project is described in Dindler et al. (2016). Others have built on this work, e.g., (Zbiejczuk Suchá et al., 2015) or (Modern Human, 2017), both providing card sets inspired by those of IDEO, specifically to facilitate design thinking for libraries. However, it is difficult to use toolsets without the basic design knowledge, and it is easy to underestimate the importance of designer’s tacit knowledge and sensibility for the positive outcomes of processes supported by the toolkits.

Diverse forms of mapping are also frequently used in conjunction with design thinking. We find Giga-mapping (Sevaldson, 2011) to be particularly useful. It aims to facilitate thinking and communication by visualization, inviting participation and collective negotiation of understandings related to the design context, usually by providing a large physical work space for these efforts. Furthermore, it allows for mapping out the context in layers (e.g., from the perspectives of different stakeholders), fostering further understanding of complexity and relatedness of problems.

From this background work, we find that in order to sustain design capabilities, diverse tools can be effectively employed, but also, attention needs to be paid to develop structures that support diffusing and upholding new designerly knowledge.

## **Methodological approach**

### *Research through Design (RtD)*

Research and design have been long regarded as separate endeavors, in particular within interaction design and human-computer interaction. Research through design (RtD) is a recent effort within those fields to merge the two, building on designerly ways of thinking and working (see Bowers, 2012; Dalsgaard, 2010; W. Gaver, 2012; Höök, Dalsgaard et al., 2015; Koskinen, Zimmerman, Binder, Redstrom & Wensveen, 2011; P.J. Stappers & Giaccardi, 2012; Zimmerman & Forlizzi, 2014), using design research, its theories and practices, as the main vehicle to generate new knowledge, often engaging users to validate, evolve and evaluate the work.

As articulated in Höök et al. (2015, p. 2), one of the main issues that RtD faces is how to articulate the gained design knowledge, and allow design researchers to engage with, and build on, one another’s contributions. There are several proposals aiming to establish connections between theory, and practice, e.g. (Fallman, 2008; Gaver, 2012; Höök & Löwgren, 2012; Odom et al., 2016) and others. One of these approaches is Fallman’s interaction design research triangle (Fallman, 2008), a tool to guide and describe research and design efforts. The triangle frames the work by three main activities: design practice, design studies and design exploration. Each one of these “*has its own purpose and intended outcome and the rigor and relevance have to be defined and measured in relation to what the intention and outcome of the activity is*” (Fallman & Stolterman, 2010). Recognizing that research practices do not normally fall neatly into one of the three activities, but exists in the

space between them, the triangle (see Figure 1) provides a way to address the research practice through *drifting* trajectories, looping or shifting dimensions, etc.

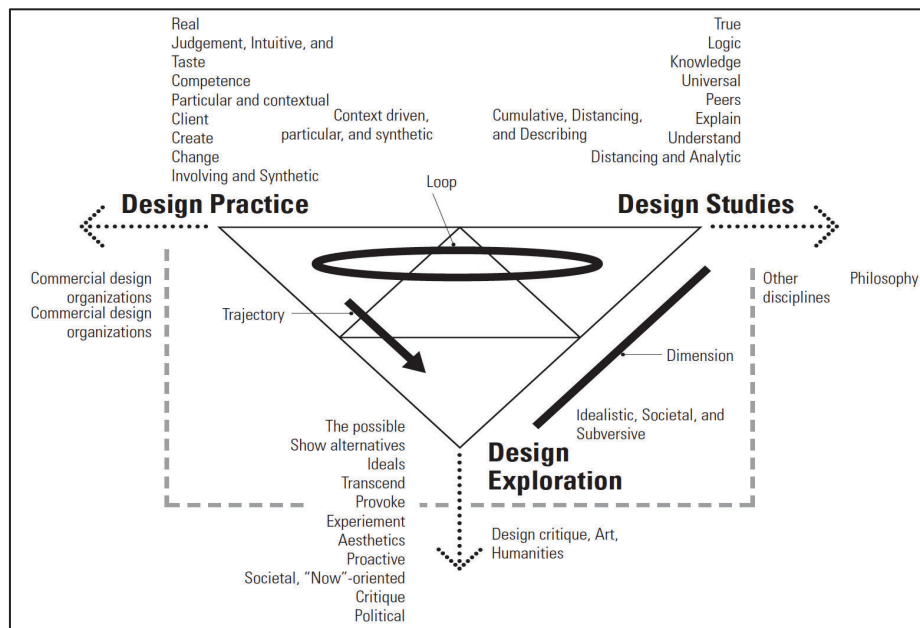


Figure 1: Design Research Triangle connects design practice, exploration and studies as researcher drifts in various ways (loops, trajectories, dimensions) through these activities. Figure adapted from Fallman (2008).

