

VISUALISING AND REVERGING: UNDERSTANDING THE INTERSECTION BETWEEN CREATIVITY AND VISUAL THINKING

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ABSTRACT

We investigate reverging - the phase between the diverging and converging steps in a creative process - in the context of a visual thinking agency. Creative facilitation literature advocates for such a phase, aimed at revisiting and rearranging ideas generated during diverging, to prepare for converging. However, in practice this step is often neglected or not performed well, resulting into a sense of increased complexity or lack of client ownership.

Two studies were used to investigate reverging in context: a preliminary study consisted of interviews and observations to better understand reverging in current visual thinking practices. The follow-up study focused on co-creating a tool to solve the problem identified in the preliminary study.

While the preliminary study revealed the need to involve clients in both diverging and reverging phases, the follow-up study resulted in the creation of the Whiteboard Canvas. The tool was tested in practice and several benefits of reverging in visual thinking practices emerged.

The tool empowers visual thinking practitioners to involve their clients more actively in reverging, resulting into a more deliberate creative process and an increased sense of client ownership.

Keywords: Visualisation, Creativity, Creative Facilitation, Reverging, Design practice

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1 INTRODUCTION

To deal with the increased complexity in today's world, organisations (private and public alike) have become aware of the needs of applying innovation methodologies and outside perspectives to solve 'wicked problems'. Visual thinking is an approach that is growing in popularity to deal with uncertainty and complexity, which is at times coupled with design thinking (Bresciani, 2019) and co-creation (Aguirre et al., 2017). Design and innovation consultancies, such as XPLANE (US) or Flatland (NL), have generated enormous know-how on visual thinking facilitation and its value to cope with complex societal issues. However, although visualising is omnipresent in many collaboration projects (e.g., Hautopp & Ørngreen, 2018), it remains an emerging practice, based on practical know-how and hands-on expertise. On one hand, the value of sketching has been widely explored in the design process (e.g., Goldschmidt, 2003; Eppler & Kernbach, 2016); on the other hand, the emergence of visual thinking to facilitate, co-create and design strategically, especially in relation to creativity and creative facilitation, is not yet well understood (Hautopp & Ørngreen, 2018). The link between creative problem solving (CPS) and visual thinking is particularly worth investigating because of how complementary they tend to be in practice. Traditionally, CPS is considered to have two main phases: diverging and converging (Guilford, 1950). While diverging refers to activities where the focus is on the generation of many new ideas as possible without judgement, converging entails the selection of the best-fitting solutions to solve the problem at hand. Together, these two phases form the creative diamond (Guilford, 1950). However, performing divergent and convergent thinking consecutively is cognitively challenging, as it relies on different neural mechanisms requiring distinct brain activity (Hommel, 2012). Moreover, jumping immediately to converging tasks tends to lead to a loss of overview of the generated content during diverging tasks. To tackle the challenges above, reverging was introduced by Heijne and van der Meer (2019) to formalise the activities in between the two phases, to further build on Tassoul and Buijs' (2007) notion of clustering (Figure 1).

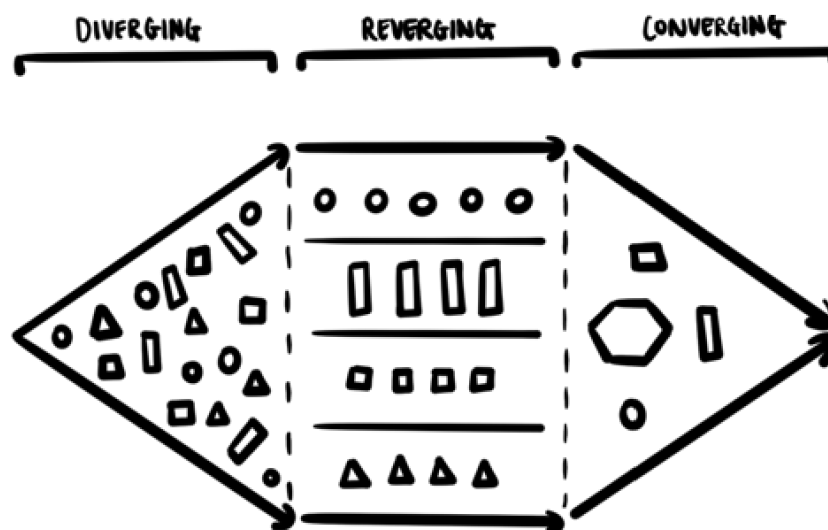


Figure 1. Creative diamond 2.0 including reverging adapted from Heijne & van der Meer (2019)

