Design Archeology Toolbox: An Exploration Of 'Design Archeology' In A (Governmental) Multi-actor Context

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Abstract: Reflecting is considered an essential part of learning and growing. 'Design Archeology' is a novel approach that highlights how information about current and future practices is present in past narratives. 'Design Archeology' has only been used in the context of designers' past projects. This research aims to explore 'Design Archeology' in multi-actor contexts of mission-oriented innovation and to extend its research by the design qualities needed for this context. To explore these qualities a new distinct design, named DAT, was created, and used to explore the effect of different design qualities in the multi-actor contexts of three mission-oriented innovations in the public sector: the World Design Embassies, the Brabant Outcome Fund, and the University of the Future.

Keywords: design archeology; reflection-on-action; sensemaking; ambiguity; mission-oriented innovation

Wordcount: 7871

1. Introduction

The practice of design is generally still focused on solving problems, yet the focus on addressing complex societal challenges and transformation is increasing steadily. In both instances, design hereby focuses mainly on the future, its potential scenarios, and corresponding solutions and propositions (Koskinen et al., 2011; Göransdotter, 2021; Coops et al., 2024). Transitional Design Histories (TDH) and 'Design Archeology' (DA), nevertheless, point out how information for present and future practices lies in past narratives (Göransdotter, 2021; Van Der Horst, 2022). Both these practices, however, have solely been tested on trained designers in problem-solving areas, and not yet in transformation processes addressing societal challenges, which are often executed by multi-actor groups.

This research takes place in the context of mission-oriented innovation. Mission-oriented innovation, sometimes also called mission-driven innovation, points to a practice where the focus is on reaching ambitious and time-bound goals for societal challenges. The public sector plays an active role in bringing together different actors and coordinating projects that aim to tackle these challenges (Glaser et al., 2022; Trotto et al., 2024). This research draws on three public multi-actor contexts that focus on finding solutions for pressing societal challenges: the World Design Embassies (About - World Design Embassies, n.d.), the Brabant Outcome Fund (Provincie Noord-Brabant, n.d.), and the University of the Future (Eindhoven University of Technology, n.d.).

In this exploratory research, the aim is to explore how the approach of 'Design Archeology' could be applied in a multi-actor context of mission-oriented innovations. It applies the approach in settings where designers and non-designers collaborate and in which design qualities play a role in the application of 'Design Archeology'. The research aims to answer the following research questions:

How do professional trained designers and professionals not trained in design (non-designers) experience reflective practice differently within the approach of 'Design Archeology'? What design qualities make 'Design Archeology' suitable for a multi-actor context?

This paper describes a Research through Design (RtD) approach (Koskinen et al., 2011), in which two tools are created and tested in two phases of semi-structured interviews. The first phase aims to gain an understanding of the experience of non-designers with the Design Archeology Research Kit (D.ARK), i.e., as a toolkit for practising 'Design Archeology' with designers, originally created by Sam van der Horst (2022). In the second phase, the aim is to explore new design qualities within 'Design Archeology' that are effective for both trained designers and non-designers through the creation of the Design Archeology Toolbox (DAT). This second phase is explored in the context of the Brabant Outcome Fund, World Design Embassies, and the University of the Future.

2. Related Work

2.1 Reflective Practices And The Design Process

Exploring the past can be framed as a way of reflection. For individuals and organisations, reflection is seen as an important activity to learn and improve. Therefore, an extensive body of research is present on approaches for reflection on projects and processes. Processes, however, can be fairly different based on the nature of the project. The design process, for

example, is described as a dynamic and explorative process in which a design challenge is refined and explored (Overbeeke et al., 2011; Schön, 1983), whereas the traditional problem-solving process is more linear, analytical, and milestone-based (Brown, 2009; Dresch et al., 2015; Schön, 1983). An effective reflective method might thus depend on the nature of the project to extract essential learnings. Schön (1983), in his research on reflection in design, identifies two different types of reflection within the design process. The first is *reflection-in-action*, which occurs during the activity of designing. The second is *reflection-on-action*, which occurs after the action and aims to gain insights from the experiences of the designer. With the approach of 'Design Archeology' and its exploration of past projects, this research mainly adds to the *reflection-on-action* category.

2.2 Exploring Histories As A Means of Reflection

This research builds upon the approach of 'Design Archeology' as developed by Sam van der Horst (2022). The approach is based on the concept of Transitional Design Histories (TDH), which was introduced by Maria Göransdotter (2021). TDH aims to frame design histories in light of how it led to the emergence of a design and its establishment and allows for seeing its potential future. The concept of TDH specifically approaches one's history as a combination of different prototypeable narratives, centring attention on the process instead of the final result, i.e. the eventual design. Exploring these different narrative-prototypes allows for uncovering different perspectives that build into a larger historical narrative, whose influence on the present and potential future can be uncovered.

