Research Topics

EXPLORING THE ROLE AND INFLUENCE OF FACILITATION ON THE DESIGN PROCESS

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Contents

1 Introduction

The field of Human-Computer Interaction (HCI) often makes use of (participatory) design sessions, where participants are involved in the design activities. Groups of users and other stakeholders collaborate to discuss, explore and work out design-related challenges. These sessions are typically led by a *facilitator*, who performs tasks that guide the participants from A to B: from design challenge to design outcome. Research in this field showed that a competent facilitator is essential for a successful outcome of a design workshop, since it has such a strong impact on the process and, therefore, the design outcomes [35, 33, 28, 14, 20, 11]. Despite its importance, the influence of facilitation in design is hardly recognised in HCI literature. This leaves the facilitator to be a 'black box' that is taken for granted in design research, despite its potential (negative or positive) influence [8, 42, 20].

Since design sessions are oftentimes guided by facilitators, there is a need for recognition of facilitation as an influential force that shapes the outcomes of a design session. Uncovering the influence of facilitation helps to understand how this impact manifests. Thus, this calls for 1) understanding the role of the facilitator to better understand the potential impact of the facilitator, either implicitly or explicitly, on the design process, and 2) empowering facilitators to make conscious decisions about their practice.

This literature review aims to answer the following research questions: 'What is the role of facilitation in design sessions?' The term 'role' covers the general function of facilitation in design, as well as the factors that the individual facilitator needs to balance. By sketching the broader context in which facilitation takes place, facilitators can become aware of their 'play field' and make conscious decisions about their practice. This review also discusses which factors are most influential. In this way, it tries to detangle the 'black box' and shine a light on the facilitation factors that need more attention in HCI research.

This review is structured as follows. Section 2 will describe the methods that were used to collect and analyse the data for this review. Section 3 will present a high-level overview of the different factors that influence facilitation, after which all the factors are discussed in more detail. These findings are summarised in a final overview, which is presented in Section **??**.

2 Method

2.1 Define

A systematic review of the literature was conducted to identify which factors are related to facilitation in design sessions. First, the inclusion criteria were determined. Accordingly, this study only included articles from the field of Human-Computer Interaction (HCI), or fields related to design thinking. This showed the number of times a facilitator is included in Design Thinking studies and which roles they play. The literature search was done in three phases, starting with a broad search of articles from the HCI field. After that, the field was narrowed to specifically include HCI in combination with movement-based design thinking. Then, the field was specified further to facilitation in the HCI and movement-based design field. A query of (a combination of) the search words, denoted in Table 1, was used on the databases ACM Digital Library, ResearchGate, Google Scholar, and WorldCat.

2.2 Data Collection and Selection

During the collection of data, the search words and outlets, as described in Section 2.1, were iterated upon.

For the selection of the data, first, duplicates in papers were removed from the set. Then, only the articles related to the field of Human-Computer Interaction or fields related to design thinking were included in the data set. This was done by scanning their title and abstract, after which the full articles were then scanned for their context relevance. Forward and backward search was done to find

design thinking and/or methods	movement-based design thinking	design thinking and facilitation
Embodied Design Methods	Movement-based (interaction) design	Participation
Design methods	body movement	Facilitation
interaction design	body-storming	Role
Human-computer interaction		leadership
method cards		
design tools		
interaction design process		
research through design		

Table 1: Search words for the three search phases

relevant related studies, and to enrich the quality of the data set.

Two additional sources of data were used in this study: expert discussions and observational data. The expert input on facilitation and grounded theory was directly used in the data analyses, see Section 2.3. The observations were done during a facilitated movement-based design workshop, which took place at the University of Twente with students from the master´s Interaction Technology.

2.3 Data Analysis

The literature studies were analysed according to the principles of Grounded Theory, using open coding, axial coding and selective coding in an iterative manner. The book 'Constructing Grounded Theory' by Charmaz [6] was mainly used as reference, in combination with a more practical Grounded Theory approach from Wolfswinkel, Furtmueller, and Wilderom [41]. In this study, the data used in the Grounded Theory was in the form of published papers, observational notes and discussions.

Each article was scanned again, and relevant findings and insights on 'facilitation' were highlighted. The selected text, either words, sentences or whole paragraphs, served as excerpts that were later used in the coding process. During this stage, concepts and insights were starting to form mentally. The highlighted 'excerpts' were then re-read and coded using the line-by-line approach [6].

Each line was coded, using the open coding principle. Besides, additional comments or broader insights, called 'memos', were noted. In this way, the 'hidden' meaning was articulated and labelled into concepts. In an iterative matter, axial coding was used to identify themes, relations, broader concepts and categories from the open codes. This uncovered categories and relationships between the data excerpts and the codes.

The iterative character of grounded theory allowed for identifying and relabeling the set of concepts once more excerpts were analysed. This caused the theory to become more stable over time. Once half of the data was analysed, the codes were transferred to a large brainstorm map. This mapped out the codes, their overarching categories and the relationships between them. Then, in an iterative process, the codes from newly analysed articles were added to the map and the structure of the map evolved accordingly. Selective coding was used to identify relationships between the main categories. Comparative analysis, as described by Charmaz [6], was used to engage with the data and the codes, by comparing codes with other codes, codes with other data, and data with other data. These new findings and higher-level insights were also used to refine the word map.

The observation notes from the facilitated session were first transcribed and complemented by memory. Then, the transcript undertook the same analysis process as the research articles and it was line-by-line coded and analysed. The codes were added to the map. The discussions with facilitation experts lead directly to alterations of the map and were not coded.

Once the literature from the initial search was analysed, the gaps in the map were identified. A second literature search was performed to fill these gaps to reach saturation. This was done by backward and forward searches with the most relevant papers. Each new article was directly analysed using Grounded Theory and the findings were integrated into the map. This iterative process altered the categories and codes until theoretical saturation was reached, meaning that no new concepts,

categories or interesting links appeared [6, 41].

2.4 Theory Building

The word map iteratively evolved while more codes were integrated. Once the categories appeared stable, the map was analysed using thematic analysis. Main themes were abstracted by engaging in interpretation and sense-making of the map. According to Maguire and Delahunt, thematic analysis makes use of six phases: becoming familiar with the data, generating initial codes, searching for themes, reviewing themes, defining themes, and writing up [24]. Step one to three were already performed during the Grounded Theory analysis. The initial themes from the first version of the map were reviewed and further grouped according to their overlap and relevance. This involved critically asking whether the themes made sense, if the codes were placed underneath the correct themes, if there was overlap, whether there were sub-themes visible within themes, etc. This process was repeated for the second and third versions of the word map. During this stage, there were still articles added to the data set when more 'substance' was needed in a certain corner of the map. After the completion of the third version of the map, an abstraction was made from the main themes of the map which served as the 'backbone' of the remainder of this literature review. This literature study was built by reviewing the codes and excerpts that were involved with each specific theme. A more general theory was shaped from the selection of papers related to the different themes.

3 The Findings

3.1 Literature Search

The first literature search resulted in a total of 65 papers. From this list, 9 papers did not met the inclusion criteria and were excluded. All papers were first analysed according to three categories: they either 1) didn't specify a facilitation role, 2) did not specify, but briefly noted the presence of a facilitator, or 3) specified that there was a facilitator. Table 2 shows the distribution of these categories over the three search domains. In the later stages of the Grounded Theory approach, a second literature search was performed to reach data saturation and fill 'gaps' in the map. This resulted in an additional 20 papers, which makes an overall total of 74 articles.

Design thinking and/or methods	**movement-based design thinking**	**design thinking and facilitation**
Not Specified: 11	Not Specified: 10	Not Specified: 0
Described: 5	Described: 4	Described: 0
Specified: 5	Specified: 5	Specified: 16
Total: 21	Total: 20	Total: 16

Table 2: Results of the initial literature search regarding the occurrence of a facilitator

3.2 A High-level Overview of Facilitation

Three iterations of the facilitation map were made in the online brainstorming environment 'Miro', which can be seen in Figure 1 and in the online Miro environment[1].

In the first version of the map, the codes were placed in clusters and categories were made between them. These categories were linked to higher-level categories, which formed the main theme of the map, as shown in Figure 1. After that, thematic analysis was used to iterate upon the map and evolve the sub-themes. In the second and third (final) versions of the map, the categories were critically analysed and reshaped according to the steps described in Section 2.4. Additional discussions and a design session were included in this process.