The main three activities are now briefly described.

*Design practice* can be described as a generative and synthetic research practice where the researcher becomes an integral part of a multidisciplinary design team working on a real-life library project, not primarily as a researcher or observer, but as a designer. This is to say, the researcher takes an active part in the hands-on design work of sketching, constructing and building artifacts and prototypes, dealing with time constraints and communicating and negotiating with fellow team members. Thus, the researcher, alongside library employees can build an appreciation and understanding of the tacit knowledge and competences involved in a professional design practice. However, unlike a professional designer, the researcher approaches the process “with an explicit design research question in mind, or with the clear intent of forming such a question from their activities” (Fallman, 2008, p. 6). It is important to mention that the research question does not have to align with the direction and goal of the design interventions, but can be formulated to focus on particular issues or themes that are relevant from a research perspective. In this case, for example, the intervention’s goal may be to create a new service, but the research aim is to inquire into tools, meaning creation, ways of thinking etc., which support gain of design capabilities and understanding of design thinking.

*Design exploration* is synthetic and proactive, involving the researcher in a reflective, hands-on process of exploring designs and constructions of prototypes. These activities revolve around the researcher’s own research interests, where “the most important question is: What if?” (Fallman, 2008, p. 7) Design exploration intends to experiment, question and provoke critical reflection on the current state of the world, and to imagine possible, alternative and preferred futures. “[D]esign exploration is a way to comment on a phenomenon by bringing forth an artifact that often in itself, without overhead explanation, becomes a statement or a contribution to an ongoing societal discussion” (Fallman, 2008, p. 8). In the context of this paper, the research explorations were centered on how design interventions should be designed so that the learning is re-enforced by tackling different real-life issues. Each intervention outcome was intended to serve as a road to becoming aware of larger, more complex issues, values and notions that the library can engage in through gained skills and understandings.

*Design studies* is the type of design research activity “that most closely resembles traditional academic disciplines” (Fallman, 2008, p. 9), where the goal is to build upon and contribute to a cumulative body of knowledge. This requires an analytical engagement with design theory, methods, history and philosophy, as well as theories and approaches from a variety of other disciplines. It also involves presenting and publishing research outcomes in academic conferences and journals. “[U]nlike design practice, [design studies] seeks the general rather than the particular, aims to describe and understand rather than create and change, and because of that

often appears as distancing to its character rather than involving.” (Fallman, 2008, p. 9) Design studies, in the context of this paper, highlight concepts that emerged through the process of implementing the interventions as the most important ones for gaining and maintaining design capabilities.

The role of the triangle is not so much about the positioning of a particular activity, but the way in which it enables reflection and discussion about how RtD researcher moves in between the three activity areas, thus providing concepts that describe movements, such as *trajectories*, *loops*, and *dimensions*. *Trajectories* are either intentional or unwanted drifting between research activities. They enable discussions about the perspectives and directions of a particular research activity, how the outcome of the activity may feed into another activity and “what kind of quality measures, guarantors, and stakeholders we will face when moving in between different activity areas”, (Fallman, 2008, p. 11). *Loops* are trajectories without start and endpoints, signifying an ability to freely move back and forth between the two, and in some cases all three, activity areas. Thus, activities in different activity areas feed into each other, iteratively driving the research forward. Finally, *dimensions* infuse the triangle with meaning by creating conceptual continuums and tensions between the activity areas.

All these concepts have been useful in describing the research process regarding design capabilities within an academic library through interventions. The interventions were made with a clear intent of performing designerly work and allowing the challenges, both the learning ones and the ones related to appropriateness of methods and tools to emerge from activities and engagement of participants in any given intervention. Each intervention required engagement in design practice prior to the intervention (for example, designing and making context specific card sets, worksheets, or other objects to be used during the intervention to engage the participants in rapid prototyping), during the interventions (by participating in whatever design activities were a part of the intervention). Design explorations required a focus on research intent and exploring different ways in which design capabilities and practices could be supported through an intervention, as well as performing explorations under each intervention together with other participants. Design studies, in line with traditional understanding, served the purpose of generalizing findings from individual interventions and framing of research contribution to the body of knowledge that addresses how an organization, such as an academic library, develops design capabilities over time. Epistemologically, the triangle postulates that concepts and ideas have to be tried and explored to demonstrate their validity, in line with Dewey’s position that knowledge and theories are active phenomena “that are formed and reformed” during an inquiry (Biskjaer & Dalsgaard, 2012).