Van der Horst (2022) extends the concept of TDH by creating the approach of 'Design Archeology'. In this novel approach, one aims to reconstruct past activities through interacting with the material remains of past design projects. To be more specific, the embodied re-engagement with the physical material remains (e.g. prototypes, demonstrators, finished products, tools, sketches, etc.) of old design projects helps to prompt memories and allows for tacit knowledge to become visible again (Stig Sørensen & Rebay-Salisbury, 2012; Kuijpers, 2017; Jürcke et al., 2021). One attempts to extract the memories that are embedded in the material aspects of the design through the activities of looking at the remains and re-enacting the intended interactions (Tolson, 2014). By embracing ambiguity in this process, 'Design Archeology' can draw attention to the overlooked and forgotten aspects of the objects and environments, and what processes played a role in its creation, thus encouraging reflection on their significance for the designer's practice (Gaver et al., 2003; Peeters & Trotto, 2015). In this way the approach can help in analysing the past and its material remains, and through this

trigger reflection on how the past influences the present and the future and inform emerging (design) practices.

The approach was originally tested through the design and implementation of the Design Archeology Research Kit (D.ARK) (see Figure 1). D.ARK was designed to assist in reflecting on and extracting knowledge from the material remains of old projects. The goal of this portable research kit is to support the user in reconstructing past experiences through the use of ambiguous visualizations. For more detailed information, see Van Der Horst (2022).

Figure 1, The left picture provides a close-up of the D.ARK design. Right shows the set-up of the design during an interview (Van der Horst, 2022).

Before this study, 'Design Archeology' had only been tested with trained designers in the context of Transforming Practices (TP). TP is a design approach that aims at transforming existing practices and developing new alternative practices to engage with the world in co-responsible ways (Hummels et al., 2019; Hummels, 2021; Trotto et al. 2021). How TP does this is best described by Hummels (2021) in the following passage: *"The way TP is doing this, is by designing new material arrangements and activities, as a way of co-developing and mediating transformation over time. Our thick moving dot on the horizon is thereby the transformation of meaning, values and ethics, i.e., the development of alternative practices and futures. Such alternative practice can support and pursue a sustainable world in its broadest sense: human, social, ecological and economic, in which people are taking responsibility for the world. In order to transform practices, we are continuously situating transformation, balancing actions, aspirations, the context, the challenges at hand, historical developments and the arising opportunities over time."*

As practice shows and TP calls for, the current societal challenges are often tackled by multi-disciplinary and multi-actor teams. This research, therefore, aims to shed light on how the

approach of 'Design Archeology' is experienced by non-trained designers and so can be applied in a multi-actor context.

2.3 Reflections Through Interrelatedness

Just like D.ARK, there have been more attempts to use exploration as a means of reflection-on-action. One clear example is Freed, which is a digital tool that allows to collect and display the content of a project and its process (Mendels, 2013; Overbeeke et al., 2011) (Figure 2).
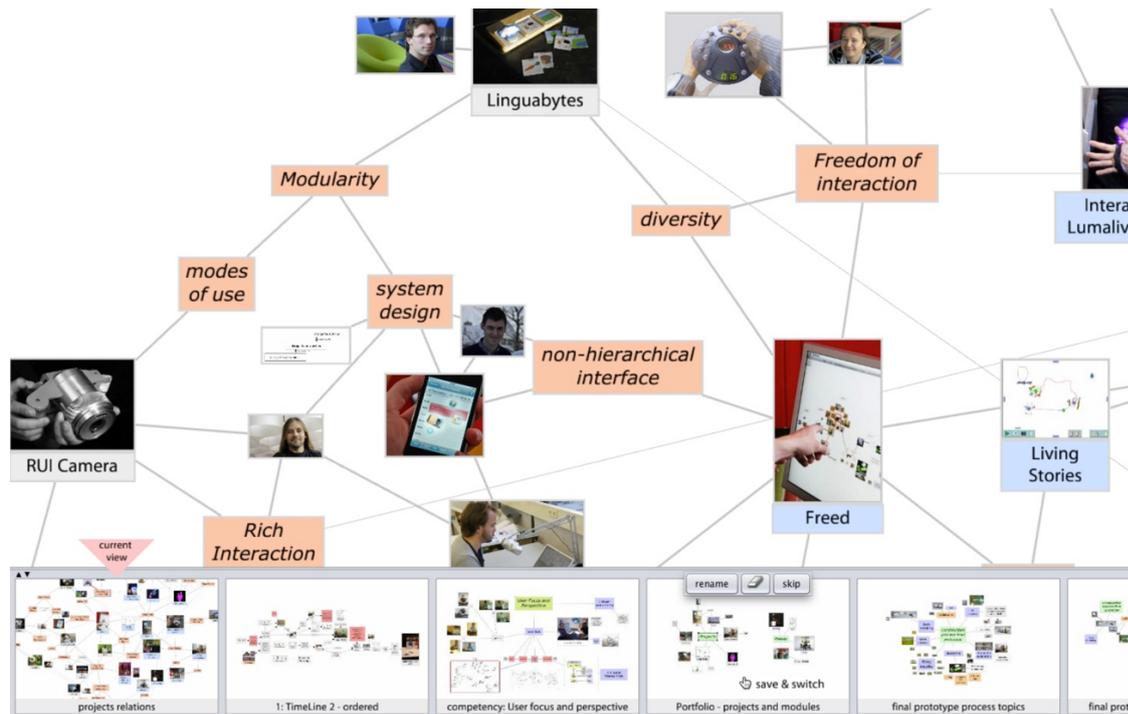