An abstraction from the final version led to a high-level overview of the different factors that play a role in the facilitation of a design session, shown in Figure 2. The main themes are Practicum, Facilitator as an individual, Social dynamics, Experience, and Support. The remainder of this study

[1] https://miro.com/app/board/uXjVPN-sFbc=/?share_link_id=877758937769

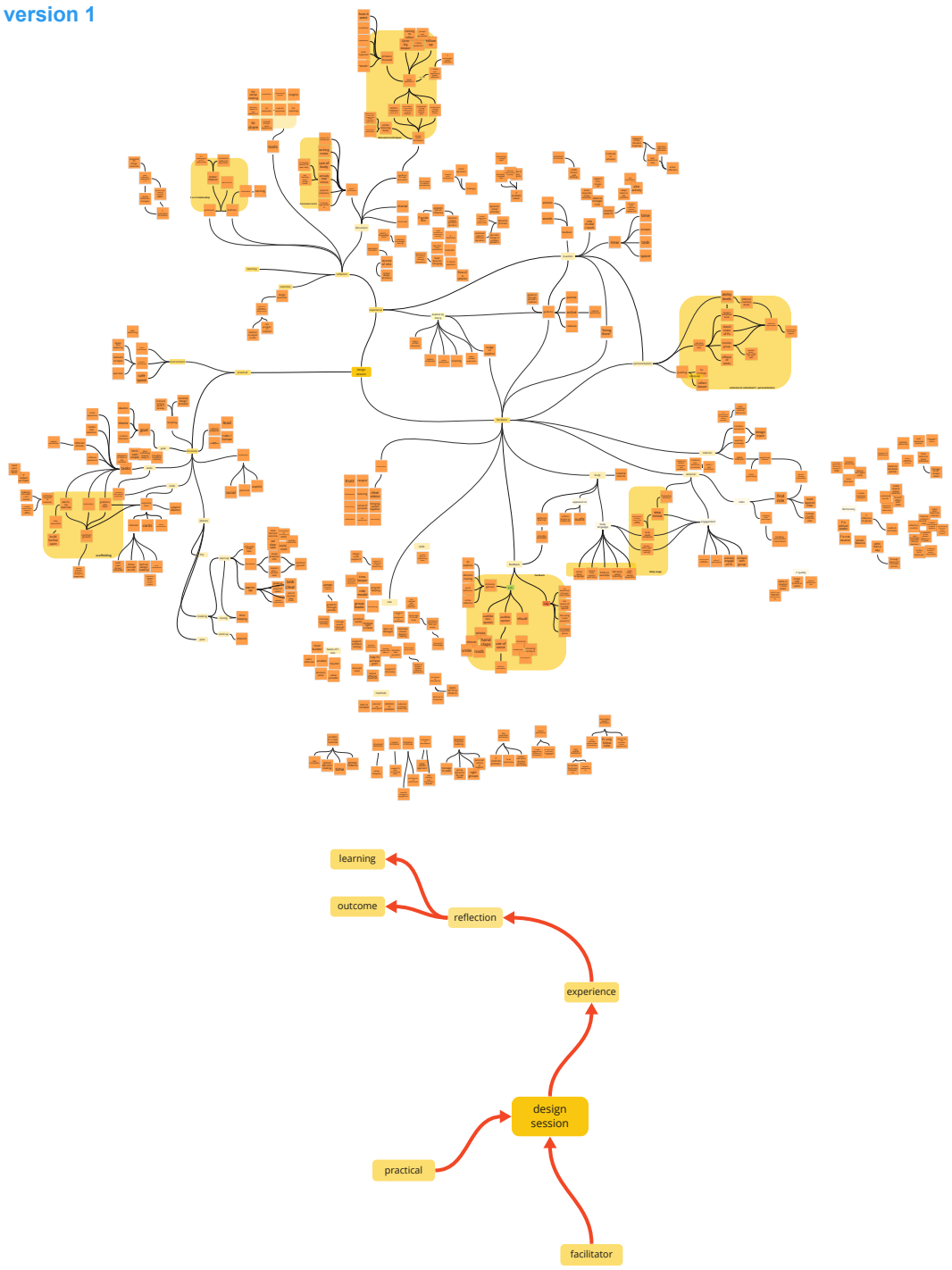

Figure 1: Mapping the Facilitation: version 1 of the word map (top) and the main theme (bottom).

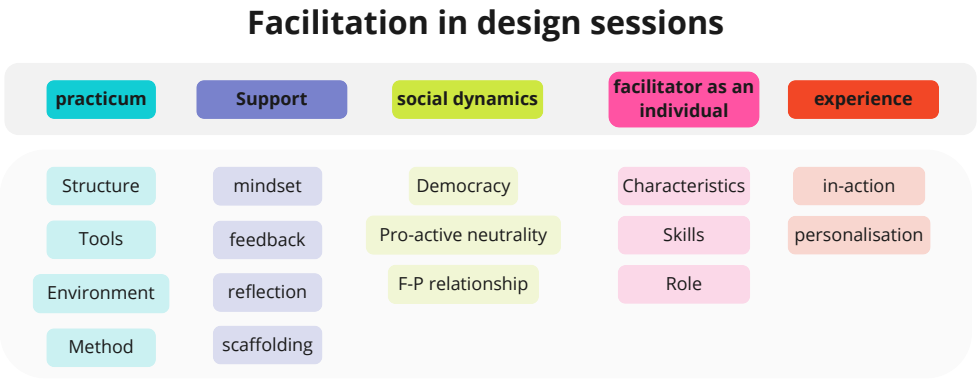

Figure 2: High-level overview of Facilitation

will go over these themes and their interrelations in more depth.

3.2.1 A three-layer facilitation figure

These main themes are structured in a three-layers figure of the facilitation factors that influence the design session, see Figure 3. From outside to inside the factors that influence the design session become more ambiguous and abstract.

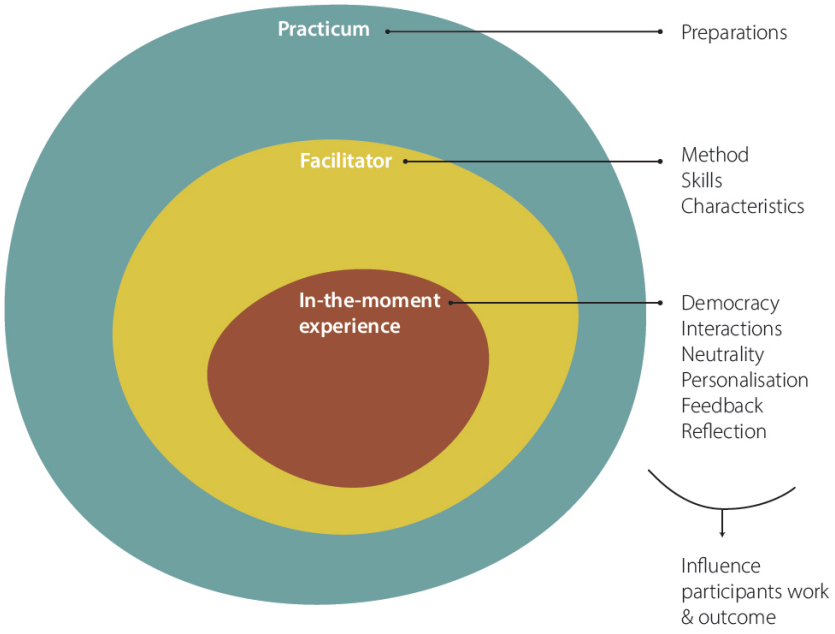

Figure 3: Model of the facilitation factors

The outer shell represents the practicalities of the 'Practicum', discussed in Section 3.5. These are all the elements that need to be carefully prepared and thought out. This involves preparations such as the structure, the tasks, the tools, the logistics, and the environment. But also preparing different personalisation scenario's for potential differences in skills and creativity. The preparation responsibilities stretch over all the phases of the session, from the first client contact to wrapping up the session. The elements of this shell need to be taken care of in order to have a successful design

session. However, they are relatively easy to implement and are independent on the characteristics of the facilitator. Awareness to these elements can already help facilitators to consciously design a fitting design session.

The second shell discusses the elements that the facilitator brings to the session, discussed in Section 3.5.4, 3.6.2 and 3.6.1. It was discussed earlier that the facilitator as an individual, brings his own preferences, skills and characteristics to a session. Section 3.6 discusses multiple characteristics that are related to competent facilitators, some of which are inherent qualities, whereas others can be learned. This section also discussed the three different characteristics of a facilitator: interpersonal, process management, and personal. Although these qualities might come easier to some, they still can be improved when the facilitator actively works and reflects on them. This is the same for the skills of providing guidance and feedback. The facilitation method is also the result the personal preferences of a facilitator. Active reflection on the facilitator's influence and the effect this has on the process and the participants is a valuable way to improve facilitation practice.

The factors in the third layer are taking place *in-the-moment*, all at the same time whilst interacting with each other, discussed in Section 3.7.1, 3.7.3, 3.7.2, 3.8.2, 3.9.2 and 3.9.3. The facilitator has the role of 'juggling' all these balls. High-performing facilitators have the ability to handle all these factors with ease at the same time. The literature often recognised that the facilitator needs excellent social engagement and awareness to work with the social complexities of the group in a respectful, structured and flexible way [4]. The most competent facilitators can pick up the subtle things that are happening in the group and directly respond to them in an intuitive matter. These social abilities, as well as the ability for instant and intuitive response, show to be the most influential factors in distinguishing between novice and expert facilitators.

3.3 Main Findings on Facilitation

It became clear from the literature that facilitation is a subtle art. During a design session, participants move from a design challenge to a design outcome. Along this journey they might interact with each other, perform all kinds of activities, learn, experiment, explore, and experience. It also became apparent that there is often someone (although this is not always clearly noted in design research) that owns or presents the design problem and guides the participants on their journey towards the solution. A facilitator nudges and guides the participants on the path towards the solution. This asks for a delicately tuned facilitator that can bring the right amount of support for the best design circumstances. If this is done well, the session will be more effective and the results more successful [35, 14, 33].

However, this literature review found that the presence of a facilitator is barely acknowledged in design-related research. The reviewed articles in the 'Design Thinking methods' category only acknowledged the presence of a facilitator in 5 out of 21 studies. In the other 16 studies, facilitation was not noted at all, or only briefly mentioned. This was similar for the articles on movement-based design thinking. Even *if* there was a facilitator involved in the design process, his specific roles were not or very briefly described. However, research by Stewart, which specifically focused on facilitation, emphasised the importance of a facilitator [35]. The study stated that a competent facilitator is essential for a successful outcome of a design workshop.

Many of the analysed articles on facilitation suggest that there are different factors that play a role in facilitation [34, 13, 3, 35, 42, 28, 2, 25, 36, 8, 1, 11, 23, 9, 33, 5, 19]. However, most studies focus on a selection of factors in isolation, while a review of all these factors together is missing. Since most of these factors appear to influence the facilitation practice, the design thinking field can benefit from a more zoomed-out approach where all factors are considered. This will also shine a light on the potential interrelations between the factors. Therefore, this study aims to collect all the factors together in order to paint a more comprehensive picture of facilitation.

