EMPOWERING NON-DESIGNERS THROUGH ANIMATION-BASED SKETCHING

ARTICULATIONS
DANWEI TRAN LUCIANI
LINKÖPING UNIVERSITY
DANWEI.TRAN.LUCIANI@LIU.SE

DYNAMICS
PETER VISTISEN
AALBORG UNIVERSITY
VISTISEN@HUM.AAU.DK

ABSTRACT

This paper asks whether it is feasible and valuable to facilitate early stakeholder involvement in the design process by applying animation as a common temporal sketching language. We build on the notion of sketching as an efficient activity for designers to think with and communicate ideas through. Not much research has sought to involve non-designers in the sketching process and assess which sketching media might be suitable for this purpose. We present the findings and learnings from a one-day workshop of using animation-based sketching techniques with non-designers as a way to empower them in the early concept exploration phase. We then discuss whether animation could be a suitable mediator of the sketching mind-set in stakeholders with varying preconditions for participating in the early exploratory phase of design.

INTRODUCTION

Sketching has been broadly recognized as the principal expressive activity in design for opening up design spaces and exploring possible futures by posing 'what if' questions (e.g. Jones 1992; Fallman 2003; Buxton 2010; Vistisen 2015). It has been extensively documented how a designer engages in a reflective conversation with a sketch and is able to gather new insights from the materialized thought compared to what was present prior to the creation of the sketch. This seminal piece of knowledge examines sketching as understood as something done with pen and paper (e.g. Schön & Wiggins 1992; Goldschmidt 1994; Goel 1995; Ferguson 1994). However, in Buxton's (2010) much cited work about sketching within design, it is argued that sketching should be defined by *how* a technique is used, rather than *what* the technique is. From this, Buxton derived a continuum of criteria differentiating sketching from more time-consuming and committal prototyping. The criteria emphasize the evocative, explorative, non-committal, and tentative nature of sketches. Thus, a sketching technique needs to be fast, easy and create disposable outputs. In a later work, Vistisen (2016) has aligned this with the early need in the design process to reduce uncertainty about which design possibilities exist, whereas prototyping serves the later need to reduce the complexity among a wide palette of design alternatives.

Recent works from the latest decade have opened the sketching discourse to encompass various other expressive media, such as artifacts (Jørgensen & Strand 2014), the body (Oulastira et al 2003; Arvola & Artman 2007), video (Ylirisky & Buur 2007), and even programming code (Lindell 2012; Forsén et al. 2010). These explorations into other expressive formats for sketching have been largely driven by an attempt to find suitable ways for early explorations within the domain of interaction design. Fallman (2003) described the sketching challenge of interaction design as being caused by the discipline's explicit focus on expressing experiential factors such as interactivity, temporality, and immersiveness in addition to the examination of the aesthetic form and rational function of the designed object. In that sense, as also noted by Löwgren (2004), a sketch in interaction design needs to both be static and temporal at the same time, while avoiding turning into 'the product' itself.

The challenge with sketching within interaction design becomes even more evident when the explored design involves technologies or interaction concepts which lack established conventions or interaction idioms – what Löwgren (2016), Lindell (2012) and Vistisen (2016) discussed as being non-idiomatic design situations. In these situations, the lack of temporal information makes it hard to fill the gaps of a sketch suggesting how the interaction design might work. That is, the lack of experiential idioms of conventions make it harder for designers to mentally simulate the effects of the sketched output.