Reverging refers to collaboratively revisiting and rearranging the options generated in the diverging phase and preparing for converging (Heijne & van der Meer, 2019). Three key principles for successful reverging are: **1) be jointly active** (all participants need to be involved, as to ensure that tacit knowledge is preserved); **2) listen responsively** (focus on understanding relationships between ideas, rather than judgement or selection); and **3) move circularly** (the emergence of new connections will come from iteratively exploring all ideas) (Heijne & van der Meer, 2019). While creative facilitation literature advocates for such a phase (Gray et al., 2010; Kalina, 2018), reverging is not a widely known concept in practice. Therefore, design and visual thinking agencies who perform facilitation often disregard reverging or find implicit ways to tackle the transition between diverging and converging (Tassoul & Buijs, 2007). Overlooking a deliberate reverging step may lead to disruptions in the creative process, which could include "map-shock", lack of overview of ideas

generated and, thus, potential losses of creative opportunities (Heijne & van der Meer, 2019). This knowledge gap is the starting point for this paper. Our goal is two-fold: Firstly, we aim to investigate the link between reverging and visual thinking, especially when coping with complex societal issues. Secondly, we seek to develop tools that can support deliberate reverging practices in the context of a Dutch visual thinking agency, Flatland.

2 LITERATURE

2.1 Sketching and visual thinking

Sketching is described as a way to express ideas or thoughts in a tangible form (McKim, 1972), while visual thinking refers to the process consisting of the interaction between (a): seeing, what we see with our eyes; (b) imagining, what we imagine in our minds; (c) and idea sketching, what we sketch with our hands. Sketching entails more than the final representation of a preformulated image or idea; instead, the act of sketching supports the process of ideation, in a conversation (or “backtalk”) between the sketched surface and the creator (Goldschmidt, 1991; 2003). Being both an individual and collaborative activity (Bucciarelli, 2002), sketches become in itself a boundary object that facilitates understanding (Hautopp & Ørngreen, 2018) and “spurs creative thought” (van der Lugt, 2005). Cherubini et al. (2007) defined four main categories, which highlight the value of sketching (and visual thinking) in addressing complex problems. The categories are: (1) to share, (2) to ground, (3) to manipulate, and (4) to ideate.

- **To share – communication:** Sketches play an essential role in communication because they enable the externalisation of internal thought by making explicit and tacit knowledge visible to the sketcher and others (Cherubini et al., 2007).
- **To ground - creation of common understanding:** Sketches can assist in making (individual) frames or mental models explicit and visible. This facilitates the negotiation towards a shared frame or team mental model (Yang et al., 2019). Furthermore, visual representations provide clarity regarding ambiguous interpretations, inherently present in human communication (Cherubini et al., 2007). Therefore, sketches serve as a medium to develop shared understanding and common ground.
- **To manipulate - reinterpretation and iteration:** Sketches can be considered as the externalisation of an (individual) mental model on a drawing surface, which enables the manipulation of the externalised knowledge between individuals (Henderson, 1991). Due to the ambiguous nature of sketches, (collaborative) manipulations happen through reinterpretations of the visual, which in turn, lead to new insights and opportunities for further iterations (van der Lugt, 2005). Schön (1984) describes these manipulations as ‘moves’, which give the situation new meanings, as it “talks back”. The drawn world serves as a context for experimenting and stimulates an iterative conversation between what is sketched and the designer's thinking process (Goldschmidt, 2003).
- **To ideate - generation new ideas:** As mentioned above, the iterative nature of sketching allows the discovery of new directions and opportunities for ideation. Sketching functions as “external memory”, for individuals and in group, enabling one to store and recall information and to build on each other's ideas (van der Lugt, 2005), reusing and reinterpreting previous sketches into new ideas.