3.4 Facilitation in context

The larger context in which facilitation takes place is often not mentioned throughout the reviewed literature. Only researched by Stewart went into detail on how the group structure and the larger organizational context might influence the design process [35]. However, a closer look into the larger picture can help the facilitator to make conscious decisions on where his influence reaches. Stewart [35] concluded that the power of influence of the facilitator only stretches to the group process itself. Group process on its own is also discussed in other studies [34, 14, 19, 20, 3], and includes elements such as problem-solving [35, 14, 9, 26, 28], decision-making [35, 10, 31, 28, 14], communication [35, 19, 40, 31, 15, 14, 20, 9], boundary management [35, 15, 14, 20], and conflict management [35, 4, 10, 31]. According to Stewart, these are the elements for which the facilitator is responsible. Other factors that have to do with the group structure, the group effectiveness or the organizational context, lie beyond the influence of the facilitator [35]. The study also argued that an effective facilitator should understand and minimize these factors, but has no responsibility for them. However, the facilitator can support the participants in managing these factors, but according to Stewart, this is dependent on the competencies of the facilitator [35]. The remainder of this review will focus on these competencies and the factors that are in the facilitator's circle of influence. However, it is important for the facilitator to stay aware of the external influences that can intervene with the session.

After zooming in one step closer, research by Azadegan and Kolfschoten sketched the facilitation process during a single design session [3]. Their research shows the relationship between some of the competencies of the facilitator and the quality of the participant's work, however, they don't go into detail on the individual qualities. From their work, it becomes clear that the facilitator is responsible for setting up a structure so that the participants can collaborate efficiently and effectively. This was supported by other studies, who also stress the importance of providing a guiding structure [12, 19, 33, 10, 28, 14, 20, 9]. The facilitator also influences the motivation by managing the energy in the group through exercises [3, 28], which has an impact on the effort that the participants make [3, 19, 28, 20]. However, participant motivation is also partly intrinsic and influenced by other factors such as the external factors discussed in the previous section [35, 14, 38]. Azadegan and Kolfschoten expect an interaction effect between the group motivation and the quality of the facilitation service [3].

These results show that the facilitator has an important role in stimulating the right mindset and energy, as well as the process. However, the study by Azadegan and Kolfschoten does not specify what is needed to achieve this and which qualities are required from a facilitator. But since the overview includes elements that are related to social dynamics, such as motivation, energy and effort, it suggests a need for strong social and communicative skills from the facilitator. In the next sections, this work aims to review a large selection of papers in order to provide an overview of these qualities and the way they impact the facilitation practice.

3.5 Practicum

This section discusses the practicalities that involve facilitation. Most of the aspects that contribute to a successful session mainly require thoughtful preparation, planning and critical thinking upfront. That suggests that these elements are easier to implement since they don't necessarily depend on the personal characteristics of the facilitator. These individual skills relate, for example, to the facilitator´s ability to handle social dynamics, design skills, or his experience in facilitation [31, 26, 20]. This section will go over the different practicalities that were abstracted from the reviewed literature: Structure (3.5.1), Tools (3.5.2), Environment (3.5.3), and Method (3.5.4).

3.5.1 Structure

The timeline of design facilitation stretches both before and after the session. As a facilitator, it is important to understand the context in which the session takes place in order to steer towards relevant outcomes. This includes an understanding of the design challenge, the client, the different stakeholders, the overarching project, previous sessions, etc.

There are different studies on how the timeline of session preparations can be structured [3, 35, 14].

Hayne note that the division into stages serves as a loose guideline and shouldn't be used as a rigorous structure [14]. However, they suggested that design problems of higher complexity require a more structured approach, whereas this is less necessary for simpler design problems. Overall, the literature has an agreement upon the phases: an initiation, pre-workshop, workshop, and post-workshop phase.

These findings are summarized and the following 4-stage model is proposed:

1) Initial Client contact This stage describes the initial workshop request and information meeting with the client. There are different facilitator tasks in this stage that might influence the design session later on. First, the facilitator has the task of gathering a first understanding of the design problem and situation, since this might influence his ability to intuitively guide the design session. This might include the workshop topic, practicalities, and potential challenges and opportunities [35]. Another factor that might influence the group dynamic later, is how the facilitator understands which stakeholders are involved and what their requirements are. A last factor is how the facilitator diagnosed the design problem: is a design session suitable or could alternatives, such as a presentation or training, be considered? Picking the most suitable format might affect the effectiveness of the session [35].

2) Pre-workshop preparation This planning and preparation stage occurs around five to ten days before the design session. In this stage, the way different preparations are carried out might influence the design process later on. This includes the facilitator's cultural- and contextual awareness, preparations of the logistics (such as participants, venue, documentation, and equipment), a design of the workshop process and a decision on the tools that will be used in the design session [35, 14]. This has a large influence on how the space, tasks and participants will come together in the session later on. Other factors that influence the session, are which participants are invited and how they are briefed on beforehand. Designing the appropriate tasks is dependent on how the facilitator assessed the participant´s familiarity with the tasks and materials [9]. Last, the design session might be influenced by how the facilitator reviewed the previous meetings to understand the overall process and prepared the meeting goal, key documents and agenda, and anticipated the risks [14].

3) Workshop Facilitation Activities This phase describes the design workshop itself and it contains managing the process, objectives, and participants. Although the facilitator has the end responsibility to meet the session deliverable, he will not be involved with the content itself, but rather with the process [28, 14] The competencies of a facilitator become most evident during this phase since he has to manage all the elements in real-time [35]. The factors that are of influence *during* the session are discussed in more detail in the next sections.

The workshop activities can be further fragmented into a Start-Up, During, and Wind-Up phase [14]. The *Start-Up* phase aims to create a common ground between all participants and prepare the right mindset. The *During* phase contains the actual design tasks and activities that are earlier prepared by the facilitator. The *Wind-Up* phase recaps and summarizes the session and ensures that the participants have a common understanding of the accomplishments [14]. The influential factors that come into play during the design session will be discussed in depth in the next chapters.

4) Post-workshop Activities The post-workshop activities contain the finalisation of documentation, such as project plans, summaries, or business models. Although the session itself has already been completed, the facilitator can still influence its effectiveness by tying up the loose ends in a responsible matter. This includes tasks such as distributing the right materials to the participants and stakeholders afterwards, as well as communicating the next steps and potential forthcoming sessions. [35]. This also includes a moment for reflection, so that the facilitator might improve his own practice for future design sessions. As well as a meeting with the client to review whether the objectives and outputs met the expectations [35].

3.5.2 Tools

Different types of materials are used during design sessions, such as technologies, craft materials, or design tools (such as design cards). These tools are used as media to explore, express, discuss, reflect

or transfer thoughts [30, 12, 9, 10, 40]. It is *through* these materials that the participants are able to channel their thoughts and creativity [10, 26, 19, 28, 20]. To facilitate this as effectively as possible, the facilitator should show and introduce the tools clearly so that the participants are able to 'master' them [15, 10, 26, 19]. Especially if there is a tool abstraction, where a tool substitutes for an abstract concept, it could cause difficulties for some participants [9]. A selection of conventional and unconventional materials can encourage participant exploration [40].

Hutchinson et al. gave their participants 'low-tech prototyping art materials (coloured paper, string, clay, etc.) to use to design technology solutions´ [16]. Low-technology materials can substitute for complex materials, while the design goal can still be reached. Similarly, Lee, Lim, and Shusterman asked their participants to design an interactive product, but they provided only 'various materials for sketch drawing and low-fidelity prototyping´ [19]. In a study by Oulasvirta, Kurvinen, and Kankainen, materials were used to explain the design scenario, where 'drawings and written text were used as a media for scenarios' [26]. This served as a source to transfer thoughts, and provoke expression and discussion.

The facilitator can also make the decision to design with more complex technologies. Wilde[1] et al. encouraged the participants to experiment with technological materials, such as body-mounted sensors and other recording devices [40]. [10]. Hsueh, Alaoui, and Mackay asked their participants to interact with high-technological materials [15]. They were instructed to dance and move their bodies in reaction to adaptive visualisations on a larger screen. The visualisations could be altered with different visual parameters, such as springiness, fluidity, or speed. In this case, the participants interacted with the technology in a more one-sided interaction, where the technology only gave the prompts to which the participants reacted.

A combination of high-tech and low-tech materials is also possible. Frauenberger, Makhaeva, and Spiel used a combination of high- and low-technological materials to design quick but interactive prototypes [10]. These types of click-and-play technologies lend themselves perfectly to quick, low-fidelity prototyping since they can often be combined with craft materials such as cardboard. The technological materials used by [10] were 'Little Bits' [2], which is described as 'an open source library of modular electronics, which snap together with small magnets for prototyping and learning' [7]. After the participant became comfortable with the technological material, low-tech materials were introduced to create hybrid prototypes that were semi-functional.

Design cards

Design cards are a physical tool that can facilitate ideation and creativity [5, 18, 32]. Cards are able to digest abstract frameworks or theory into a more operational and tangible form through keywords, pictures, cues and questions. This can serve as a stimulus for new contextual perspectives. In a review of 18 design cards by Bornoe, Bruun, and Stage, it was highlighted that cards can 'facilitate a design process, support design dialogues, make the design process visible and less abstract, provide structure in the process and are easy to use and manipulate' [5]. It is therefore a useful tool to shape common ground among participants and stimulate concrete discussions. Bornoe, Bruun, and Stage make a division between general or open-ended design situations, context-specific situations, or participatory design situations (where designers and users are both engaged). They further divide the usage of cards into 'no methodology', 'suggestions for use', and 'specific instructions'[5].