Figure 2, The free spatial positioning and connectedness between the elements in the Freed software (Mendels, 2013).

Similar to D.ARK, it places actions and their specific outcomes as a central guiding point for reflection. A key difference here is that D.ARK poses this reflection through interaction with the physical remains, whereas Freed uses spatial positioning of completely digital representations of the actions and outcomes. Different views are created that allow for the integration of different activities. These views provide spatial freedom to organize the process in a non-linear way. This creates the possibility for the user to uncover interconnectedness between the taken steps and their outcomes. Furthermore, this tool specifically uses force-based layouts (Mendels, 2013). This feature brings content-related objects close to each other and makes non-related content repulse each other. The goal here is to raise a why-question that is seen as a central element for reflecting. This poses an opportunity to investigate how much a directed exploration could assist in the context of 'Design Archeology'.

3. Background

This section introduces concepts that elaborate on the situating and understanding of this research.

3.1 Mission-Oriented Innovation

This research is placed in the context of societal transformation and mission-oriented innovation. This type of innovation embraces more open-ended experimentation and collaboration between citizens, businesses, researchers, and other civic, private, and public partners to tackle complex societal challenges and reach ambitious and time-bound aspirations (Mazzucato, 2021). There are various types and initiatives of mission-oriented innovation, some aimed at faster scientific and technological progress and others more focused on societal challenges involving transformational changes (Fisher et al., 2018). In this research we focus on the latter, in which the public sector plays an active role in bringing together different actors and coordinating projects that aim to tackle these challenges (Glaser et al., 2022; Trotto et al., 2024), since they are the only one having the capacity to enact transformation at the magnitude to achieve societal impact of improving society's welfare (Mazzucato, 2021).

This research draws on and takes place in the following three (governmental) multi-actor contexts that focus on mission-oriented innovation, with all a slightly different type of multi-actor ecosystems.

3.1.1 World Design Embassies

The context of the World Design Embassies (WDE) provides a real-life environment where trained designers and non-designers collaborate on innovative projects (*About - World Design Embassies*, n.d.). Both can benefit from reflecting and thus learning about the executed project. The WDE is a program started by the Dutch Design Foundation and aims to shed light on mission-oriented innovation. It creates an environment where both trained designers and non-designers, including from the public sector, collaborate and can benefit from 'Design Archeology'. The WDE was our first environment in which we tested 'Design Archeology', and it is the only context in which we ran phase 1 of this study (see section 4).

3.1.2 Brabant Outcome Fund

The Brabant Outcome Fund (BOF) is a program from province of North-Brabant that aims to connect government, entrepreneurs and investors, to make social, economic, and ecological impact (Provincie Noord-Brabant, n.d.). This initiative aims to create a systemic change in making the connection between these different actors and their expertise more accessible, in

each bridging the gap between different stakeholders. The BOF is on the verge of starting a new round, which provided a rich opportunity for reflecting and discovering improvements for this upcoming round through the use of 'Design Archeology'.

3.1.3 University of the Future

The University of the Future program focuses on creating a development plan to move the academic education within the Eindhoven University of Technology to the desired level of education in 2050. It specifically tries to develop academic education which prepares the engineers of the future through gaining transdisciplinary skills and the ability to work and collaborate interdisciplinary (Eindhoven University of Technology, n.d.). Examples within this program are extra-curricular Challenge-Based Learning projects, which are tackled by interdisciplinary student teams, and connecting these projects to businesses, regional and national initiatives and partners, including the public sector. Participating in this study by reflecting on their program allows the team to collect and oversee the lessons learned from previous phases, thus providing directions for the following phases.

3.2 Sensemaking

One central aspect of reflection and 'Design Archeology' is the concept of sensemaking. By exploring different narratives and artefacts, a certain sensemaking is triggered on how these fit the bigger historical narrative. There are many different definitions when it comes to the concept of sensemaking. These are often based on their framing, such as individual or collective sensemaking (Aston, 2024; Kolko et al., 2010). However, the commonality within these definitions seems to be that it is a process that either an individual or collective undergoes, for example by exploration, reflection, organisation of information and experiences until the context is sufficiently understood. Sensemaking is often also attributed to learning.