These four points highlight not only the value of sketching in design but also visual thinking, to make sense of complex issues. Visual thinking, sometimes referred to as process sketching or graphic facilitation (Sibbet, 2010), refers to the professional practices where visual facilitators represent knowledge and processes using sketches in-situ supported by the participants' utterances (Hautopp & Ørngreen, 2018). These professional practices have gathered interest to visualise knowledge and complexity (Bertschi et al., 2011) but it is still in its infancy as a research topic (Hautopp & Ørngreen, 2018).

2.2 Boundary objects

As mentioned above, design sketches are able to become boundary objects in interdisciplinary creative sessions. Boundary objects are ‘artefacts’ that enable knowledge transfer, translation, and

transformation (Carlile, 2004), characteristics intrinsically present in sketching. For an artefact to serve as a boundary object and to enable the creation of knowledge, it needs to meet two ‘contradictory’ characteristics: robustness/rigidity and plasticity/fluidity (Star & Griesemer, 1988). The artefact should be both (1) robust enough, so individuals with different perspectives can give meaning and identity to the object; and (2) plastic enough for individuals to fit their own perspectives and meaning to the object. Therefore, the object should be able to adapt to the (mental) needs of each individual or group interacting with it. Thus, during visual thinking facilitation, the visuals generated in co-creation can be considered boundary objects that facilitate sense-making (Hautopp & Ørngreen, 2018), where emergence takes place (Aguirre, Agudelo and Romm, 2017).

2.3 Knowledge creation

Solving today's ‘wicked’ problems, such as social and sustainability-related problems, require a transdisciplinary approach due to their complex interconnected nature. Mishra et al. (2011) suggest that transdisciplinary learning is about creating knowledge that transcends a specific discipline supporting the integration of different forms of knowledge, solutions, and points of view. A transdisciplinary approach is characterised by its collaborative and creative nature, which blurs the boundaries of disciplines, and enables the generation of insights transcending their original silos. For transdisciplinary knowledge creation, it is important to gauge both explicit and implicit knowledge. The former refers to knowledge that can be transmitted in a formal, verbal language. The latter is considered tacit, which represents most of a person’s knowledge and entails what is known but cannot be expressed or something a person considers too obvious or trivial to express (Henderson, 1991). Nonaka & Takeuchi (1995) suggest that knowledge is created in the social interaction between explicit and tacit knowledge, through a process of ‘knowledge conversion’ (Nonaka & Takeuchi, 1995). This is represented by four different modes of conversion: (a) Externalisation – tacit to explicit knowledge; (b) Combination – explicit to explicit; (c) Internalisation – explicit to tacit; and (d) Socialisation – tacit to tacit. We argue that visual thinking can support knowledge conversion, based on the review above: visualisations entail both explicit and tacit knowledge (Goldschmidt, 1991). As a boundary object, visualisations can support the conversion of tacit knowledge into explicit (Externalisation); it promotes the combination of represented insights leading to creative discoveries (Combination); as a completed artefact, a visual helps to crystallise and internalise agreed-upon insights (Internalisation); and finally, visuals can serve the purpose of reinforcing tacit knowledge within an organisation (Socialisation). Based on these insights, we aim to understand how visual thinking practices emerge in context. As stated in the Introduction, we are interested in the intersection between visual thinking and reverging, as this phase in the creative process seems to be highly relevant to knowledge conversion and protection of creative insights (Heijne & van der Meer, 2019).

3 METHOD

3.1 Context

Flatland is a Dutch visual thinking agency based in Rotterdam, with over a decade of experience under their belt in supporting (private and public) organisations with a strong focus on Sustainable Development Goals in defining strategy, activating change and accelerating innovation (via visual thinking). From an initial focus on graphic recording, their core business evolved into a more co-creative approach with their clients. Nowadays, Flatland provides facilitation and organisation of the creative process in addition to the visual support to their clients. As they combine both visual thinking and creative practices, Flatland was considered an appropriate context for our research goal.

3.2 Preliminary study

The goal of the preliminary study was to gain a better understanding of the current visual thinking and creative practices. In order to achieve this, ten semi-structured interviews were conducted with members of the Flatland team. The interviews consisted of three main parts:

(1) their personal skills and roles at Flatland, (2) their creative facilitation practices supported by visual thinking, (3) and their current perspectives on reverging. The full analysis and methodological approach can be found in Jansen (2022).