3.5.3 Environment

The environment is the space where the design session takes place. The environment entails the physical setting itself, a more subtle atmosphere in this physical space, and possibly an online environment for extra support [28]. However, COVID-19 showed that the physical space itself can, although with certain limitations, also be brought to an online environment [27].

The physical space should mostly be big enough to and allow for free exploration [33, 10, 19, 14, 27]. Reidsma et al. note that 'An essential role of a facilitator in Movement-based Design is to create a safe and welcoming space where the design activities can take place. People may feel exposed and embarrassed performing movement activities.' [28]. In line with this, Lee, Lim, and Shusterman stated

[2] https://sphero.com/collections/design-build-systems

that 'The physical space should allow for the design activities to take place, the space for designers to freely move around, and work either at the table or on the floor.'[19]. Frauenberger, Makhaeva, and Spiel add that the environment should allow for free exploring of possibilities regarding the design materials and space [10]. And Body, Terrey & Tarags add that 'A good space will have good natural light, space to move around and plenty of horizontal or vertical surfaces on which to develop or display emerging thinking' (Body, Terrey & Tarags, 2010). Choosing certain environmental stimuli can influence to the facilitation of the participant's mindset, according to Reidsma et al.[28]. However, the facilitator should be aware to 'protect the group from the external environment' and potential hindering, external threats or distractions [14, 38].

The more subtle atmosphere is largely influenced by the setting, but also by the group dynamics and the facilitator himself. The mood and energy in the room should be facilitated for the best possible participant commitment and engagement [28]. Reidsma et al. noted that mindset is an important factor and that it can be scary for participants to engage with full commitment. They state that when 'acting out (in often new environments with new people) is scarier, the group dynamics also become more critical.' This asks for active facilitation to guide the participants in their stage engagement. However, it is a fine balance of pushing certain participants a bit harder, while other participants might need to be left alone more [28]. The initiation of more restricting exercises, such as warm-up exercises, can help to 'support building a safe and friendly movement environment, but probably takes away some flexibility and spontaneity' [28]. Overall, the facilitator should be very mindful towards the atmosphere of the group, since it can greatly impact the group dynamics and participant behaviour. It asks for careful 'feeling' of the group´s doing and which support is needed.

3.5.4 Method

Different variables can influence the facilitation approach, such as group culture, task complexity, group decision-making, and time [14]. Hayne stated that there are different processes that the facilitator can influence. The task activities themselves are mostly content-driven which means that they are in the hands of the participants. However, the structure and the process are in the facilitator's control. The facilitator can thus actively decide upon the structure of the session or how much influential control he gives to the participants.

A range of facilitation methods

This framework visualises how facilitation approaches can differ from each other, by distinguishing between four parameters.

Starostka et al. discussed four parameters that characterize the different facilitation methods, see Figure 4 [34]. Each of these parameters is a continuum on which a facilitator's approach can change, either voluntarily (by adjusting to the group) or involuntarily (by social pressure or preferences). The first parameter is understanding Design Thinking from a Tool vs. Mindset perspective. This ranges from participants focusing on the tool itself and using it as-it-is to achieve a goal, to the participants understanding the mindset behind the tool and being free to explore and experiment with it. The second parameter is focusing on solutions vs. on problems. this ranges from a focus on the creation of a solution or prototype and working towards this, to a focus on identifying the full problem, whereas the solution itself comes secondary. The third parameter is a planned vs. emergent process. This ranges from having a defined and well-prepared plan, which is presented to the group as a ´given´, to having many prepared materials, but no predefined plan. Instead, there is room for consensus and co-developing with all participants. The last parameter is individual vs. shared leadership. The left side of the continuum describes a process that is led and steered by the facilitator, with two extremes that are either 'I facilitate', or 'I delegate facilitation responsibilities to you´ [34]. Whereas the right side describes a process where the responsibilities are shared with the group and the facilitation will provide guidance to teach and engage, but the participants take co-responsibilities and the overall process is co-created. Each approach has its own strengths and weaknesses, and the appropriate method should be adjusted to the context of a project and to the group´s development and expectations. To illustrate this continuum, Starostka et al. did two case studies, where one facilitator practiced on the left side of the continuum. Participants stated that they really disliked the rigid structure and the unpleasant way the facilitator took authority. They had no room to follow unexpected leads or explore a certain area more. The facilitator from the second case study was found on the right side

of the spectrum. Although the participants liked the freedom and co-sharing of responsibilities, they noted that they felt very lost in the possibilities. More guidance and restrictions would have been very beneficial. This shows that the extremes both have their own consequences, and the facilitator should make a deliberate decision on which side fits better to the session.

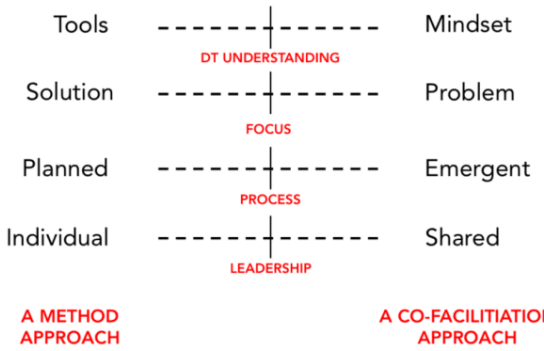

Figure 4: The four facilitation method parameters on a continuum extracted from [34]

Facilitator control

This framework describes four different approaches in which the facilitator can exert control over the participant group.

Reidsma et al. mapped facilitation approaches along four facets [28]. The first is fully controlled facilitation, where the facilitator controls the complete process and participants only focus on their tasks or activities. This limits flexibility and spontaneity but adds to a safer and more friendly movement environment. The second is shared participation, where participants can explicitly suggest methods or influence the process. This requires a smoother session where participants feel comfortable, but it has the risk of a unbalance in participant dominance. Thirdly, fully shared facilitation, where the session runs between the participants, without a fixed facilitator. This requires an experienced group that is aligned in their goal, path and timeline. Last is technology-based facilitation, where a technological tool steers the process and provides structure and rules. This increases the efficiency of the session but lacks adaptiveness and personalisation to individual participants.

Types of facilitation

This framework summerizes the different elements that can be facilitated.

Reidsma et al. also introduced a theory on the different elements that can be facilitated. Their seven focus points are: 1) structure facilitation, which ensures that the group stays on the right path, regarding order and time [28]. 2) content facilitation, which helps to identify interesting or 'unheard' ideas from all group members. 3) mood and energy facilitation, so that commitment and engagement stay high. 5) facilitation of maintaining a playful attitude, since this is hard to do on commando and needs some steering with examples, tasks, props, or task constraints. 6) group-building facilitation, which handles the group dynamics and involves monitoring individual participant engagement, setting up the right groups, and the personalisation of support. 7) Facilitating of stage-engagement, to help participants step-in-and-out of the centre point of the group.

3.6 Facilitator as an Individual

Facilitation methods and techniques cannot exist on their own, instead, they are carried out and embodied by the facilitator [20, 39, 9]. Light and Akama stated that 'it is not meaningful to separate the designer from the method since we cannot know participative methods without the person or people enacting them. Methods and techniques require embodiment [9]. We must also look at how this relates to practitioner characteristics, their worldview, purpose and decisions on the day.' [20]. The study by Light and Akama urged researchers to pay attention to the way in which designers practice facilitation, rather than merely looking at the methods themselves. They further stated that the characteristics

of the facilitator are relevant since they influence how the method will be carried out, which was also found in other research [38, 31, 9].

Stewart stated that the 'competency' of a facilitator can be split into five parts: motives, traits, self-concept, knowledge, and skill [35]. Motives describe the drive and behaviour that steers facilitators towards certain actions. Traits are the personal characteristics and nature of the responses to situations. Self-concept contains the facilitator's values, self-image and attitudes. Knowledge describes how much the facilitator knows about a certain area [28]. Skills describe the facilitator's ability to perform a certain task, either physically or mentally [30]. Skills and knowledge are relatively easy to learn with time and training. On the other hand, motives and traits are difficult to learn and are more dependent on the innate characteristics of the facilitator [31, 20, 9]. This requires a selection process to ensure that the facilitator has the essential characteristics in order to effectively facilitate a design session. A larger difference in these factors will distinguish an average facilitator from a superior one [35]. These factors are further discussed in the three sections below, focusing on characteristics, skills and facilitator role in design sessions.

3.6.1 Characteristics

The facilitator is the enactment of his own worldview, values and personal characteristics [20]. This means that the inter-subjective nuances of an individual facilitator will have an influence on the session [9]. Schweitzer, Sobel, and Groeger named the following characteristics that make a competent facilitator: trustworthy [28], respectful [9, 38], charismatic, understanding [27, 14, 20, 9], having a clear vision, sense of purpose, full commitment, bringing people together [9], collaborative [12, 27, 28, 20], and strong in communication [31, 40, 14].

Stewart proposed a set of competencies that are essential to high-performing facilitators. Their competency model stretches over five categories: Interpersonal competencies (communication skills, and other skills), management process competencies, personal characteristics, and knowledge competencies. High-performing facilitators stand out because they 'can do it all at once' [35, 33]. They also show greater abilities of sensitivity, intuitiveness and empathy [35, 9, 20].

Interpersonal characteristics
The interpersonal skills of a facilitator mostly contain the ability to participate in an effective conversation. Stewart concluded that high-performing facilitators have exceptional communication skills. These skills were summarised in 'LEAPS': Listen, Empathize, Ask, Paraphrase, and Summarize. Their verbal, non-verbal, and written communication skills are also high, in combination with an attitude of good questioning, active listening, and perceptive listening.