Within this research, sensemaking is considered on an individual level, bringing the definition closer to the perspective of Dervin (2003). They additionally point out that it is subjective and relies heavily on the summation of knowledge, emotions, and prior experiences of the learner (Dervin, 2003; Kolko et al., 2010).

Within design, the concept is sometimes practised as embodied sensemaking (also referred to as participatory sensemaking) (Hummels, 2016; Hummels et al., 2008). Hummels and Van Dijk (2015) define it as a shared process with ongoing and situated interaction in a collective action space, instead of exchanging information solely on a verbal and cognitive-oriented level. The concept of 'Design Archeology' poses a certain level of embodied sensemaking by re-

engaging and interacting with the physical remnants of the project. Combined with the definition of sensemaking by Dervin (2003), this would pose different outcomes for the users involved in a multi-actor context.

3.3 Ambiguity

As said, 'Design Archeology' focuses on embracing ambiguity to trigger sensemaking behaviour in its user. This is in line with the propositions about ambiguity in information, context, and relationships, posed by Gaver et al. (2003). They argue for ambiguity's resource potential by highlighting its characteristics to make interactive designs engaging and thought-provoking. Later studies, similar to the concept of 'Design Archeology', apply this principle to trigger their user to form their relations, narratives, and reflections and as a manner to enhance engagement and social connections (Di Lodovico et al., 2023; Peeters & Trotto, 2015; Van Der Horst, 2022). Ambiguity can be found and exposed in information, context, and relationship (Gaver et al., 2003). 'Design Archeology' currently builds mainly on the ambiguity of relationship, as it aims to highlight the significance of things, behaviour, and events in their environment (Van Der Horst, 2022).

The research presented in this paper highlights, however, an additional aspect of ambiguity in combination with sensemaking. Design processes are often embedded in ambiguity, and it is often even purposefully sought as a characteristic by designers. This attitude is contrary to the one in organisations. Here, ambiguity is often referred to as a characteristic of wicked problems. To deal with this 'unwanted ambiguity' strategies around experimenting and gathering information are developed (James & Bennett, 2014; Pop, 2017). Organisational strategies are aimed at reducing ambiguity instead of embracing it as a resource. This seems to indicate that trained designers could be more comfortable in dealing with ambiguity compared to those who are not experienced and trained as a designer. Placing this in light of sensemaking, which is influenced by the summation of experience, knowledge, and emotion, highlights whether different characteristics of ambiguity are needed for different participants to trigger similar reflective results.

4. Method

This research used a Research through Design (RtD) approach (Koskinen et al., 2011), being both exploratory and qualitative. The exploration was specifically aimed at how 'Design Archeology' and its design qualities manifest in a multi-actor context. The RtD process therefore aimed at gaining insights into 'Design Archeology' in a different context and the

exploration of its design qualities. The research is performed in a field setting, where design is used as a means of inquiry and applied as an open-ended exploration (Koskinen et al., 2012; Wensveen & Matthews, 2014).

This research consisted of two subsequent phases. The first phase replicated the interview sessions with D.ARK. A parallel was created with the data collected by Van der Horst (2022) to uncover the differences between trained designers and non-designers in terms of experience, perception of D.ARK and behaviour in dealing with ambiguity and sensemaking. The second phase aimed to explore the design qualities and characteristics of 'Design Archeology' to become effective in a multi-actor context. In this phase, the Design Archeology Toolbox (DAT) was created based on the insights gained from the first phase. Both phases resulted in a collection of qualitative data and were analysed according to thematic semantic analysis (Braun & Clarke, 2006).

4.1 Data Collection

During both phases, semi-structured interviews were held and online surveys about their experience were sent the day after the interview. In both interview set-ups, the participants were asked to interact with either D.ARK or DAT, respectively, based on the phase they were being interviewed. The interviews were held in Dutch or English, depending on the preference of the participant. All interviews were audio recorded and the visual digital output was screen recorded. The interviews were transcribed using MS Teams and relevant parts were manually checked for adherence to the audio recording. All data was anonymised in its further usage.

In preparation for the interviews during the first phase, the participants were asked to collect physical remnants of the project they would like to explore. The interview was conducted at a location convenient for the participant, and the remnants were present during the interview.

The design of DAT was based on the insights of the first phase of this study. Using DAT consistsed of three stages. First, the participants engaged with a probe that guided the search in remnants and collected basic information about the project. The second part consistsed of interaction in classification, ranking and organizing with Polaroid photos as visual representations of the remnants. The third consisted of a reflective part, where the participants were able to scroll through the made classifications and arrange their thoughts. The design is shown in Figures 3 and 4. The differences between the D.ARK and DAT designs are presented in Table 1. Additionally, the role of the interviewer was specifically aimed at indicating the

ambiguity of information and forcing the sensemaking of the interviewee, similar to the force-based layout of Freed (Mendels, 2013).