3.2.1 Participant selection

To obtain an overview of the different perspectives, we strived for a diverse mix of participants among the Flatlanders (Flatland employees), according to the following criteria:

- Their role at Flatland: illustrators and facilitators
- Years of experience: senior (>2years) and junior employees (<2years)
- Educational background: design and non-design background

3.2.2 Qualitative data analysis

The qualitative data analysis of the interviews was conducted by the first author (supported by the remaining authors) and consisted of three main steps (figure 2).

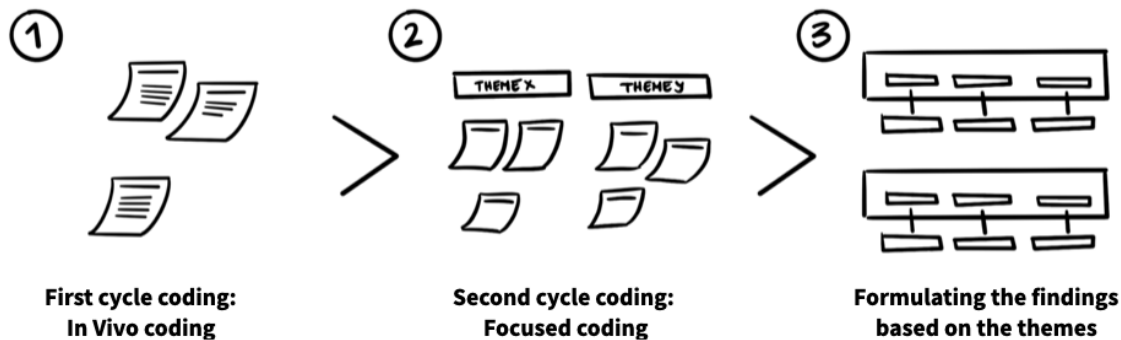


Figure 2. Three main steps of the qualitative data analysis

1. InVivo coding: The answers to the interview questions were collected through memos on a Miro board (a digital collaborative whiteboarding tool), representing the verbatim, InVivo codes, of the participants' answers. This approach allows the analysis of the perspective of a (sub)culture the Flatland culture.
2. Focused coding: The codes from the first cycle served as the data for forming higherlevel codes (themes), based on salience and frequency. Finally, the categories were identified within four levels (functional, purpose, collaborative, and individual levels).
3. Formulating the findings: The core categories for each level were used as the foundation for formulating the key findings, which triggered the follow-up study.

3.3 Follow-up study

The follow-up study investigated how the problem identified in the preliminary study (to be discussed in section 4.1) could be addressed in order to improve Flatlands' current visual thinking practices. This was done by co-creating with Flatland, in five stages: (1) a cocreation session focused on requirements, (2) three co-creation sessions on the topic of ownership, (3) a co-creation session on the final concept of the tool, (4) a reflection session with fellow researchers, (5) and four iteration rounds of the tool. The input from the participants was brought together throughout the sessions in one overview, on Miro. Additionally, prototypes emerging from the many sessions were made in Miro. Thus, the participants could add information and interact with the prototypes, in an emergent and iterative manner.

4 RESULTS

4.1 Preliminary study: Highlighting the opportunity for reverging

Flatland's way of working can be structured in four phases: (1) Clarity (to elicit the clients' perspective and create a common understanding); (2) Story (to visually prototype a story that fits the client's ideal vision); (3) Validation (to examine the visual story with the client); and (4) Delivery. Each project is carried out by at least two team members with specific roles: a facilitator and an illustrator. The preliminary study revealed that the main reverging moments at Flatland occur in-between phases, without the client. This activity is referred to as 'whiteboarding' (Figure 3): an internal session (1-2 hours), where the Flatland project team comes together after a client session. Its

main goals are to make sense of the output of previous client sessions and iterate on early concepts, usually resulting in a visual draft, further development of the story and/or explicit expectations for the next client session. As indicated in the Introduction, reverging is defined as the stage where ideas are revisited and the relationships between them are analysed, which aligns with the goal of whiteboarding.