Besides communication skills, other essential interpersonal skills were flexibility, sensitivity and modelling neutrality. However, almost all interpersonal skills were evaluated as important by Stewart. This includes cultural awareness, leadership, and building relationships. Interestingly, leadership was evaluated as the ability to 'shepherding', where the facilitator 'leads from behind' instead of a hierarchical way of leading.

Process-Management characteristics
The competency model by Stewart showed that managing time, planning and organizing, managing the physical environment, and managing feedback were evaluated as the most important process-management skills.

Personal characteristics
Adaptability and emotional resilience are two personal characteristics that were evaluated as most important. However, there was no large difference between the other personal characteristics from the model, such as trustworthiness, self-awareness, objectivity, or intellectual agility.

3.6.2 Skills

Novice facilitators do not have the same skill set as expert facilitators [20]. The largest difference lies in their ability to identify problems. Light and Akama suggest that engineering tools can support the

Design Thinking Types	Design Expertise Levels	Problem Level	Problem Level Approach & Description
Result-Focused	Naïve	Simple	**Direct** Complete a task
Convention-Based	Novice	Simple	**Change Work Processes** Modify process to facilitate self-direction
Situation-Based	Advanced Beginner	Complicated	**Modify Structure** Modify approach, information & connection
Strategy-Based	Competent	Complicated	**Convene & Intervene** Compare approaches with and without goals
Experience-Based	Expert	Complex	**Convene** Bring together components of complex adaptive systems
Developing New Schema	Master	Complex	**Examine, Describe Patterns** Observe interactions between complex and adaptive systems
Redefining the Field	Visionary	Chaos	**Seek Patterns** Scanning chaotic systems for emerging patterns

Figure 5: Design expertise compared to design thinking types, extracted from [25]

novice facilitators, which can 'improve reliability and quality of problem identification' [20]. They note that design cards can serve as a helpful tool to support novice facilitators. Their study also suggested that an ongoing reflective approach to their own facilitation practice can improve the quality and skills. Besides, facilitators can improve their level of design expertise with repetitive practice, 'skill acquisition, learning declarative knowledge and developing relevant experiences', which will help in their facilitation practice [25].

Different studies explored the influence of design expertise on the quality of facilitation [25, 28, 20]. The success of a design session is for some part dependent upon the facilitator's guidance and feedback [25, 33, 14, 12, 19, 30, 10]. However, a certain design expertise level is required so that the design thinking methods can be successfully instructed and provided with feedback.

A model of seven layers of design expertise was proposed, ranging from naive to visionary [25]. These seven layers are mapped against design thinking types, as shown in Figure 5. The lower levels of design expertise have a problem-focused approach. This means that naive designers tend to take on a problem-focused strategy where they spend all their attention on analysing the problem in order to get to a solution. On the other hand, facilitators with higher levels of expertise apply novel, unexpected solutions. Design experts tend to use solution-focused problem-solving techniques, where they focus on the generation of solutions [28].

Another differentiator between novices and experts is the facilitator's ability to perform reflection-in-action [33, 9, 20, 12, 27, 39], which, according to Mosely, Wright, and Wrigley 'helps them to deal well with situations of uncertainty, instability, uniqueness and conflicting values that are inherent in ill-structured problems' [25, 27, 20]. Advanced designers also apply a focus on the 'methods, skill set, modes of reflection, mindset or mind-shifts needed to practice design thinking' during the design session [25, 31, 28, 27, 20]. This is in contrast to the naive facilitator, who focuses on surface-based issues, such as workshop structure and the stages that are often associated with design thinking.

This suggests that facilitators can be differentiated by their ability to approach problems [25]. However, Mosely, Wright, and Wrigley added that the ability to solve problems is not only influenced by design expertise, but it's also greatly influenced by creativity [25]. Their study recommended facilitators to have a minimum level of 'Advanced Beginner' or (preferably) 'Competent', which corresponds to a finished undergraduate study in design. Facilitators with a lower level will have trouble guiding the participants through complex problems. This will impact the participants' ability to fully comprehend and address the design challenge of the session. Mosely, Wright, and Wrigley advised mindfulness towards the complexity of the design problem so that it fits the design expertise level of the facilitator.

Sanders and Stappers discussed that facilitators can bring domain-specific skills into their practice since they are often also active in other fields [30]. For example, a facilitator that is also a social psychologist can bring in knowledge of interviewing skills, as well as knowledge of social interaction patterns. This expertise can be valuable in the facilitation process. It is also argued that the expert

knowledge of the facilitator, as well as their facilitation experience itself, can serve as additional design input [27, 30]. However, this is a debated topic since other studies suggest that facilitators should stay away from the content of the design session [28, 14]. But perhaps this asks for subtlety from the facilitator's side, to balance his influence on the design session while making use of his valuable insights.

Another highlighted skill is to provide guidance, although the body of literature suggests different ways of doing so [30, 19, 39, 40, 37, 28]. Lee, Lim, and Shusterman discussed guiding the participants in reaching the appropriate mindset or reflecting on experiences [19]. Wilde, Vallgårda, and Tomico proposed guidance to help participants through a method and in the discussion phase [39]. Sanders and Stappers noted how the facilitator can guide participants on different levels of creativity, ranging between leading, guiding, providing scaffolds and offering a clean slate [30]. Wilde[1] et al. discussed guiding the participants during the experimentation and discussion phase [40]. Hsueh, Alaoui, and Mackay discussed an example where a participant was 'stuck' in the task and the facilitator 'stepped in and helped guide her in relating to the visuals', which shows that the facilitator has a role of actively stepping in- and out in order to assist participants at critical moments in their process [15]. Light and Akama summarized that a facilitator guides 'people through processes to agreed-upon objectives in a manner that encourages participation, ownership and creativity from all' [20]. And last, Reidsma et al. added that 'a facilitator is skilled in guiding a group in co-operative processes, including shared decision-making to full its purpose in the best manner — focusing on managing design activities, unlike managing the content' [28].

Wakeford and Pimbert criticise that facilitators often apply a ready-made method without much elegance. Rather, facilitation should be seen as a craft that requires 'a comprehensive apprenticeship rather than a handful of brief lessons' [38]. They proposed that a facilitator has a toolbox ready, which they can tap from according to the situation. In addition to this, Light and Akama stated that there is a consensus in research that facilitation cannot be done by a handbook [20]. It asks for a subtlety to feel, experience and think about what is going on. Especially what is happening *now* in the moment with the participants and the atmosphere in the group. It asks the facilitators to respond in-the-moment to the situation in an intuitive matter, although this (often) stems from a method or theoretical skill. There is a need for subtle 'feeling' of the room [20]. Their research further described this as 'The facilitator is required to juggle personnel, materials and processes in intuitive ways (Light and Miskelly 2008), often instantly or reactively and we detail the interaction that influences the decisions made – often intuitively and often in response to unexpected incidents'. This indicates that an important part of being a facilitator is managing the group in an intuitive manner. This asks for quick responses that come from an intuitive grounding, and are not always fully thought through on the spot.

3.6.3 Facilitator role

Facilitators can have different roles in relation to the session or to the participants. The facilitator is challenged to find their role in the group, while there can be one facilitator with a multi-layered role, or multiple facilitators with different roles [27]. Research by Harvey described this as the 'multifaceted role' of facilitation, which contains enabling reflective learning, identifying the participant's needs, guiding the group process, encouraging critical thinking behaviour, and helping achieve the design goals [13]. Facilitators have to navigate this social environment while handling assumptions and associations from the participants [27]. In this dynamic environment where the relationships are constantly changing, it asks for a critical questioning attitude with active reflection and constant adaptation [27, 38, 19, 13].

The different roles of a facilitator can be roughly categorised in process or practicalities related.

Process. Regarding the process, the facilitator role can be further divided into group dynamics, reflection and exploration. Hayne stresses the importance of this role: 'process guidance, process restrictiveness, and communication mode directly impact decision quality', where decision quality describes the ownership of the participants over their design problem and their ability to tackle it.

Facilitators assist group dynamics by supporting problem solving or, as Hayne concludes, ´help the group face, access, and deal with unpleasant realities' [14, 9]. Hayne further differentiates between

problems that are ‘(1) *substantive*, limitations in information available or use of information, (2) *procedural*, the best way to sequence activities, and (3) *relational*, relationships among the group members´ [14]. Facilitators also support the group dynamics by helping the group reach a consensus [14, 9], by encouraging and stimulating decision-making and collaboration among participants [10, 28, 14], encouraging a collaborative mindset that embraces diversity [31, 27, 28, 20], and encourage active participation [19, 28, 20]. Facilitators also have an important role in equalising the power relations that might be present among different stakeholders or participants. This will be discussed more in section 3.7.

A second element of the facilitator's role in the process is reflection. Facilitators have the role to open up the dialogue [33, 28, 38], assist participants to express their view [9], or support communication to create understanding between participants [14, 20, 9].

A third facilitation role in the process is regarding exploration. This entails facilitating the right mindset, stimulating playfulness and movement [28], supporting participant discovery [14], stimulating idea generation [28], and encouraging ownership and creativity [31, 20]. Especially regarding movement-based design, the facilitator also has the role to encourage the participants to use their bodies to experience, feel and use their senses [28]. This is important since participants' bodily knowledge serves as design input in the process.