Figure 3. The Design Archeology Toolbox probe which consists of a booklet, a camera including Polaroids and a pen. (left). The participants answer questions in the booklet in relation to Polaroids they make of specific remnants (right).
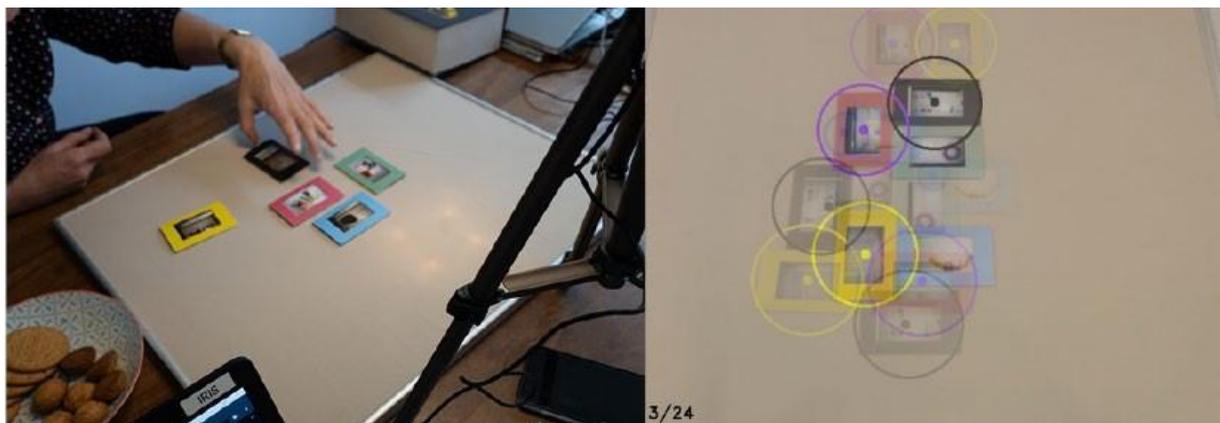

Figure 4. The set-up of the interactive part used by the participant (left). An example of an overview during the reflective part (right).

In preparation for the interviews during the second phase, the participants were asked to complete the probe and return the completed probe before the interview. This information was used to tailor the interview guide to the participant. The Polaroids served as visual representations of the collected remnants and were later used in the ordering and classification tasks.

The total data collection consisted of the interview transcriptions, videos, photos, and observations made during the interview, input from the survey, and the results presented by Van der Horst (2022) in his research.

Table 1, Comparison of design characteristics between D.ARK and DAT.

Characteristics	**D.ARK**	**DAT**
Steps	Preparation in collecting remains. Interaction session with D.ARK	Probe used as preparation. Interactive positioning session. Reflective session on created classifications
Process	Re-engagement with remnants to narrative to emotional representation in visualization.	Spatial positioning to narrative to interrelatedness
Ambiguity	Relationship; embedded in the creation of the visual	Relationship and information; embedded in spotting inconsistencies in narrative and created positioning
Form of interaction	Digital/Physical	Physical
Remnants in interaction	Remnants itself	Visual representation (Polaroid) of the remnants
Role of interviewer	Guide narrative from past to present and towards future	Actively involved in highlighting inconsistencies and asking why-questions during positioning. Posing link towards current practice.

4.2 Participants

The participants were chosen based on criterion sampling (Bell et al., 2019). Two criteria were used to ensure that the gathered data is practically relevant for the field of mission-oriented innovation. The first was the classification of designers and non-designers. Designer participants were defined as those who received training and a degree in design and identified themselves as some sort of designer in their current profession. A non-designer was everyone that fell outside this category. The second criterion related to the sole inclusion of mission-oriented innovation projects in which the participant was part of and/or leading. The division of the participants over the phases and their characteristics are shown in Table 2. Phase 1 is only done within the setting of the World Design Embassies (WDE), and phase 2 is done with participants from all three contexts.

Table 2, Participant characteristics.

Participant	Phase	Category
1	1	Non-designer
2	1	Non-designer
3	2	Designer
4	2	Non-designer
5	2	Designer
6	2	Non-designer
7	2	Non-designer

4.3 Data Analysis

The collected data in both phases was analysed through a thematic semantic analysis (Braun & Clarke, 2006), coding the data in an abductive manner. They were partially based on the codes used by Van der Horst (2022) and added upon when finding new categories. This was done to ensure the data was evaluated on the same variables and thus providing a clear comparison.

5. Results

This section presents the results, respectively, in the order of the phases of this research.

5.1 Phase One: D.ARK Sessions

First, a summary of the findings of Van der Horst (2022) is presented. Second, the data gathered from the non-designers is presented and an observational comparison is made.