### Constructivist learning

Building design competences by applying design thinking in the library context had to do with ways of organizational learning. The approach to learning that was implemented in the context of the library was based on real-life problem solving, through an experiential and constructivist approach (Jonassen, 1999; Kolb, 1983). In fact, while articulating how learning was implemented, the Beckman & Barry’s (2007) model that combines design thinking, innovation and learning styles (see Figure 2) was re-discovered.

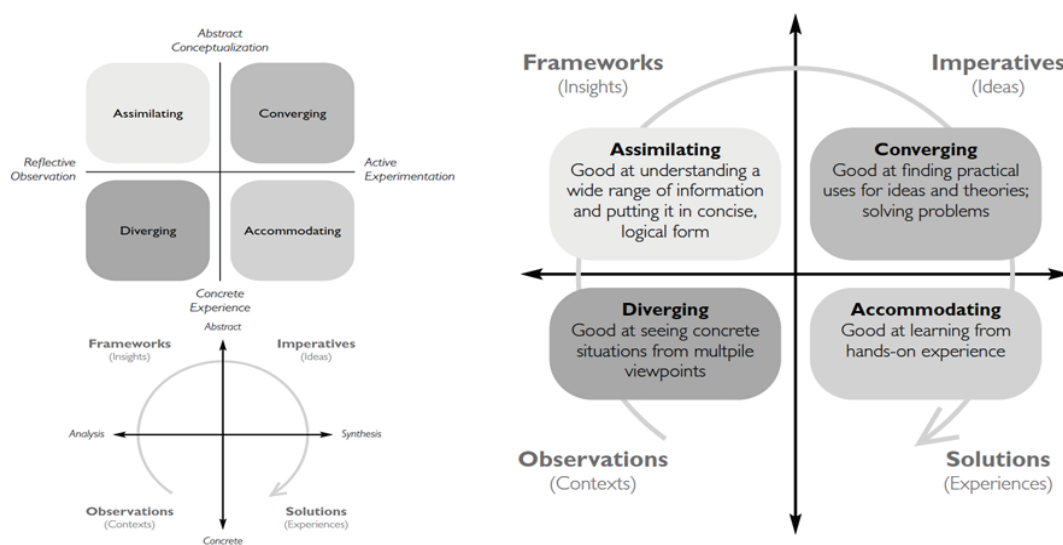


Figure 2 - Beckman and Barry’s model that integrates design thinking, innovation and learning styles. Figure: from (Beckman&Barry, 2007).

Figure 2 is rather self-explanatory. Design thinking process is shown in the left bottom image, iterating between the synthesis and the analysis, the concrete and the abstract when moving from understanding the context towards solutions. The top image on the left shows different thinking styles. These are explained in relation to design thinking phases in the large image on the right, which depicts the integrated model.

While engaging participants in intervention activities in the library context, attention was paid to shift between divergent and convergent thinking, concrete and abstract, allowing the time for dialogues and assimilations, synthesis and learning from concrete experiences.

## The case: design interventions in an academic library

During the course of this research, 16 design interventions were carried out. They grew increasingly complex over the period of four years that this research took. Interventions can be divided into three groups in accordance with what research aims were. The first set interventions (4) all focused on service design as the aim of the intervention (innovative services, or improvement of the old ones), as well as organizational learning (vocabulary for service design and design thinking) through experiential engagement in the intervention, exposing participants to different thinking styles and thinking through rapid prototyping. The mid-period interventions (9) also focused on services, but were tackling more complex issues that were of importance for the library at the time when they were performed. During this period, some library employees already got engaged with the approach, and it could be said that became knowledge-brokers for design thinking in the library (Pandey & Srivastava, 2016). The last set of interventions (3) was related to three large projects, two of which are still going on. These interventions were strategic, deeply engaged in envisioning of the role of the library in the future. To provide flavor of these workshops, one representative intervention from each group is presented.