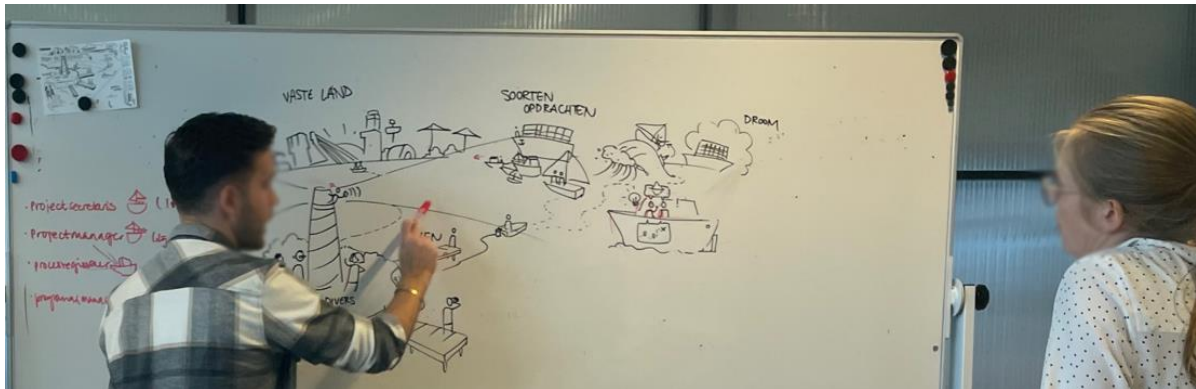


Figure 3. Whiteboarding in action at Flatland

4.1.1 The current process of whiteboarding

Directly after a client session, a short debrief takes place with the Flatland team to share their first impressions. Later, the illustrator drafts out a first idea to prepare for whiteboarding, which takes place a few days later to allow for incubation. First, each team member shares their thoughts and reflections about the client session. Second, they work together on the story by iteratively sketching together on a whiteboard. Based on the output of whiteboarding, the illustrator finetunes it to a presentable concept to be shared in the next client session.

“We actually went into our [Flatland] cave for a while, and we need the thumbnails to show the client what happened in that cave.” – Facilitator 1

4.1.2 Deliberate reverging (or its absence) during whiteboarding

The interviews revealed that Flatland and their clients are indeed jointly active (one of the key aspects of reverging) during the main sessions. However, clients are never involved in whiteboarding, as it is an internal session. Flatlanders consider it as part of the service and expertise they deliver and see it as a more efficient approach.

“In theory, we could have involved the client in all the steps we make, but it slows down a lot. There is an acceleration of the process because we go into our Flatland cave for a while.” – Facilitator 1

However, Flatlanders seem to be aware of the potential danger of excluding clients from whiteboarding, such as the possible lack of client ownership towards the end of the project.

“(…) sometimes this creates a problem at the end of a project. It can be difficult to get them towards the final step. For instance, how do they explain their own [visual narrative]? Sometimes it is still difficult because the client might lack ownership and is lagging a bit behind.” – Illustrator 1

We have observed that whiteboarding is the moment to revisit and reorganise ideas. However, Flatland’s current approaches do not fully follow the three reverging principles: by excluding clients from the whiteboarding session, they are not jointly active (and tacit knowledge from earlier phases might be lost), clients do not participate in mapping relationships between ideas (listen responsively) and iterations are not consistently shared (move circularly). Nevertheless, it was considered unrealistic and unfeasible to involve clients at all stages of the process. Thus, the challenge identified is to support a more deliberate reverging and mitigate the lack of project ownership, even without the full involvement of the client during whiteboarding. This challenge was tackled in the follow-up study, using a co-creation approach with Flatland.

4.2 Follow-up study: Co-creating the solution, the whiteboard canvas

4.2.1 Introducing the whiteboard canvas

Based on the findings from the preliminary study, we developed the Whiteboard Canvas, a tool created to mitigate the risk of the client lacking ownership on the project (figure 4). The Whiteboard Canvas aims at encouraging Flatland to reverse deliberately instead of unconsciously, by keeping its key principles in mind. Moreover, the canvas converts implicit design steps into explicit argumentations, so it can be discussed and shared with the client (even if not present during whiteboarding), to increase the sense of client ownership. Finally, the canvas aims to stimulate the exploration of new iterations based on the input generated. It is designed as a guiding tool, and as such, the different steps do not need to be completed sequentially.