The results of Van der Horst (2022) showed that through D.ARK all designer participants could extract tacit knowledge from the remains of past design projects. Participants addressed that D.ARK supported them in uncovering new relations in past developments and allowed them to construct the narrative of the artefact and its usage over time more creatively. They were able to reflect on how aspects of the past project influenced their current practice. The interaction with the kit itself was considered to be fairly intuitive and inviting for different explorations once the usage of the controller was known. The time to get used to the control

module was seen as a limitation. However, this unfamiliarity with the controls also assisted in finding alternative ways in constructing the narrative. Additionally, the ambiguous visualization was considered supportive in their story and even allowed them to extract the values enclosed in their practices and projects.

The newly gathered data in this study demonstrated different results. The non-designer participants addressed that the interview with D.ARK allowed them to go deeper into the process and details of the project. The participants attributed this effect to the questions posed by the interviewer instead of to the usage of D.ARK. This is illustrated by quote 1. Furthermore, the deepening insights were considered as known information.

> *"The questions have led to greater depth in the exploration of the past and have enriched the story. I found the interaction with the tool (devices) less pleasant."* - Quote 1 (participant 1, non-designer)

As quote 1 illustrates, the interaction with D.ARK was not considered optimal. Additionally, participant 2 pushed the controller of D.ARK away halfway through the interview and did not touch it afterwards. Participant 1 used the controller as a tinkering device but did not pay deliberate attention to how this altered the visualization. Both participants additionally described interacting with D.ARK as distracting. This is illustrated by quotes 2 and 3. Further observations highlighted that interacting with the kit and telling the story were two different activities that seemed to be difficult to conduct simultaneously. The participants lost track of their story while interacting with the kit, and in some cases even completely stopped talking to interact with it.

> *"Digital tool distracted from conversation/questions and interrupted reflection due to the actions you have to perform. Too little intuitive to use during a conversation."* - Quote 2 (participant 2, non-designer)

> *"I was sometimes a bit distracted by the form, because I wanted to control it and therefore became distracted from the content"* - Quote 3 (participant 1, non-designer)

Finally, one of the participants mentioned that the current created visualization missed the potential for interpretation. Remarkable here is that apart from the gain of insights, the results seem to be almost opposite between the trained designers and the non-designers.

5.2 Phase Two: DAT Sessions

Based on the results of phase 1, DAT was designed. DAT was created to consist of three different parts with more prescriptive tasks and assignments compared to the open exploration of D.ARK. Each part additionally allowed the participant to focus on completing a single task. Finally, the interaction used in DAT was specifically focused on triggering sensemaking behaviour. This was done by asking participants to classify, organize or rank the visual representations of their chosen remnants. The ambiguity was still embraced, yet the level of ambiguity was built up with each consecutive part, as the fully ambiguous visualization of D.ARK was difficult to interpret. DAT used design elements of D.ARK, such as the portability, allowing the interviews to be situated in the context.

The presented results follow the sequence of the steps taken. First, the results of the probe are discussed. Between both groups, there seemed to be no distinct differences in the manner of answering and the collected remnants. It struck attention that the majority of the participants had collected artefacts that reflected them personally, showing what they found important. For example, one participant photographed a total of 6 attributes, of which 5 attributes were either the outcome or the tools of a co-creation session. Later during the interview, this participant stated that they were focused on talking less and creating more. This is illustrated by quote 4 showing a connection with the collected cocreation remnants.

> *"I notice more and more, my job involves a lot of talking, way too much talking. And now I am …. More and more leaving. How are we going to make things together and so a shared language and tune in by simply creating something. So, I think that has also changed, partly because of this project and other things, because you just see. It works."* - Quote 4 (participant 6, non-designer)

Furthermore, it became clear that the participants primarily collected artefacts of which they were proud and positive, as illustrated by quote 5 which answered the question what feeling came up with observing the artefact.

> *"Pride, curious, enthusiastic about the richness in experiences and expertise of these people."* - Quote 5 (participant 3, designer)

It became clear that the completion of the probe was motivation dependent. Participant 4 addressed only to have collected 2 artefacts because of time (see quote 6). It is additionally supported by quote 7, which was given by a participant that considered the activity as fun and ended up collecting seven artefacts and gave extensive answers to the posed questions.

"I could have continued…. But in the end it is also a bit of a time consideration, I must admit honestly." - Quote 6 (participant 4, non-designer)

"I enjoyed the individual exercise. The combination of the booklet and camera were engaging and FUN." - Quote 7 (participant 5, designer)

Second, the results of the interactive session are discussed. Both designers and non-designers showed during the session to be able to collect insights and actions towards the future. This is illustrated by quotes 8 and 9.