### *An example of early interventions*

The intervention presented here was a workshop with 25 participants. Seventeen participants were library employees, including leaders, librarians, digital service employees, and open access consultants. Four participants were graduate students in interaction design and four were researchers. The participants were divided into four multi-disciplinary groups to discuss searching for e-books, which was a real life issue at the library. The activities were hands-on. Each team got their deck of service design cards, and other typical workshop items, such as colored pens, dots, and a large sheet of paper (see Figure 3, left and center). The participants took some time to become familiar with service design concepts and tools, especially cards. Cards were quickly recognized as an excellent tool, facilitating the building of common understanding of the problem space. Soon, all groups started also using arrows and dots to reason by assigning importance to specific cards or processes, and mapping out present and future customer journeys while searching for e-books. Design thinking was an approach, at least in the simplified format in which it was presented, that all could easily understand and use to solve the problem at hand.



Figure 3 - The images show some of the cards that were made to depict the local library spaces, use of cards during a workshop and a Giga-mapping session (Photo: Gasparini).

The outcome of the workshop was, for the library employees, the understanding that service design uses a design thinking approach and tools such as customer journeys and touch points between library users and the library. Alternative customer journeys (prototypes of future services) were easy to visualize using service design

cards (touch points cards). One of the lessons was related to the understanding that through synthesis of experiences from diverse suggestions of future customer journeys, inferring and discussing the best solutions may lead to design of better services.

The research aim was how to best introduce design thinking and build interest, motivation, engagement among the library employees by considering the selection of the intervention aim (a small, manageable one at first, such as e-books search, yet related to the real organizational need) and the use of tools that are appropriate for the purpose. The team work facilitated fast learning and constructive dialogues. Attention was paid to the number of participants within the team (in this case, 6-7 per team) in relation to the engagement and equal opportunities for all to actively take part in the process. The level of openness of tools emerged also as central (Culén & Gasparini, 2016; Culén et al., 2016) already during this first intervention.

In the subsequent three interventions in this first group, we used different sets of cards, to explore the different effects on participants when tools were directing behaviors, were too open, somewhat structured, or fully structured. Other layers of *openness* also became visible, establishing openness in tools, processes and mindset and a main theoretical concept to be explored.

### *An example of mid-period interventions*

This example is an intervention concerned with the use design thinking in order to improve web services for the library, as well as the coordination between different departments maintaining the web pages. The goal was also to envision a common strategy for dealing with web-services across all departments. The intervention comprised several workshops and was organized in collaboration with the Communication Department at the University of Oslo Library. All participants were web-editors and different workshops had different number of participants, ranging from 7 to 10, most participants took part in more than one workshop. Since participants by now were familiar with design thinking processes, the tools changed. Communication exercises, design thinking exercises, mind-mapping and Giga-mapping (see Figure 3, right image) became central, and were based on real library needs (apart from the communication exercises such as writing a break-up letter, and others that were picked up to support the processes). Materials such as large paper sheets, post-it notes and colored pens were provided.

The outcome of these web-service workshops (constituting a single intervention to improve processes around web-page maintenance) for the library was a draft of the common strategy that all could agree to. In the aftermath of the workshops, it became evident that the participants in this intervention managed to integrate the design thinking approach in their daily work practices, implying that they have indeed succeeded in developing some design capabilities. They demonstrated this this indeed is a case by using the new gained skills and ways of thinking to organize different events and services entirely on their own.

From the research perspective, exploration of how to support dialogues continued. This now became conceptualized as *dialogical spaces* and is described in more details in the discussion. The emergence of these spaces was fostered by using and shifting between different tools (again, in accordance to constructivist and experiential learning, Figure 2). The participants showed routinized behaviors when using tools, that is, familiarity with both processes and tools. Temporal aspects were now brought to the foreground of research inquiry into integration of design capabilities and designerly practice with everyday work in the library.

### *An example of the most recent interventions*

A new department at the university, and the physical space to house it, was under planning since 2016. In the initial plans, the library was given only a small place to perform the traditional library functions. The intervention, comprised of two workshops was carried out to change this outcome strategically. The workshops were initiated by one of the library leaders, along line with other knowledge-brokers in the process of organizing the intervention. The first workshop had the aim to discover opportunities for the library that could be fronted, and through which the library could support the needs of the new department in new ways. The second workshop focused on an even broader question: *“What should the University do to be known as a place for convergence and innovation? How to create room for innovation, and innovative thinking in the new department?”*

Eleven participants took part in the first workshop, from different departments of the University, and one architect. The second one had 14 participants, all with different backgrounds, aiming to create truly multidisciplinary teams. Participants were in research leadership positions (6, in charge of research groups), a dean, a student representative, employees from different departments, interaction-design students and two library employees.