One promising approach to accommodate temporal sketching within interaction design is to leverage animation as a sketching capacity. The principal advantage of animation is the ability to achieve 'full control' of the transitional material, as opposed to traditional film (Stephenson 1973). Adapting animation as a sketching capacity originates from over a century of development in animation techniques, but distinguishes itself from the aesthetic and storytelling ambitions of traditional animation or art films (Wells 1998). Instead, animation-based sketching has been proposed as a way to pose the designerly 'what if' questions about possible futures through the temporal information gained from animation (Vistisen 2016). Using animated motion in design was proposed earlier by e.g. Vertelney (1989) and Mackay (1988), though they clearly marked the use of animation as a way to augment video by creating a high visual and temporal fidelity. This could hardly be labeled as 'sketching', but is more a means of prototyping. Later, Löwgren (2004) proposed the use of short and sketchy animated user scenarios to gather feedback in the fuzzy front-end of design. Similar accounts can be found in the works of Zarin et al (2012), Fallman & Mousette (2011) and Bonanni & Ishii (2009), who applied stop-motion techniques, and Eikenes (2010) who applied computer animated motion graphics to explore interface interactions. Furthermore, Quevedo-Fernández et al (2012), Davis et al (2008) and Sohn & Choy (2010) all experimented with creating specific digital tools for animation-based sketching. Vistisen (2016) built upon these results, with a broader empirical examination of more than 200 designers and design students using various fidelities of animation for sketching, and formulated a set of principles for animation-based sketching as a design approach. Sketching seems like a promising way to empower designers in non-idiomatic design situations (Tran Luciani & Lundberg 2016), and the research into animation-based sketching has shown its potential as a temporal and narrative sketching tool for such design situations. However, prior contributions on animation-based sketching all fall into the category of being primarily 'designer-driven' (Sanders & Stappers 2008) and focus on introducing the approach to people with design skills. How are we to proceed when earlier boundaries between design disciplines and other stakeholder disciplines are becoming more permeable? Could non-designers, such as developers or business analysts for example, also be empowered and get a creative voice through extended sketching techniques, like animation-based sketching? In an attempt to shed some light on this question, we have experimented with how non-designers can create a common space to explore new non-idiomatic design situations through animation-based sketching.

THE WORKSHOP

We needed an experimental setup to work with participants with limited design knowledge who might be considered possible stakeholders in an interaction design process. To do this, we organized a one-day workshop on animation-based sketching in collaboration with the annual developer conference Øredev (Øredev 2016a), which took place in Malmö, Sweden. Eleven participants from five different countries signed up to learn how to use animation-based sketching as a method to explore and communicate early concepts. The workshop was divided into a series of blocks from 9.00 to 17.00, starting with an introduction to sketching, moving on to hands-on work, and ending with a critique session.

The only prerequisites listed for the workshop were for the participants to bring their own laptops with the video editing software Adobe Premiere installed and an "open mind to explore the early fuzzy front end of design" (Øredev 2016b) . Prior to the workshop, we sampled the participants' backgrounds and their proficiency in sketching. It is fair to say that most of them were unfamiliar with sketching even in general, with two of the participants working with design and characterizing themselves as not being highly proficient in sketching, and the rest being developers.

The workshop started with a presentation of the fundamentals of design sketching, followed by a 20-minute warm-up exercise in traditional sketching with pen and paper, all in order to prepare them for both the rapid pace of sketching as well as its non-committal nature. The exercises were built from the lessons of e.g. Greenberg et al (2012) and McCloud (1994), in which basic geometric shapes are gradually created and combined to form basic idiomatic figures (such as faces, devices, household items, and so forth). At the end of the exercise, the participants were asked to combine these idiomatic figures into scenarios of their morning routines as a way of introducing the notion of temporality to their sketching mind-set (Figure 1). By moving from scribbling lines and shapes, to combining them into figures, and to storytelling, we tried to encourage expression through sketching, and prepare them for adding extra temporality through animation. The emphasis in the exercise was to build a 'sketching' not 'making art' mind-set in which the skill to rapidly sketch idiomatic assets is established, forming the basis for animation-based sketching techniques to come.

Figure 1: Sketches made by participants telling the story of their morning routines.