"Now when I see this when I'm triggered a little bit about why I left it out and I realize that this is something that we used one time and that I'm also thinking like: OK, how can we use it more?" - Quote 8 (participant 5, designer)

"Because what I happen to see now, because I now had it again. I looked back into these old booklets especially for this assignment. And when I say it I was like: ah, it was well constructed. So, for upcoming Dutch Design Week I will look again like: goh, can we do something with it?" - Quote 9 (participant 4, non-designer)

Both groups addressed being surprised by the number of different perspectives and classifications that they were able to create while interacting. Additionally, they addressed that it allowed them to dive deeper and that this was supported by the questions posed by the interviewer. This is illustrated by quotes 10, 11 and 12.

"The clustering was fun! And then you noticed that there was more coherence than I previously thought." - Quote 10 (participant 5, designer)

"It is special to experience that there are so many possible ways to analyse the project and position it within my own development." - Quote 11 (participant 3, designer)

"It was a playful way to reflect. I liked the surprise in the session. The deepening of the interviewer who asked really critical questions and interpretations during the session was very nice." - Quote 12 (participant 6, non-designer)

However, this action additionally revealed a struggle among one participant. This participant struggled with whether to view from a personal perspective or the perspective of the project. This is highlighted by quote 13.

"I was looking more from a holistic program level, and this is more content, I thought. That initially felt too simple or too small … The program is of course enormous. So I was thinking how much I had to zoom in, but now we are ... These have been from my perspective really important projects as well" - Quote 13 (participant 4, non-designer)

The third part and reflective part of the session was considered difficult by all participants. Both of the designers addressed that they were not able to work with scrolling through the overview of classification. They found it to be difficult to link it to the narratives behind their classifications, and it was overwhelming in the elements present in the visualization. This is illustrated by quote 14. The non-designers addressed that they were able to see some thought patterns and one non-designer participant even extracted an insight, which is illustrated by quote 15.

"that I'm not understanding it anymore." - Quote 14 (participant 3, designer)

"It strikes to me that the black one is almost all the time at the same position. It does not change much in position… Yes. Because it is what we are doing, that is what really concerns the content. And, he is almost always in the middle, which feels logical, I just hadn't realized that. I expected the card deck to be in the middle and that is it." - Quote 15 (participant 6, non-designer)

Finally, the participants addressed that the completion of the DAT session did not change their perspective, but merely addressed gaining deeper insight and approaching it from different angles. This is illustrated by quotes 16 and 17.

"It did not change my views, but it allowed me to give deeper into some thoughts/ideas/reflections I already had. It also allowed me to pinpoint what are crucial moments and stages in the project and what outcomes resulted out of them (process and product-related)" - Quote 16 (participant 5, designer)

"I don't immediately look at the project differently, but I have learned that you can approach and organize it from different angles." - Quote 17 (participant 4, non-designer)

Phase 2 thus illustrates that DAT and its design qualities posed little differences between trained designers and non-designers, while still allowing interaction with the remnants, exploring different narratives, and allowing for the extraction of deeper insights. The

differences that were present, as for example, the number of gathered remnants could be attributed to motivation instead of their category.

6. Discussion

This research investigates how trained designers and non-designers perceive practising ''Design Archeology'' and identifies design qualities relevant to a multi-actor context. This research followed a Research through Design approach.

The first phase of this research illustrated that trained designers and non-designers experience D.ARK oppositely. The results show that both groups were able to extract deepening insights from their past projects. However, in the interviews conducted by Van der Horst (2022), the designers attributed this to D.ARK and the supportive visual elements, whereas the non-designer attributed it to the questions posed during the interview. They even mentioned the use of D.ARK as distractive, and it was clear that interacting with the visual interfered with answering the questions. This was seen as an indication that the visuals and interaction were too ambiguous to make sense and apply to their story.

To tackle the issues with D.ARK's ambiguity, DAT was created. This new design provided a different approach to the ambiguity by creating three distinct parts. These parts increased in ambiguity and were engaged separately, shifting the participants focused on one particular action at a time. Additionally, where the ambiguous visualizations of D.ARK were considered not interpretable by non-designers, DAT created an overview while the participants were actively interacting and making sense of the artefacts by classifying and organizing. The participants were only confronted with this overview as a reflective part of the interactive part, and thus did not conflict with the focus of the participant during the interaction.

DAT showed that both designers and non-designers were able to gain deeper insights and alternative perspectives while interacting. The participants stated that they were surprised by the number of possible combinations they were able to make. The DAT probe showed the personality of the participants in their gathered remnants and highlighted the role of motivation in its completion of specific tasks, such as the DAT probe. Again, the effect of the interviewer on the establishment of these insights was addressed. It was additionally highlighted that the perspective, from a personal or project-oriented level, taken while participating in the session, influenced the collection of the remnants and the manner of classifying and organizing. The reflective overview was perceived as difficult. There was a slight difference in perception, but this difference is so slight that it is difficult to say whether this is attributable to the categories.