During the first workshop, people used ethnographic methods and tools (walking tours with photo-documenting). The second one used a whole range of tools – cards to make newcomers comfortable and open for dialogue, customer journeys and touch points to understand the approach to service design, Giga-mapping and other mappings to discuss the complexities and layers of needs in the new building, see Figure 4.



Figure 4 - Wall from the second workshop showing different design tools used, such as the affinity mapping, and customer journeys (Photo: Gasparini).

The outcomes for the library could be summarized by what the leader of the library who initiated the workshops said: design capabilities, skills and understandings of the processes gained during earlier design thinking interventions allowed her to envision how to use different design methods to position, in the difficult arena of political negotiations for the space and presence in the new department, the new values of the library. The design approach used during the two workshops helped the participants understand that the library could be a much larger stakeholder in the building than they previously realized. Using the design thinking approach in these two meetings, the library managed to change its position from being almost marginalized to be the party responsible for innovation and creative thinking spaces in the new department.

For the research, this represented the point at which the interventions could be stopped naturally. It confirmed very clearly that the understanding of design thinking at the organizational level was now deep enough and powerful enough to serve also the strategic purposes. The leadership and the knowledge-brokers have gained competences that they could use in complex contexts, and to meet new challenges. Temporal aspects of the processes became of central interest, whilst different aspects of openness could not be clearly seen, as well as how it influenced creation of dialogical spaces that last within the organization.

## Discussion

As common when engaged in research through design, the basic way of gaining new knowledge was through reflections in actions during each intervention, and reflections on actions post intervention. In practical terms, after careful planning, possibly design of cards or other tools, piloting the intervention, in action, every step was evaluated anew. For example, even if tasks were carefully timed, interesting processes and discussions were allowed to continue even if the allocated time was over. Also, many different aspects, such as team work, quality and quantity of ideas etc. were always ongoingly evaluated during interventions. Reflections on action allowed for establishment of new explorative pathways that were deemed optimal towards continuing to build in-house design capabilities. They also helped in recognizing important theoretical concepts that facilitate processes of adoption and integration of new practices in everyday work.

The three core concepts (openness, dialogical spaces and temporalities) that emerged as central through the research efforts are now discussed.

### *Openness*

Several layers of openness became visible in these processes. *Openness to change* implies willingness to observe and identify opportunities for design in everyday work. It also requires the willingness to *periodically evaluate* the effects of using design thinking, as well as consider other ways in which it can be used, towards building of design capabilities. *Openness to learn* and acquire design skills and competences was also important, but did not necessarily apply to all employees. As long as some library employees were willing to become knowledge brokers, in-house competences could be maintained, and built further. However, it was remarkable that nearly

all employees wanted to learn, and participated in at least one of the interventions to gain the understanding of design thinking processes. Keeping in mind Beckman & Barry's (2007) constructivist and experiential learning model, oscillation between the concrete and the abstract, as well as reflections and actions, was important to keep people engaged and open to learning. *Openness to proto-practices* relates to the willingness to integrate new ways of thinking and working with already established practices and processes. *Openness to be a part of a multidisciplinary team work*, where dialogical spaces and creation of truly shared knowledge, was important. It is directly related to individual's behavior and experiences in team-work settings and people's willingness to adjust personal behaviors and expectations from personal to project based ones, to take the full advantage of the diversity of competencies.

At a different level, *openness to research collaborations*, that is work with other researchers and designers engaged in similar research and practices, fostering positive collaboration to explore building of design competences, was of importance to increase competences of knowledge brokers and understanding of tools used to communicate design thinking processes.

When discussing tools, the understanding of *openness of tools* emerged as a very important one. Most of the tools, such as diverse card sets available on the market, have structured approaches so that novices can use them with some gain. Alternatively, they are open for interpretation and require facilitation by professional designers, to address their tacit knowledge and sensibility. One of the main findings from having been involved in the processes of building in-house competences has been that semi-open structure work best. In other words, using tools that allow creativity instead of limiting it, but that support well both divergent and convergent thinking and enable broader research and wider inquiries into the problem space were the best to use. In addition, such *semi-structured design tools* were found to support various forms of communication and emergence of dialogical spaces well.