After the warm-up sketching exercise, we held an introductory presentation about animation-based sketching as a method for exploring early non-idiomatic design concepts. Following the presentation, we moved on to a 20-minute follow-along exercise on how to create a stop-motion animation in Adobe Premiere using simple key frame animations with added visual and sound effects. This follow-along exercise gave the participants basic proficiency in the production environments – digital as well as physical – which they had to use for the remainder of the workshop. The participants were divided into four small groups and spent the next 3.5 hours sketching with animation. The groups worked independently, and the authors acted as facilitators for troubleshooting and feedback. The groups all dealt with the same case, which was to imagine a possible future system for air traffic control towers. The motivation for choosing this specific case was to reflect an authentic non-idiomatic design problem, and the case is also related to an ongoing research project involving one of the authors. To set the context, we described the work of an air traffic controller as designing airspace flows. Pictures were shown of how their current work situation looks like and a video showed a real example of the dense traffic in the airspace. Their mission statement for the workshop was:

> Imagine future system for air traffic controllers to design airspace flow. Visualize the interaction between the air traffic controller and the system.
>
> Things to consider in the design:
>
> - Location of all aircraft in the air (and all vehicles on ground)
> - Individual characteristics of aircraft such as size, speed, turning ratio
> - Changing weather conditions
> - The role of the air traffic controller versus the role of the system

Although there already exist plans and more innovative concepts for future air traffic control towers, these were deliberately not part of the introduction to avoid affecting the participants' own concept development. After the quick introduction to the case, the participants gathered their analogue sketching materials and started creating. Materials available for them to use included cardstock, post-it notes, pens, scissors, sticky tack-its, and lightboxes. The groups drew on cardstock, cut images out, and with the help of a lightbox they took still images for their stop-motion animations (Figure 2).

With Adobe Premiere they put together the animation-based sketches into a playable video and added background music and sound effects to set the ambience.

Figure 2: Work-in-progress of participants making analogue assets for their stop-motion animation and manipulating them in Adobe Premiere.

It is interesting to note how the sketching process seemed to have two sub-processes. First, the participants sketched analogue assets by drawing, cutting, and mixing different physical elements together, then throwing some of the sketches out and finding new ways to express the elements they wanted to experiment with temporality through animation. Secondly, the analogue and static assets were manipulated through either stop-motion or key frame animation in Adobe Premiere, where the sketching process changed into a series of iterative design moves experimenting with adding different aspects of motion. As such, the animation-based sketching process during the workshop started out with the sketching of static assets, and later, sketching temporality by combining these assets with digitally created motion and effects.

At the end of the workshop, four animation-based sketches had been created showing different ways of tackling the air traffic design challenge. During a short design critique session, each group showed their animation-based sketch in front of the whole class to receive critique. The focus of the critique session was twofold: to discuss how the proposed concepts engaged the non-idiomatic design challenge, and to reflect on how the groups had used the animation-based sketching techniques to explore the temporal and spatial dynamics of the interaction design.

THE FOUR SKETCHES

We will describe the animation-based sketches, and how the expressed concepts dealt with the design challenge. In doing so, we leverage on the dialectics of sketching, presented by Goldschmidt (1994) of 'reading' the content of sketches as interpretations of the thinking done in the sketching process.

Group 1’s sketch (31s video): On a touch-screen, take-offs and landings can be seen overlaid on a map. Two aircraft are approaching and their predicted paths (depicted as dashed lines) are crossing and a possible collision is detected. This sets off a warning illustrated by an icon and a sounding alarm. An air traffic controller rotates one of the aircraft to adjust its flight direction in order to avoid collision. A new updated path for the aircraft is automatically laid out by the system and shown on the screen. (Figure 3).