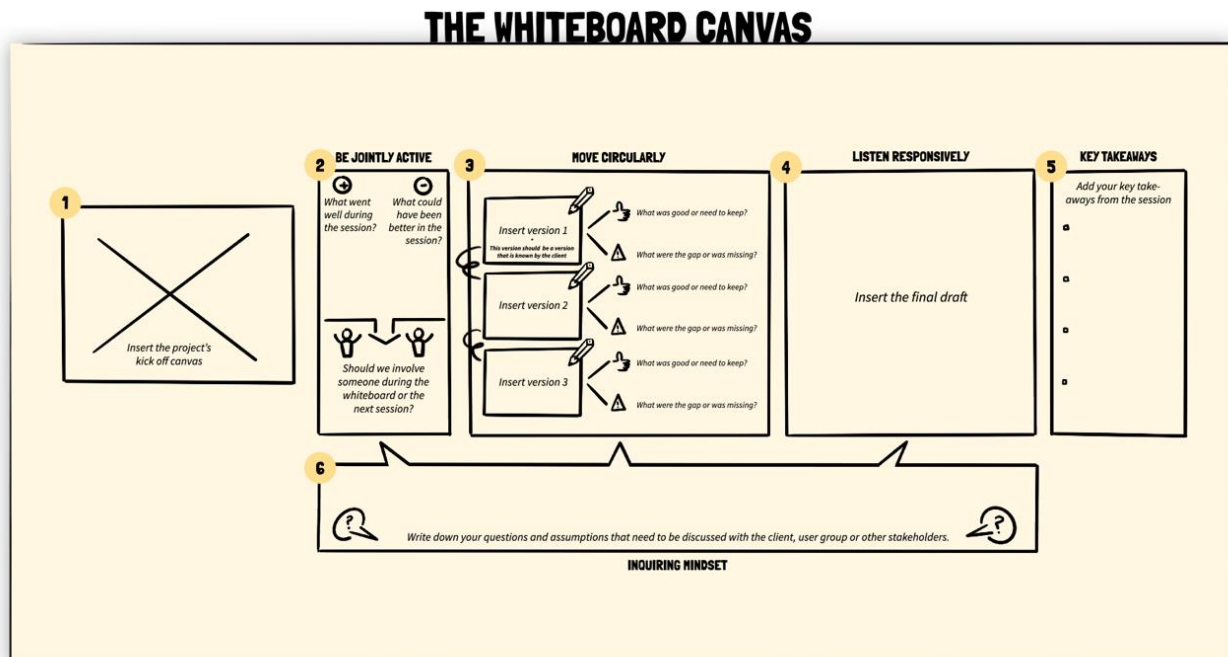


Figure 4. The Whiteboard Canvas

Box 1 serves as a space to reflect on the outcome of the previous stage. Box 2 aims at encouraging to 'be jointly active' by reminding if someone should be involved in the whiteboarding session or follow-up sessions. Box 3 is meant to 'move circularly' by adding the last iterations of the concept and stating the pros and cons of each version, to support the final iteration. Box 4 is for the last iteration and final draft, so it can be shown to the rest of the team later on. The comments and feedback from the client can be added to the draft in that box, encouraging Flatland to 'listen responsively'. Box 5 captures the key takeaways from the whiteboard session to be discussed in the next session. Box 6 serves as a 'parking lot' for the questions and assumptions that arise while whiteboarding in order to be discussed later on with the client or stakeholders.

4.2.2 Testing the whiteboard canvas

An interesting insight that emerged from testing the canvas was that it enabled the users to use ideas from the previous (client) sessions in the new sketch. This led to a greater chance of survival of ideas from the divergent phase to the following ones.

"We are often inclined to throw our earlier sketches or versions away. It was cool to see that by adding our previous versions of the design, we were inspired by ideas we had at the beginning and otherwise would forget. it really inspired us to iterate towards a more wholesome design that related to the first version." – Facilitator 2

Moreover, as the current whiteboarding activity takes place both offline and online, the canvas was tested during three whiteboarding sessions: in Mural (online collaboration tool), Photoshop, and in printed format. We observed that the medium influences how the tool is used: Mural works best as a reflection and conversation tool for a more in-depth and individual reflection, as all participants can add their own input to the canvas simultaneously. Photoshop seems to be ideal as a documentation tool, where previous sketches can be added, showing the evolution of the project. However, this approach has the limitation of only the person sharing the screen being able to add, write down or draw on the canvas, reducing the co-creation aspect. In face-to-face sessions, whiteboarding tends to be more chaotic, as team members can simultaneously add their own input to the board. Limitations were found regarding the size of the printed canvas, which can be relatively small compared to the physical whiteboard. Ultimately, adding previous drafts and iteration is more difficult than in an online session, as it requires upfront printing and formatting of earlier sketches.