### *Dialogical spaces*

Developing dialogical spaces, design vocabulary, and the project vocabulary, in line with findings from (Krippendorff, 2006) and (Boland, Collopy, Lyytinen, & Yoo, 2008, p. 14), were shown through this work to be of paramount importance for building and sustaining design capabilities and understanding of design thinking processes in an organization such as the academic library. What we have seen is that the design thinking approach and the tools, different at different stages of assimilation and capabilities building, supports the creation of a dialogical space where a common understanding is created. The real-life solution-aimed activities supported well the reflective learning (Beckman & Barry, 2007; Schön, 1983). However, dialogical spaces, both the physical ones (created for each intervention so that people could easily engage in creative activities, move and talk in different constellations was always facilitated) and the mental spaces in which participants could feel safe, and share knowledge, stances, and ideas freely were essential property of the process. Next, we found that playfulness was important in the dialogical space, as it supports team interaction and invites people to a more relaxed communication with each other. Often, tools to be used in an intervention were selected just for their power to support dialogues, speculations and criticism (where relevant) but through playfulness.

Regarding the physical aspects of dialogical spaces, the territory where they take place is important. Places chosen for interventions mediate the character of the event (for example formal or informal), level of care for the event (careful preparations, availability of all needed materials, preparation of cases to work on and more), level of intimacy (the size, coziness and other properties) and so on. In the dialogical space physical proximity of participants, as well as activity spaces are both important and some personal routines may be challenged. To be in the same space for duration of the intervention is important for dialogical spaces. When appropriate, informal spaces for dialogues could also be created, such as during lunch or coffee breaks.

In summary, the term "*dialogical spaces*", reflects the concept of both physical and mental spaces (supporting possibly multiple dialogues within the same space) in which a cross-disciplinary design projects take place. Dialogical spaces shape the project language and introduce the design vocabulary to newcomers to design processes. Through careful choice of physical spaces, using constructivist and experiential learning (sharing of concrete experiences, abstracting together, etc.), supported by adequate design tools, like Giga mapping (see Figure 3, right image), learning is speeded up, and new understandings of project-relevant knowledge emerge.

It is also important to note that, when concerned with building of design capabilities, knowledge brokers continue these dialogues by integrating them into their regular work-practices. They are thus always available to others, to engage in dialogues around possible new projects or areas of application for their design capabilities.

### *Temporal aspects of building design capabilities*

As noted above, this part is rather mundane and part of the common practice when planning interventions, workshops or other activities involving people who dedicate their time to come to the activity. During the entire project, no participants were paid for their work extra (the library employees did the activities during the normal working hours, and had their regular pay, all others volunteered their time). Thus, the return on time investment needed to be thought of. It turned out that most participants, if novice, were happy with the learning process, and if experts, with sharing knowledge in a real-life and meaningful setting, usually with people who were quite engaged. Making sure that each intervention had some form of concrete outcome, even if not immediate, was an important return on time investment.

It can be said that the first group of interventions was an orientation phase, using the term as in Karapanos et al. (2009) that describe temporal aspects of processes, becoming familiar with design thinking and the ways of using it. The second group of interventions was corresponding to the incorporation phase, through prolonged use of the new practices. Finally, the last interventions can be said to represent the identification phase, demonstrating how designerly ways of thinking and working have become meaningful within the library.

Between interventions, especially the more complex ones, integration of gained knowledge, changes in the mindset, or in practices, needed to be allowed some time. This kind of temporal perspective are really little understood, because they can be subtle and unnoticeable for those who are not a part of the organization (connecting back to the importance of insiders and knowledge brokers for the development of design capabilities). How to support and how much time to dedicate to these processes? If new participants attend different events within an intervention, as was the case with later ones, how to save time related to establishing dialogical spaces, and the orientation phase? The findings here indicate that selecting knowledge brokers here too, is necessary (or, at the minimum, there should be some overlapping participants who can speed up the learning processes for the newcomers). Equally important, deciding what ideas and possible solutions should be discussed further, what solution trajectories to choose when implementing, was also interesting from the time perspective.

### *Remarks on learning and participation*

Although the portfolio of interventions was diverse, they all focused on integrating design thinking and building of design capabilities in the library. Some have taken concrete, simple projects that, seen in isolation, are not of a large significance. However, seen jointly, as re-enforcements of learning how to act in designerly ways, they do address macro management of time. Distributing these smaller, manageable and possibly inspirational projects across the timeline of the overall project kept re-enforcing the learning.