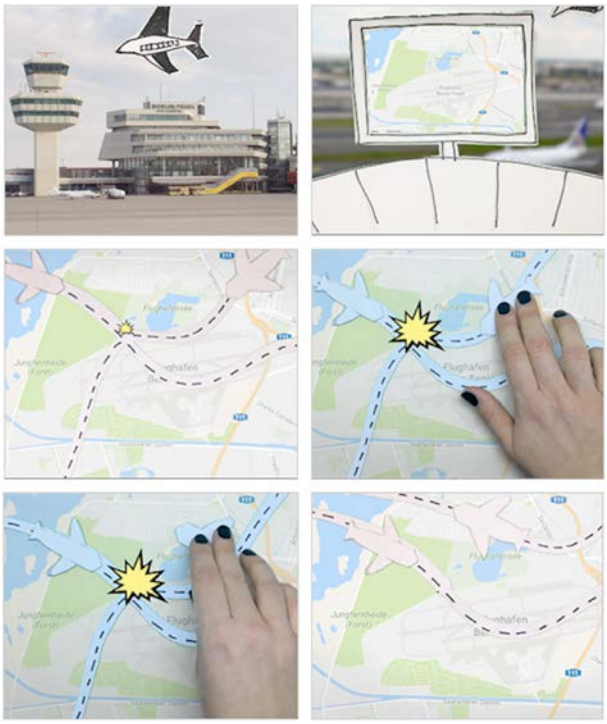

Figure 3: Screenshots of group 1’s animation-based sketch (see full animated sketch)

Group 2’s sketch (46s video): Inside a tower near the runways, air traffic controllers are using a new system with a touch-screen. The user interface shows a radar view, a flight strips pane, an information pane, and a view of the ground area surrounding the airport. An air traffic controller taps to select an aircraft on the radar to see detailed information about it. Flight strips and aircraft arrive simultaneously into their respective panes. A possible collision is detected and a warning is illustrated with an icon placed on the radar where the collision is predicted to happen. At the same time, flight strips of the aircraft at risk are highlighted in another color. The air traffic controller taps on the warning icon and predicted paths for the involved aircraft are shown as dashed lines. The path for one of the aircraft changes color and the air traffic controller pulls it to adjust its direction in order to avoid collision. A change in the weather condition is illustrated on the radar screen as a lightning coming in and two aircraft that are affected by this change color. These two aircraft are prevented from take-off until the sky has cleared up. (Figure 4).

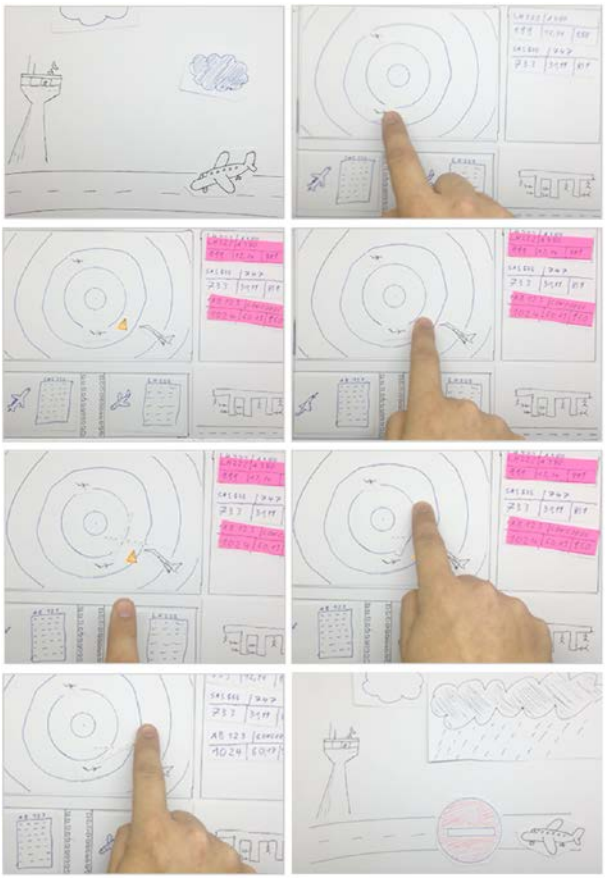

Figure 4: Screenshots of group 2’s animation-based sketch (see full animated sketch).