Lastly, it was clear from the different tests that there is a difference between a whiteboarding session taking place at the beginning of a project or towards its end. Early whiteboarding enables making sense of the information obtained in the Clarity stage with the client and preparing for the next session/stage. Whiteboarding at a later moment in the project serves to assess the different versions developed to come to a final draft for the Validation stage.

5 DISCUSSION

The importance of involving stakeholders throughout the entire creative process has been highlighted by [Buijs & Van der Meer \(2013\)](#), which they refer to as ‘Acceptance Finding’. This is connected to the Not-Invented-Here (NIH) syndrome ([Antons and Piller, 2015](#)), which refers to how people are more critical and less willing to accept ideas that come from ‘outside’ the group they are embedded in. The NIH syndrome also applies when ideas are missing information about how they were conceived and why they might be good ideas ([Antons and Piller, 2015](#)). Conversely, people feel more engaged when they were actively participating in the creative process, increasing a sense of ownership. Therefore, not being jointly active in the reverging phase could lead to a more difficult acceptance of the final outcome or solution ([Heijne & van der Meer, 2019](#)). By completely excluding the client from the whiteboarding sessions, Flatland increases the potential risk of missing tacit knowledge essential to have an overview of the problem and solution space and understanding the design decisions made. Our canvas offers support to reverge and mitigate the NIH syndrome and lack of ownership, even if the client’s involvement is reduced during whiteboarding. An interesting connection can be found when linking this to the knowledge-creation process introduced by [Nonaka & Takeuchi \(1995\)](#). The externalisation of tacit knowledge generated during the reverging phase by making it explicit through visualisations enables the expression and sharing of one’s mental model ([Goldschmidt, 1991](#); [Yang et al., 2019](#)). Later on, the externalised knowledge can be internalised by the same or other individuals, converting the explicit knowledge into tacit knowledge. This is where the new knowledge becomes a part of their mental model, increasing the sense of ownership and the likelihood of accepting and implementing the outcomes created by Flatland into the client’s organisation. Finally, the whiteboarding canvas tool was designed to find the right balance between structuring and documenting the thinking process while it should also encourage Flatland’s employees to come up with new iterations. This is in line with the description of boundary objects given by [Star & Griesemer \(1989\)](#) and [Hautopp & Ørngreen \(2018\)](#). The definition emphasises that a boundary object should be robust enough so individuals can give a common meaning, while being fluid enough to allow for multiple interpretations.

6 LIMITATIONS AND FUTURE RESEARCH

This study's first limitation is that the research context only included one company, making it impossible to generalise the results. A future study could explore the application of this tool in the context of other agencies to further investigate its effects on client ownership and implementation, in the long term. The second limitation is that the canvas has not yet been tested with the involvement of Flatland’s clients and, as such, it was impossible to measure whether the tool led to increased client ownership and acceptance finding. [Buijs & van der Meer \(2013\)](#) suggest that a higher acceptance finding of the final idea or outcome is essential to increase the chances of its implementation. Thus, additional research is needed to investigate this potential effect.

7 CONCLUSION

The two studies presented in this article revealed that reverging (the stage between diverging and converging in a creative process) is not widely known and is applied only implicitly (instead of deliberately) in visual thinking practice. It was found that the reverging principle of 'being jointly active' is usually dismissed, leading to a lack of involvement of the client in the process. Visual thinking practitioners tend to make design decisions without involving the client or the entire team, leading to a potential lack of client ownership and acceptance of the final outcome. To mitigate this problem, the Whiteboard Canvas has been designed and tested. The tool helps to increase the chance of survival of ideas that were conceived in the divergent phase by making the evolution steps of the creative process more explicit, so creative ideas are protected and the thinking process can be shared, better understood and build further upon.

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