In the light of previous research, especially the poor ability to sustain design capabilities (Malmberg, 2017), the creation of a design language based on the vocabulary used during projects was of paramount importance. There are many examples of how the library staff used their design capabilities. For instance, one subject librarian, long after this research was done, when working together with the faculty from another department at the university, used design methods to engage with the following questions: *What makes a research paper a good one?* and *What does a PhD student need to do to get to have a good one?* After mapping the problem area, they created a number of different user journeys, charting the territory from an assignment to a successful paper. This example shows that the subject librarian continued to be open to design methods, successfully remembered design vocabulary and explained the user journeys to others, creating a common dialogical space along the way. The subject librarian also could articulate the time perspective more clearly, leading to the better understanding and implementation of the collaboration on this particular case.

Since projects were diverse, people were always open for new learning and participation. As mentioned earlier, many library employees have participated in multiple interventions. Repetition and diversity of interventions were hugely important factors for building capabilities over time. There was no prescribed number of interventions that had to be done. Instead, the momentum built by one intervention and the interest it generated were used to organize the next one. In this process, the attention was paid to not have them too close to each other so that they do not become burdensome, but close enough that they can build on the outcomes of the previous ones. Between these, the library leadership could use the time to evaluate and appropriate the skills. With time, they developed the ability to notice the design opportunities. As described in the most recent intervention example, it was the leader who was the initiator of the intervention. This was a marker that incorporation has indeed taken place.



In summary: a practice-oriented approach, research through design, utilizing experiential learning, and a pragmatic approach and especially the Dewey's notion of *inquiry*, aiming to approach a non-defined situation and try make it *thinkable* (Dewey, 1909, p. 108), has been a suitable way of introducing design thinking and building of design competences for the academic library. Real-life problems, solved through design thinking and in the context of experiential and hands-on learning, were crucial. In addition to repetition, as a learning strategy, what motivated people to engage, and keep them engaged in design thinking processes, were dialogical spaces and openness. Allowing time for assimilation, integration, evaluation and emergence of proto-practices, also played an important role.

I close this section by providing guidelines, rather than recipes, on how to work with capability building and design thinking in complex organizational settings of academic libraries.

### *Guidelines*

Based on the outcomes of this study, some simple guidelines are provided on how to work with design capability building and design thinking in complex organizational settings of academic libraries.

- 1) Start by providing introduction to design thinking and service design, using compelling examples of real-life library issues, to the leadership (have in the back of your mind the ways in which people learn (Kolb, 1983) and use concrete real-life library problems to so that people can relate them to experiences that they already have).
- 2) Systematically work on increasing and building design competences. This can be accomplished by using knowledge brokers, someone who has design competences to start with, or is willing to learn in order to facilitate systematic building of competences.
- 3) Use, at the very start, simple activation tools, such as cards. Then increase the complexity of both problems and tools used gradually. Changing tools, and choosing ones that are suitable for the issue at hand is important. Tools like cards, Giga-mapping, semi-open templates and workbooks are very helpful.
- 4) Use a lot of thought on how to facilitate emergence of proto-practices, but allow this organic process to unfold by itself. It may take time. After some time, people (as a collective) either pick up new practices and add to the old, or do not.
- 5) Pay attention to dialogical spaces, and keep them active even between interventions. When someone in the organization shows interest for the approach, take time to help (or design a help service for the approach).
- 6) Repeat and refresh whenever possible. Be very pragmatic about this. Nothing should be imposed, overdone, but also not underdone.
- 7) When engaging others in multidisciplinary process, pay attention to the choice of people that make up the team. Having positive and competent participants, who are communicating easily, is good. However, paying attention to thinking styles, the knowledge and competences that participants have is also important.
- 8) Knowledge brokers need to keep developing their own competences (exploring, experimenting and reading about the approach, tools, teams, practices, etc.). It is an advantage if someone in the leadership evolves into a knowledge broker.

## **Conclusion**

Concluding, RtD offered a good, hands-on, exploratory, and reflective way to engage with the inquiry regarding development of design capabilities in the academic library. Engaging in a series of sixteen design interventions through practice – oriented approach that utilized real-life problems and experiential learning, gave insights into how design competences can be developed in an academic library. Some of these insights were articulated as guidelines that can be explored and followed when building design competencies is desired. At the more abstract level, concepts of openness, temporality and dialogical spaces emerged as foundational to understanding competence building.

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