Group 3’s sketch (16s video): Multiple air traffic controllers gather around a round table. The table shows a zoomed-out view of Rome from above with aircraft moving like on a radar. An air traffic controller pushes a button on the edge of the table to show weather information. Another button is pushed and the viewport zooms in on the airport. An air traffic controller taps on an aircraft and detailed information is shown in a popup. Another tap on the aircraft reveals its projected path as a dashed line. Adjustments are made to the path by pulling. (Figure 5).

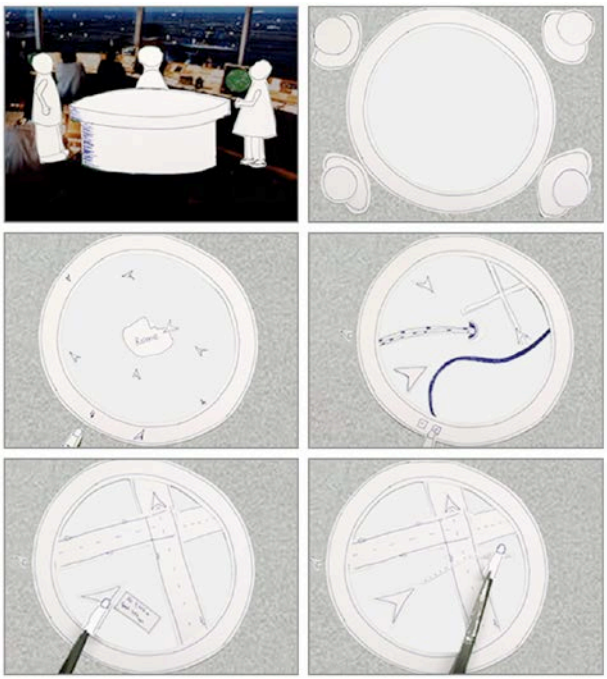

Figure 5: Screenshots of group 3's animation-based sketch (see full animated sketch).

Group 4's sketch (19s video): Weather changes for the worse and a worried-looking air traffic controller in the tower seems devastated about the poor view over the runways. The air traffic controller puts on a pair of augmented reality glasses that makes it possible to see the aircraft despite the poor weather. The glasses project detailed information about each aircraft on labels following the aircraft as they fly. (Figure 6).

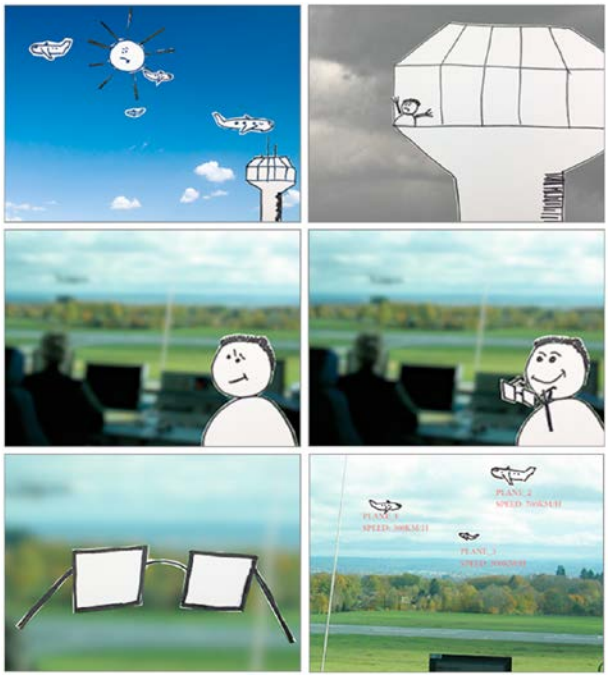

Figure 6: Screenshots of group 4's animation-based sketch (see full animated sketch)

ANALYSIS OF THE APPROACH & SKETCHES

Let us examine what the four sketches and the process of making them taught us about introducing animation-based sketching to non-designers. Our main claim is that it is possible for non-designers to benefit from sketching by using animation-based sketching as a way to empower themselves in the early design process. The first finding, which supports this claim, was the rapid pacing of the workshop. After introducing the approach and the case, the groups had their first animation-based sketches done in only a few hours. This result supports the idea that the things created during the workshop could actually be characterized as sketches.