Practicalities. Regarding the practicalities, the facilitator has a role in managing, leading, and taking care of the content. This contains management of the program, the time, the people, the materials, processes, the planning and the results [10, 26, 14, 16, 12, 28, 20, 9]. The facilitator has a main role as group leader [26], problem owner, guide [30, 20], or role model [33]. The facilitator also has a role in taking care of the content by structuring the tasks [14, 33, 10, 15], managing the balance between tasks and process [14], documenting [40, 26], and assuring effective outcomes of the session [14]. Besides, the facilitator has the job to set the boundaries in which the participants can move. Hayne described this as: ‘to provide a picture frame, or boundaries, within which the group can be creative‘ [14]. The use of boundaries or constraints is confirmed to help with creativity, collaboration and stimulation of the right mindset [22, 28, 20, 9].

Dahl and Sharma mapped the roles of a facilitator in ‘six facets of facilitation’: 1) Trust builder, 2) enabler, 3)inquirer, 4) direction setter, 5) value provider, and 6) users' advocate [8, 28]. The ‘trust builder’ creates an open setting which allows for idea and perspective exchange. The ‘enabler’ helps participants to express themselves with their ideas, needs or perspectives. The ‘Inquirer’ aims to understand the participants and their values. The ‘Direction setter’ steers the direction of the session so that the outcomes are most effective. The ‘value provider’ ensures a valuable outcome for the participants. The ‘users' advocate´ takes the role to represent their perspective during external decision moments.

Harvey concluded that there is no *one* best approach to being a facilitator [13]. Rather, it is a holistic approach with a continuum of roles and skills. The facilitator has the job to move along this continuum according to the situation and its dynamic changes. This requires flexibility to adapt and understand the needs on-the-spot. This was summarised in their research, where the facilitation role is placed on a continuum with on the left ‘doing it for others’ and on the right ‘enabling others’. Doing it for others means that there is a didactic, traditional way of teaching, with a lot of technical help. Enabling others means a more developmental way of learning, with a sustained partnership relation. The skills that fit on this continuum stretch from being very technical and clinical, to co-counselling, authenticity, and critical reflection.

3.7 Social Dynamics

The atmosphere in the group is very important for creative processes and part of this are the social dynamics between the facilitator and/or the participants. Asymmetries in the social dynamics can disturb its effectiveness since the strongest party has the potential to take over [9]. Besides, a ‘naive’ facilitator, who is not aware of the social dynamics, can form a threat to the democratic and empowering characteristics of a design session [9, 33]. These characteristics explain how all parties cooperate and take part in the decision-making process (see Section 3.7.1) [28]. This requires balanced equality between all parties. However, according to Dahl and Svanæs, this is not the default in a design session

[9]. It is dependent on the skill set of the facilitator and their active involvement to keep the social dynamics in balance. This section reviews the facilitator´s role in the social dynamic environment.

3.7.1 Democracy

Dahl and Svanæs noted that democracy is a fundamental principle of designing with participants, such as participatory design [9]. However, according to their research, it is not a 'given' inherent property of design sessions. Awareness by the facilitator is required for an active approach to potential asymmetric relations in the group. Research by Dahl and Svanæs described the facilitator as an ethical leader, who has an influence on who has a say in the session [9]. The effect of imbalances was illustrated by Dahl and Svanæs. The facilitators realised after the design session that they were not aware of the authority of the strongest party [9]. In this case, a doctor and a nurse from their design session had a discussion and the facilitators caught themselves favouring the doctor's opinion without second questioning. This might be similar when the participants are from the same party since there can still be differences in authority. A fruitful design session requires a participant group where everyone feels free to share and contribute. In other words, there is a need for an evenly distributed power balance. This gets more challenging when there are multi-stakeholder relations. When there are asymmetries in the power relations, it's the facilitator's job to equalise this. The power distribution is influenced both by the action that the facilitator takes, as well as the action he *doesn't* takes. These non-actions influence what, whose, and how perspectives result in the design output of the design session. This means that in an unbalanced group, the design outcome will likely be more influenced by the participants with the highest authority. Dahl and Svanæs's research further states that, besides the influence of participants on the social dynamics, the facilitator himself also has an influence [9]. They warn that the facilitator has a subtle and unforeseen influence on the group, but that mindfulness and continuous reflection can be applied to make more conscious decisions in order to limit this influence [9]. However, Wróbel, Cash, and Lomberg note that a certain amount of power is still required in order to keep a grasp on the process and the participants. This power might fluctuate over the course of the project. In one of their case studies, it showed that more power and authority from the facilitator was needed at the beginning of a facilitation process, but once respect and authority were established to a certain degree, there was less need for this [42].

Balancing parties asks for awareness of the relationships between participants and the underlying dynamics. The way in which participants affect each other can be subtle and easy to miss. This is 'tacit knowledge', which allows the facilitator to make immediate and effective decisions when a disruption in power balance occurs. The ability to provide an on-the-spot response can be improved by reflection. Research by Slovak, Frauenberger, and Fitzpatrick distinguish between reflection-upon-action and reflection-in-action [33]. Reflection-in-action is continuous reflection during the session, whereas reflection-upon-action is *looking back* upon the practice and improving this by reflecting on what happened. The facilitator can reflect on himself, on the actions of the participants, and on the underlying relationships. the facilitator can also reflect on his own practice, the design outcome and process, his power and control, and the amount of influence that he had on the session.

3.7.2 Pro-active neutrality

Research by Dahl and Svanæs showed that the facilitator is often labelled as neutral in design studies [9]. However, this fails to recognise how the facilitator might influence participation. Dahl and Svanæs stated that the facilitator is an influential force that has an impact on the session outcome [9]. Facilitation will *always* have an influence on the group, either subconsciously or consciously. This was illustrated during two case studies by Light and Akama[20]. The first study had a very involved facilitator, whereas the second study had a facilitator that was very distant from the group. In both studies, the facilitator influenced the process, which suggests that a facilitator is not neutral. The facilitator should handle this power with care, and reflect upon its influence. Dahl and Svanæs suggested reflection-on-action as the ultimate tool to stay aware of the interaction interplay in the group, which also contains the neutrality of the facilitator [9].

Neutrality contains, according to Wróbel, Cash, and Lomberg, three main elements that collectively contribute to the neutrality of the facilitator: impartiality, equidistance, and fairness [42]. *Impartiality*

deals with the distance that the facilitator takes from the content, refraining from judgement and treating the participants as equals. In practice, this would mean that the facilitator takes on a role of an 'external party' and limits its influence on the ideas or solutions of the participants.

Equidistance deals with the equal distribution of attention among the participants, such as actively giving people a turn and paying attention to the quieter participants [42, 38]. Wróbel, Cash, and Lomberg noted that an equidistant facilitator actively uses body language or speech to encourage participants to speak up, asks appropriate questions and pushes participants when needed [42]. Looking back at a previous example by Dahl and Svanæs of a design session with a nurse and a doctor (see Section 3.7.1), a more equidistant facilitator might have influenced the power balance between the two parties [9]. In this case, it could also be questionable whether or not strict equidistance is desirable. Perhaps, it might be better to spend more attention on a quieter participant, in this case, the nurse. This could affect the involvement of all participants.

Fairness has to do with the consistency and transparency of the process, tasks or rules from the facilitator. This also includes openness to feedback and actively implementing participants' feedback. In practice, this takes the form of clear two-way communication, where participants have room to reflect and suggest changes to the process [42]. In two case studies by Light and Akama, the effect of different amounts of fairness was illustrated [20]. One facilitator applied a strong two-way communication style, whereas the other facilitator did not. This had a strong influence on the process of the design session, suggesting that it is an important facilitation factor to be aware of.

There are three main facilitation outcomes on which the facilitator has an impact: people, process, and content [42, 30, 28, 14, 20]. The three elements of neutrality (impartiality, equidistance, and fairness) interact with these facilitation outcomes. The facilitator has the task of balancing the elements of neutrality over the course of the project so that neutrality can be achieved over time. Pihkala and Karasti noted that the facilitator's tasks change over time, as relationships and interactions also change over the course of the project [27]. This fits with the neutrality model of Wróbel, Cash, and Lomberg, where they suggest that the impartiality increases over time, which means that the participants become freer in deciding how they perform their tasks over time [42]. On the other hand, equidistance decreases over time, which means that the facilitator is less and less involved in the process. Fairness is expected to stay unaffected over time since the facilitator's attempts to provoke communication or reflection by the participants didn't change over time.

3.7.3 Facilitator-Participant relationship

There is an interaction between the participants and the facilitator. Different research noted that the facilitator should serve as an 'instrument' or 'servant' to the participants in order to guide them through the process [14], whereas other research described this as an 'apprenticeship' relationship [33]. The relationship between the facilitator and the participants should be of trust and transparency in order to create the optimal design settings [31, 20, 28]. But regardless of the nature of the relationship, research showed that the presence of a facilitator influences the discussions or the freedom of behaviour of the participants [28]. Research by Reidsma et al. suggested that the facilitator should adapt his involvement towards different participants since some participants might need guidance or a push from the facilitator to improve engagement, whereas other participants might need to be left alone to feel comfortable [28]. Finding this balance requires active reflection and awareness of the group dynamics to respond in the appropriate way [33].

3.8 Experience

This chapter focuses on the factors that contribute to how the participants experience the design session, i.e. the factors that are important *during* the design session. This is strongly influenced by the work of Schön, as discussed in research by Slovak, Frauenberger, and Fitzpatrick [33]. They state that the facilitator and the practicum work together to provide a (learning) experience for the participant. The design outcome flows out of this experience. This chapter will go over the in-action characteristic of the experience, as well as the real-time personalisation provided by the facilitator.