However, one participant gained insights through the reflective overview, which indicates its potential and the fact that this part is not in an effective form.

In addition, this study adds to the interpretation and application of 'Design Archeology' in general. D.ARK approaches it more from an emotional and intuitive perspective, where DAT is more focused on the creation of multiple narratives within the bigger narrative, highlighting the cognitive and rational perspective.

6.1 Practical Implications

The results show that D.ARK in its current design is not suitable for a multi-actor context, like mission-oriented innovation, as it is considered distractive and not supportive for non-designers. DAT, however, proved to contain design qualities that result in a similar and positive experience by both trained designers and non-designers. The design qualities of both D.ARK and DAT are summarized in Table 3.

Table 3, Design qualities D.ARK and DAT

Qualities	**D.ARK**	**DAT**
Build-up	One interactive part where re-engagement and translation occur simultaneously	Three separate subsequent parts that consist of gathering, sensemaking through spatial positioning, and reflecting
Focus	Emotional representation	Interrelatedness
Ambiguity	Relationship; embedded in the creation of the visual; Consistent level of ambiguity	Relationship and information; embedded in spotting inconsistencies in narrative and created positioning; incremental level of ambiguity between parts
Form of interaction	Digital visualization	Physical interaction
Remnants in interaction	Remnants itself	Visual representation of the remnants
Role interviewer	Guide narrative from past to present and eventually future	Actively involved in posing inconsistencies and why questions during positioning. Posing link towards current practice.

6.2 Limitations

The performed research comes with limitations. First, this explorative research was conducted with a fairly small number of participants, which makes it difficult to generalize the results. It solely provides an exploration. Secondly, the distinction made between trained designers and non-designers is binary and leaves the non-designer category as a generalization of many different subcategories. It could be the case that within the non-designer category, people with different backgrounds would experience D.ARK different as well. Additionally, this categorization is now solely based on training and experience, whereas in practice and posed by Dervin (2003) this is influenced by multiple different factors, such emotions and context.

Furthermore, both in phase 1 and phase 2, the participants addressed the role of the interviewer, which leaves the question to what extent the results can be attributed to the actual design or by simply the right questions being posed. However, it is up to debate whether it is desirable that the interviewer should be excluded in the design.

6.3 Future work

By exploring the design qualities needed for a multi-actor context, this research adds to the application of 'Design Archeology' in practice. However, in practice, projects are often a group effort. Therefore, it is relevant to further explore how the required design qualities would differ in a multidisciplinary group context within mission-oriented innovation projects. As highlighted by one of the participants, taking the perspective from the project or personal development level influences its usage and the insights gained. It sheds an opportunity to explore how these manifests and adds to the design qualities.

This research additionally illustrates that the interpretation of 'Design Archeology' can vary according to its purpose and context. This highlights an interesting opportunity to investigate how this interpretation would differ in various contexts.

Both D.ARK and DAT designs extensively focus on exploring the past and relating to the present practice. However, placing it in line with its foundation in Transitional Design Histories, the link to how this relates to future practice could be more explicit. This provides an opportunity to investigate how the translation towards future practices can be established. When looking at transition research and design (research) that is closely connected to mission-oriented innovation, we see that the former is particularly concerned with explaining and conceptualising radical changes in the way social functions are performed (Köhler et al., 2019) while both, and especially design, encourage and drive the development of new emerging

alternatives (Wizinsky, 2022). This study adds to recent research that calls for greater attention to history, context and past experiences (Coops et al., 2024), thus providing an opportunity to develop DAT further in ways that can incorporate past, present and future in multi-actor mission-oriented innovation projects.

7. Conclusion

This research explored how trained designers and non-designer perceive 'Design Archeology' and aimed at identifying relevant design qualities for (non-)designers working in a multi-actor context. A RtD approach is applied in this research. The interaction with the design is used as means to collect data on experiences. The design qualities and their effectiveness are explicitly uncovered by comparing D.ARK to DAT. By thematic semantic analysis and abductive coding, the different experiences and design qualities are extracted.

The results show that both designers and non-designers extract deepening insights from their projects through D.ARK and DAT, yet they need different types of feedback. Moreover, the participants stated that they were surprised by the number of possible combinations they were able to make. Most participants gained (some) insights through the tools, showing the potential for learning and uncovering hidden knowledge during social innovation and transformation projects in (governmental) multi-actor contexts.

Overall, this exploration was a start for bringing the concept of 'Design Archeology' from Van der Horst's original research closer to an everyday practice context focusing on societal transformation, such as the World Design Embassies or the Brabant Outcomes Fund. Opportunities arose to extend the design of tools and shape the application to a broader practice. With the insights from this research, it is expected that further research can be performed on its application within (governmental) multi-actor contexts with a focus on tools for collaboration.

8. Acknowledgements

9. References

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