Even though only one animation-based sketch was created per group, it should be taken into account that this was their first time using Adobe Premiere. Because of that, there were a fair amount of questions throughout the workshop on how to do specific things in the production environment, as well as technical troubleshooting. This suggests that although animation seemed to be a viable sketching approach among the participants, even making simple animations requires a build-up of a digital sketching literacy in the tool. However, even with these obvious usability concerns towards learning how to use a tool for a specific task, they were all still able to produce very expressive animation-based sketches in limited time. Had time permitted for further iterations, these sketches could have enabled further exploration of concepts allowing them to develop the details of the suggested interaction designs into something even more promising, and perhaps generative for the specific domain. Finally, it seems likely to assume the participants are now able to create new animation-based sketches at much faster pace, due to their newly established basic animation literacy and proficiency in the production environments.

The animation-based sketches were relatively short, ranging from 16 to 46 seconds in length, but each of them still conveyed enough for an interesting initial design critique session. They maintained a tentative visual and temporal fidelity level, making them ambiguous enough for multiple different interpretations and reflections to surface. It was possible to assess the concepts and identify potential details that seemed promising for further exploration. Sound-effects added another dimension to the setting and mood of the scenarios. The sound-effects made it clear when something was selected compared to when something was pulled or panned. Background music and alerts made it obvious when the situation changed into an unfavorable one and when it had been handled. The groups spent considerable time experimenting with different sounds. This observation tells us something about how temporal sketching benefits from other sketching assets than just visual components in motion, but that sound should also be considered as a sketching asset. Without sound, the animation-based sketch would still express the temporal information of the proposed interaction design, but the 'telling' of the sketch would

have lacked the experiential quality and suspension of disbelief added by sound. When visual, audible and temporal assets were combined, each of the animation-based sketches were expressive enough to communicate their concept on their own. We cannot assess whether the participants could have achieved equally expressive capacity through only traditional visual and static sketching, but we do argue that the animated sketching outputs clearly explore more than just the form of their concepts. They also explore specifics of the interaction with concepts and thus generated temporal information, which would have been difficult to explore through static means of sketching.

Rather than introducing sketching as a skill only useful for artistic expressions, we introduced it as a mind-set for early explorations. This seemed to help the participants feel more comfortable treating animation as a form of sketching. All participants were novices at making animations, which served well in creating a starting point for adopting the sketching mind-set. As such, we saw the dialects of creating a sketched expression, reflecting on it, and informing new sketching moves in both the creation of the assets as well as in the various production environments.

The assets for the stop-motion frames were all hand-drawn and hastily cut-out. For their animation-based sketches the groups used a mix of hand-drawn images, photos, and props for quick collaging to tell the story. Using the analogue materials was a quick and easy way to create and try ideas – many cut-outs were made to replace old ones that were thrown away – it was clearly a sketching process. When they moved on to Adobe Premiere, it introduced some friction in the sketching process because they were not that familiar with the software. Initially it might not have felt like a sketching tool. However, without using Adobe Premiere the sketches would not have expressed any temporality by themselves. By making an animation it invited the participants to think of the finer grains of each interaction design concept. If a transition step between two static frames was too large, it would have been difficult to fill in the gaps of the sketch due to the non-idiomatic nature of the case. The concepts are not self-explanatory in a static state without a descriptive text since there are no well-established conventions in the interaction design of this specific domain, especially when imagining future scenarios. Furthermore, even though the frames themselves can communicate aspects of the sketched concepts to some degree, it is worth noting that the frames are the product of a sketching process where the making of animation enabled the generation of the temporal information needed to explore and develop the concepts. We argue that this is an important aspect of how animation supported the participants' exploration of the non-idiomatic technology, that is to say, actually exploring the interactions in a temporal medium. As such, the empowering quality of animation-based sketching might actually exist less in the animated sketches as output, but rather in the process of making the animation itself.