3.8.1 In-action

The 'in-action' or in-the-moment setting describes how participants perform certain design tasks in a set context. According to Slovak, Frauenberger, and Fitzpatrick, the facilitator should support the participant with in-action feedback: 'whatever the coach may choose to say, it is important that he says it, for the most part, in the context of the students doing. He must talk to the student while she is in the midst of a task (and perhaps stuck in it)' [33]. In this way, the feedback comes at the exact right time, so that the participants can reflect upon and implement this. This is called 'reflection-in-action', where the students use reflection in order to learn [33]. Slovak, Frauenberger, and Fitzpatrick further noted that expertise cannot just be learned but needs to be experienced through a scaffolded practicum (Scaffolding is further discussed in Section 3.9.1). The practicum should provide the appropriate tasks to enable the experience, as well as a reflection that guides the participants to 'grasp' the experience so that learning can take place.

Another aspect of the 'in-action' element is exploring-by-doing, such as design practices that involve enactment or role-play [19, 28]. This asks for an open-minded exploration, where participants are open to unexpected outcomes. It requires active participation, from both the participants and the facilitator. An example of in-action exploration is movement-based design, where the body is used as a source of knowledge. This is seen in research by Lee, Lim, and Shusterman, where the participants explored design ideas by 'doing', meaning that the participants explored the kinesthetic and emotional dimensions of bodily movement. Verbalising and reflecting upon this experience helped the participants to make sense of their experience so it could be used in the design process. The facilitator has the job of providing guidance during this 'exploration by doing'. Especially when this explorative state doesn't come easy, the facilitator should nudge the participants to explore. This is especially important in movement-based design since the open exploration might feel uneasy or embarrassing. A good example of exploring by doing, is using techniques from theatrical performance, such as enactment or role-playing [21]. This lively experience can uncover tacit feelings or thoughts that are hard to verbalise. Loke pointed out that facilitators can make on-the-fly adaptions to these kinds of in-action performances, which allows them to explore different factors in the design process [21].

The real-time flow of the session is another part of the 'in-action' aspect. This pictures the dynamic process over time and includes the dynamic changes in the social context [14, 27]. The facilitator has the task of managing the people, the task, the technology, and the interactions between them. The flow of a session changes over time and Hayne noted that 'tasks are started and stopped and the flow of the meeting is maintained through adhering to or adjusting the time constraints, the participants' interaction, the tools used, the technology and/or the agenda'. The facilitator's role is to make instantaneous adjustments of, for example 'questioning the group or individuals on their behaviour, changing the sequence or structure, adjusting the pace of communication, challenging the vigilance of the group, or even focusing on the content for adherence to the task.' [14]. Emotional state is another important influencer of the flow of a session. Light and Akama stated that the emotional state of the participants always influences the dynamics [20]. These changes are fluid and thus require the facilitator to be intuitive and open to emerging changes or interactions [20].

3.8.2 Personalisation

Slovak, Frauenberger, and Fitzpatrick described it as the facilitator and practicum's role to 'arrange the right sorts of experiences for the students' [33]. This means that the experiences need to be altered to the appropriate level of the students so that they are able to learn most effectively. This asks for 'specifically designed curricular components to scaffold experiences (..) and reflection' [33]. This means that a 'practicum' should be carefully designed so that it provides the appropriate experience to the individual participant so it allows for reflection and learning [33]. Another example is found in the research by Sanders and Stappers, which stated that participants are the 'expert of their experiences, but that they need the right tools to be able to express this' [30]. This might be different for each participant since there exist different levels of creativity Sanders and Stappers. This means that the facilitation should focus on the expression of creativity on all kinds of levels. This asks for personalisation to support individual needs.

Personalisation starts with an observation of the real-time participant state. The facilitator has the role of monitoring the state of the individual participants, of the group, their attitude in activities, and observing changes over time [10, 29, 26, 14]. The emotional state is important since it influences the engagement and thus outcome of the session [28]. Besides, the facilitator should be mindful of differences in ability levels and individual limits of the participants [29]. Research by Sanders and Stappers described that different levels of creativity exist. This asks for facilitation with the right leading, guiding and scaffolds that fit to the variety of creativity levels among participants. The facilitator can, according to Sanders and Stappers, take on four different approaches: '1) lead people who are on the 'doing' level of creativity, 2) guide those who are at the 'adapting' level, 3) provide scaffolds that support and serve peoples' need for creative expression at the 'making' level, and 4) offer a clean slate for those at the 'creating' level.' [30].

After close observation and monitoring of the group, the facilitator can intuitively 'feel' when the group is comfortable or not. The next step in personalisation is making a change to the session design. These are real-time adjustments on feedback, experiences, methods or support [33, 21, 28, 14]. This response should be a direct response *in the moment* of the session. After that, active real-time reflection or evaluation can uncover how the state of the group changed. A response could, for example, introduce a warming-up exercise to decrease the tension, or set up a group discussion to reflect on a finished activity [28, 26].

3.9 Support

As noted throughout this review, the facilitator has the main role of providing guidance and support to the participants. In this chapter, this supporting role is further dividied into scaffolding, feedback and reflection.

3.9.1 Scaffolding

Scaffolding was already shortly discussed in Section 3.5.1, which discussed warm-up exercises as an example of scaffolding. Scaffolding is described as a process 'through which a more knowledgeable person adds supports for students in order to move them progressively toward stronger understanding and ultimately greater independence in learning' [17]. The facilitator should control the elements to which the novice is exposed so that he or she can only concentrate on the elements that are within his or her competence range. By introducing scaffolds and guidance, the novice will be able to expand their skills or knowledge. Research by K Govindasamy and Moi Kwe further proposed that tools (either visual or verbal), such as graphic overviews, question cards, or concept maps, can support the scaffolding experience [17]. Besides, multiple scaffolds might be needed to make a bridge between the needed skills and their current abilities.

Frauenberger, Makhaeva, and Spiel applied the principle of Scaffolding in their study [10]. They anticipated the fact that an introduction of all design materials at once could be too overwhelming for the participant. Instead, they first let the participant explore the possibilities of a smaller subset of the materials. Then, they provided an overview of the materials and let the participant choose any of them. After that, they increased the complexity by asking the participant to combine two materials from the subset. They made sure that the participant felt comfortable with this. After that, the complexity and amount of materials further slowly increased. When the participant was fully comfortable with all high-technological materials, different low-technological materials (such as cardboard) were introduced. In this study, the facilitators carefully observed the state of the participant, after which they decided to adapt the tasks or the materials. Another example of scaffolding can be found in a study by Oulasvirta, Kurvinen, and Kankainen, where 'one design question at a time was introduced to participants', so that the participants were step-by-step introduced to new design problems [26].

As noted in Section 3.5.1, a common scaffolding activity is warm-up exercises [28]. Reidsma et al. suggested that participants might feel uncomfortable at the start of a design activity, especially if it involves body-based design methods [28]. They noted that it is essential for the facilitator to initiate warm-up exercises, such as ice-breakers, to strengthen the participant's mindset and participation. In

this sense, ice-breakers can be seen as scaffolding activities that step-by-step create the right mindset for a fruitful design session. This doesn't only apply to the warm-up phase, but a scaffold of mood and energy can also be very useful later in the process when participants feel scared or hesitant to fully participate in body-related exercises [28]. Hayne adds that it is the facilitator's responsibility to offer the appropriate sequence of activities, and adjust the right tools, tasks and technologies [14]. The task sequence and offered materials need to be sequenced in such a way that they scaffold the right experiences.

To apply scaffolding, the reviewed literature discussed the following important take-aways: 1) apply the appropriate increase in the task or material complexity [10], 2) provide guidance into the topic of the session and the tools that will be used [19, 39, 14, 9], 3) initiate a warm-up exercise that is easy executable so that all participants can follow [19, 28], 4) build further upon exercises to scaffold towards the design problem/question. It is also recommended to combine previously known knowledge with new unknown knowledge, however, a balance must be kept between tasks that are too open or too closed off [10, 15]. Participant output of previous exercises can also be used as input in the new exercises [26, 19]. This aims to lower the threshold so that everyone can participate, as well as build a common ground among the group, which will strengthen the engagement of the group[14, 20].

Research showed that posing questions is an effective scaffolding method [17]. Research by K Govindasamy and Moi Kwe stated that 'Posing questions pertinent to a specific scope of knowledge works as a thinking stimulant and facilitates the learning process. (...) Guided questioning as a form of the scaffold has been recorded as enabling students to elicit critical thinking (Coffey, 2014) and improving the depth of written reflection' [17]. Besides, they noted that posing question serves as a handhold to organise, conceptualise and communicate abstract thoughts. This can bring out the knowledge that the participants already possess. This scaffolding tool will be further discussed in Section 3.9.3 on Reflection.

3.9.2 Feedback

As noted by Slovak, Frauenberger, and Fitzpatrick, feedback from the facilitator is very important for a successful practicum. Most literature on facilitation described that the facilitator provided encouragement and examples as feedback. Examples were especially useful in sessions that included movement or enactments that required physical participant involvement. Examples by the facilitator could help to explain a task, lower the pressure felt by the participants, or explain possibilities. In a discussion with a facilitator, the facilitator described that she often 'makes a fool out of herself´ in order to ease the tension among the participants, and open up the way for them to start exploring as well. Encouragements aim to nudge and push participants in the right direction. For example, to encourage the decision-making process, or to encourage them to explore and reflect. Encouragements can also serve as positive feedback after desirable behaviour.

The observational study showed that feedback can also be wrongly applied. In this case, the facilitator was very willing to give feedback but had no awareness of the conversation flow. The questions disrupted the natural discussion of the participants, and prolonged unwanted advice hindered them to continue. A lack of awareness of the body signals of the participants also caused the facilitator to apply wrongly timed feedback.