CONCEPTS FOR THE SPECIFIC DOMAIN

Though the main goal of the workshop was not to create usable concepts for air traffic control towers, some of the sketches produced aspects valuable for further conceptual exploration within the design space.

This included hints of designing for human-automation collaboration. In other words, who should do what? To handle possible collisions, group 1's sketch let the air traffic controller select which aircraft to rotate and then the system would calculate a new appropriate path. Group 2's sketch showed that the system would propose which aircraft needs to steer away by changing the color of its predicted path without any input from the air traffic controller. Another interesting conceptual topic was co-planning with multiple users: As of today, air traffic controllers oversee a predefined airspace and only collaborate when aircraft cross the borders of these designated spaces. The increasing density of traffic might lead to a need for co-planning with multiple air traffic controllers sharing the same airspace. Group 3's sketch, where several air traffic controllers can gather at a round-table and interact from all angles suggests a concept for co-planning. The sketch does not express how multiple users would interact with the system, but it surely opens up for discussion and further exploration.

The fact that the output sketches of the workshop held potential constructive design value to an ongoing air traffic control research project, supports the claim that there is value in including non-designers in the early phase of exploring a non-idiomatic design space. It may be argued that equally valuable ideas could have been developed with static sketching or other means of design exploration. However, based on the expressive quality of the generated animation-based sketches' temporal dynamics, we claim that the results of the workshop at least illustrate how animation enables relevant exploration of temporality at a very early stage in the design process. We see this contribution in relation to Gaver's (2012) notion of the goal of design research as not creating theories that are never wrong, but rather that are sometimes right – under a given set of parameters. The workshop described here shows the promise of animation-based sketching in the contexts of non-designers, working with non-idiomatic technologies.

CONCLUSIONS

Designers are trained to efficiently sketch and communicate ideas. Animation-based sketching has been shown in earlier works to be a promising approach for designers and design students. Our experimental study shows that animation-based sketching could also be a suitable approach for exploration for non-designers who have to do designerly work, and a way to empower them to explore and express their own ideas in the creative process. Although the main focus for the

participants might have been to learn the sketching technique and get familiar with the sketching media, the sketches produced in the process were well-made considered the limited resources. Each group produced rather expressive sketch using the same materials, case, and timeframe. This provides some basis for claiming that animation-based sketching is feasible to introduce as a co-design tool for non-designers as a way to empower them to explore non-idiomatic design situations.

When they were creating assets and making the stop-motion frames using analogue material and lightboxes, they were all familiar with the materials. The lightbox was self-explanatory and all participants quickly mastered its usage. When they continued on to the next stage, where they were to put together their stop-motion frames and sketch temporality, the progress slowed down. The reason could be because the sketching tool, Adobe Premiere, was not self-explanatory and easy to grasp. The software is not primarily intended to be used for creating animation-based sketches, and its interface presents many available functions that may not even be relevant for sketching. If a tool for sketching temporality had been made for this purpose, or at least if the options available had been limited, perhaps it would have been easier to focus on adopting the sketching technique. We could have provided kits with premade sketching assets, but that might have affected participants' design concepts. If the workshop had included another iteration, the participants would have been more familiar with the sketching media and be more equipped to use Adobe Premiere as a sketching tool. With their newly gained animation-based sketching literacy along with increased user proficiency in the production tools, perhaps more time is all that is needed.