The observational study showed that feedback was often given through non-spoken cues (such as a whistle, hand-claps or shouts), spoken cues (variations in the use of voice, 'hmm hmm', compliments, encouragements, or activation sentences), or visual cues (smiles, nods, and other facial expressions).

3.9.3 Reflection

Reflection is an important step to transform experience into hands-on knowledge that can be used as design input. This is important for the sense-making of the experience, especially in movement-based design. Reflection can help to get insights out of the experience, and besides, once it is put into words it can be expressed and shared among the group of participants. This can serve as a source of information that can inform design decisions. It also allows the participants to build further upon the experiences. A reflection upon tacit experiences will also help make the participants the 'experts of

their own experience'. This makes each participant a 'knowledge base' with a valuable set of knowledge, which can be used in collective knowledge sharing.

The facilitator has an important role in encouraging reflection among the participants. He opens up the shared discussion and allows the participants to communicate about their experiences. Research by Light and Akama noted that emotions always have an influence on how the process or product is shaped [20]. The facilitator can steer and guide this by means of reflection and open discussion. The study by Slovak, Frauenberger, and Fitzpatrick places three requirements upon the support of the facilitator: 1) it is in the context of their immediate experience (also see Section 3.8.1) it is delivered through both words and actions, 3) both facilitator and participants should participate in a reciprocal reflection-in-action [33].

Besides, the facilitator also has the task to reflect upon his own practice and the influence it has on the session. Light and Akama added that facilitators should also apply reflection-in-action to be aware of the dynamic changes in the participants and the context [20]. Reflection-in-action 'refers to the capacity to momentarily use one's tacit knowledge to make effective decisions in response to immediate events. This capacity is characteristic of on-the-spot responses executed by trained professionals' [9]. As an example of reflection-in-action, a skilled facilitator might notice a participant respond negatively towards a design idea and immediately take this event as a possibility to dig deeper and not let the incident pass. Another form of reflection is reflection-on-action, which describes reflection *after* the session has occurred. Facilitators can improve their practice by this reflection-on-action to understand how the practice can be improved, or what can be changed the next time [9].

Encouraging participant reflection requires active facilitator involvement. The facilitator should actively step in and out of the discussion. For example, the observations showed that the facilitator quickly jumped in for a compliment to stimulate the participants in their discussion. During the 'stepping-in', the facilitator physically bent towards the participants with an open, relaxed body posture. There was physical closeness, although at an appropriate distance so all participants felt comfortable. When the facilitator stepped out, the body posture bent back, while the hands closed in front of the body. These kinds of body language are important in getting across the message. Besides body posture, the facilitator also used a physical notebook to write notes, while still staying in contact with the participants. The observational study showed that the use of a digital device, such as a phone, had an adverse effect since it portrayed an image of an uninterested facilitator.

4 Conclusions

The analysis in Section 3.3 showed that a limited amount of design studies in the Human-Computer Interaction acknowledge the involvement of a facilitator. However, research that is especially focused on facilitation shows that a facilitator has a large impact on the people, the process and the end product of a design session. This means that there is a gap between research practice in reality and what is recommended.

This paper reviewed a large selection of literature to map out the facilitation space. Grounded Theory was applied to analyse all the articles in a bottom-up approach. The results are summarized into a set of factors that play a role in facilitation. In order to provide practical benefits to facilitators, it is important to know which of those elements influence the facilitation, and thus the design practice.

This section will go over each of the aforementioned sections, and provide a conclusion on the most prominent factors that influence the facilitator's impact on the design process.

4.1 Practicum

The elements that influence the practicum are divided into structure, tools, environment and method. The main factor relating to Structure that is under the facilitator's control is careful preparation of each of the four design session stages. For a better preparation, the facilitator can examine and decide upon all elements that are needed in the specific design workshop, such as the tasks, settings, problem, environment, participants, artifacts, etc.

The Tool related factors that influence the design process are the type of tools and how well the participants can use them. For the type of tools, the facilitator can reflect upon how the tools should enable the participants to explore, express, discuss or reflect upon their thoughts. This will inform the facilitator's decision upon whether design cards, low-tech, high-tech or a combination of high- and low-tech materials are most suiting. The facilitator can prepare the participants through personalisation, planning activities, scaffolds, and management during the session.

The factors relating to Environment that influence the design process are the physical space itself and the atmosphere of the group. The facilitator can influence the physical space by ensuring a safe and welcoming space that is big enough and allows for free exploration. The atmosphere can be influenced by facilitation of the mood and energy, through the initiation of exercises and guidance into movement and stage engagement. Active awareness of the group dynamics and atmosphere allow the facilitator to make personalised adaptions.

Factors related to the Method are influenced by the choice of facilitation methods and the elements that can be facilitated. The facilitator can influence the design session by deliberately choosing between the different parameters of the facilitation method continuum that fit with the specific design session. The facilitator can also influence the session through distinguishing what elements need to be facilitated, e.g. the energy, attitude, or group dynamics.

4.2 Facilitator as an Individual

There are different types of characteristics, skills and roles that influence the impact of the facilitator on the design process. Factors relating to Characteristics that most prominently influence the session are interpersonal abilities (exceptional communication skills, applying the LEAPS method, and showing flexibility, sensitivity and neutrality), managing the process (time, planning, and organisation), and certain personal characteristics (adaptability and emotional resilience).

Skills of the facilitator that are influencing the design session are the ability to identify problems, perform reflection-in-action, the level of design expertise, and the facilitator's ability to act intuitively. Advanced facilitators apply solution-focused problem-solving techniques with a focus on generating solutions instead of analysing the problem. Reflection-in-action can assist the facilitator in approaching uncertainty, instability and conflicts which influences the design process. An adequate level of design expertise enables the facilitator to instruct design thinking methods and provide feedback. For an intuitive approach, the facilitator can 'feel' the room, act reactively to unexpected incidents, and balance the different session elements.

Factors that relate to the facilitator's Role are related to the process and to the practicalities of the design session. The facilitator's role in the process is influenced by managing the group dynamics, encouraging reflection, and simulating exploration. This is affected by a focus on processes such as group creativity, mindset, reflection on experiences, discussion, experimentation, participation, ownership, cooperation, and shared-decision making.

4.3 Social Dynamics

The atmosphere of the design session is strongly influenced by the social dynamics in the group. Factors that relate to the social dynamics are the power distribution between parties and the neutrality of the facilitator. The facilitator can influence the power distribution by taking active action to equalise asymmetric power relations between participants and perform reflection-on-action to form awareness of his actions and non-actions. The facilitator can influence neutrality by adapting equidistance, fairness and impartiality in order to balance the people, process and content over the course of the session. The social dynamics are influenced mostly by the actions that happen *in the moment*, as a result of the immediate responses of the facilitator. This can be trained by applying active reflection.

4.4 Experience

There are two main factors that the facilitator can balance that influence how the participants experience the design session: in-action and personalisation. The in-action characteristic can be stimulated by the in-action feedback of the facilitator (this is applied in the context of the participants doing), by the promotion of in-action reflection (reflection-in-action upon the participant's experiences), the

encouragement of exploration by doing (exploring open-minded, unexpected outcomes), and the facilitator's ability to manage the flow of the session (by managing the dynamic changes in the people, the tasks, technology and interactions).

Factors relating to personalization that are under the control of the facilitator that influences the design process are observation of the real-time participant state and adapting the session to the specific needs of the group. The observations of the participant state can be done by looking at the emotional state of the individual participants, their attitudes and changes over time, and differences in skills and creativity levels. Adaptions can be made by intuitively feeling when the group is ready for adjustments on feedback, experiences, methods or support. The facilitator can also adjust the communication pace, the structure, the activities, the critical questions that are asked, etc. The facilitator can also apply different types of scaffolds to meet the ability or creativity levels of the participants.

4.5 Support

The most prominent factors that influence the impact of the facilitator on the design process are the ability to provide support and guidance to the participants. The factors that influence this supporting role are scaffolding, feedback, and reflection.

The facilitator can apply scaffolding by progressively exposing the participants to more complex materials or tasks to close the gap between their current and needed abilities. The scaffolding process can take place through activities, materials, technologies or questions. The facilitator can influence the session through means of feedback and awareness of the participant's needs and thus applying the appropriate response, e.g. encouragement, examples, or reflective questions. This can be delivered through the use of non-spoken, spoken or visual cues. The facilitator can encourage reflection through questions and initiating discussions. This might help the participants to reflect upon their experiences and use this as design knowledge. The ability to stimulate reflection is influenced by active facilitator involvement, the ability to step in and out, and his body posture. It is also influenced by the facilitator's ability to reflect upon what is needed, provide an appropriate response, and reflect upon the effect of the response.

5 Discussion

This study provided the HCI community with an overview of the facilitation factors that influence the design process. It provides a handhold and practical focus points for facilitators to critically evaluate their own practice and implement improvements. Starting with the outer-shell of Figure 3 and moving inwards to implement the practical focus points as discussed in Sections 4.1-4.5.

It also gives researchers a way to record the specifics of the facilitator in their design sessions. The facilitator is no longer a 'black box', but can be described on basis of the themes described in this study. Since the results of a design study are so heavily influenced by the facilitator, this allows for more transparency on how the design study was carried out. This will also positively affect the replicability of the study, so that other researchers can make use of similar facilitators factors.

This study provided the facilitator with focus points that influence the design session. However, the current body of literature does not go in depth on how specific factors, such as facilitator intuition or reflection-in-action, can be learned. Since there are so many ways of facilitation, more research could be done on developing an even more practical toolkit for the wide variety of facilitator preferences, based on the literature findings from this study. Besides, it could be useful to develop a framework to assess the quality of the facilitator, based on the themes and facilitation factors discussed in this study.

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