In conclusion, we propose this as basis for further experiments to be carried out with introducing animation-based sketching as a way to empower non-designers in the early design process. This includes introducing some ready-made idiomatic assets, and limiting the creation of sketching assets to the non-idiomatic aspects, as well as building up a more developed sketching language in the production environments used to sketch animation. In addition, it would be interesting to see how this would play out in a real-world design situation compared to a constructed workshop setting, as described in this paper.

REFERENCES

Arvola, M. and Artman, H. (2007) 'Enactments in interaction design: How designers make sketches behave', *Artifact*. 1(2), pp.106-119.

Bonanni, L. and Ishii, H. (2009) 'Stop-motion prototyping for tangible interfaces', *Proceedings of the 3rd International Conference on Tangible and Embedded interaction, 2009.* ACM, pp.315-316.

Buxton, B. (2010) *Sketching user experiences: getting the design right and the right design*. Morgan Kaufmann.

Davis, R.C., Colwell, B. and Landay, J.A. (2008) 'K-sketch: a'kinetic'sketch pad for novice animators', *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, April 2008,* ACM, pp.413-422.

Eikenes, J.O. (2010) 'Connecting motional form to interface actions in web browsing: Investigating through motion sketching', *FORMakademisk–journal for design and design education*. 3(1).

Fallman, D. 2003. 'Design-oriented human-computer interaction', *Proceedings of the SIGCHI conference on Human factors in computing systems*, April 2003. ACM, pp.225-232.

Fallman, D. and Moussette, C. (2011) 'Sketching with stop motion animation', *Interactions,* 18(2), pp.57-61.

Forsén, G., Lundin, T. and Löwgren, J. (2010) Pinpoint: A Design Study in Interactive Visualization for Finding People in a Large Organization, *Information Visualization,* 9(2), pp.141–151.

Gaver, W. (2012) 'What should we expect from research through design?' *Proceedings of the SIGCHI conference on human factors in computing systems*, May 2012*,* ACM, pp.937-946.

Goel, V. (1995) *Sketches of thought*. MIT Press.

Goldschmidt, G. (1994) 'On visual design thinking: the vis kids of architecture', *Design studies,* 15(2), pp.158-174.

Greenberg, S., Carpendale, S., Marquardt, N. and Buxton, B. (2011) *Sketching user experiences: The workbook*, Elsevier.

Jones, J.C.(1992) *Design methods*, John Wiley & Sons.

Jørgensen, K. M. and Strand, A. M. C. (2014) *Material storytelling,* Nova Science Publishers, Incorporated.

Lindell, R. (2012) 'Pining for the Materiality of Code', *From Materials to Materiality: Connecting Practice and Theory in HCI*, Workshop at the 2012 Conference on Human Factors in Computing Systems (CHI) conference, 2012, Austin, ACM.

Löwgren, J. (2004) 'Animated use sketches as design representations', *Interactions,* 11(6), pp.22-27.

Löwgren, J. (2016) 'On the significance of making in interaction design research', *Interactions.* 23(3), pp.26-33.

Mackay, W.E. (1988) 'Video Prototyping: a technique for developing hypermedia systems', *CHI'88 Conference Companion Human Factors in Computing Systems*, April 1988.

McCloud, S. (1994) *Understanding comics: the invisible art.* William Morrow.

Oulasvirta, A., Kurvinen, E. and Kankainen, T. (2003) 'Understanding contexts by being there: case studies in bodystorming', *Personal and ubiquitous computing,* **7**(2), pp.125-134.

Quevedo Fernandez, J., Schouren, J.M. and Martens, J.B.O.S. (2012) On the development of idShare, a platform to support interaction design activities of small co-located teams.

Sanders, E.B.N. and Stappers, P.J. (2008) 'Co-creation and the new landscapes of design', *Co-design*. 4(1), pp.5-18.

Schön, D. A. and Wiggins, G. (1992) 'Kinds of Seeing in Designing', *Creativity and Innovation Management*. 1(2), pp.68–74.

Stephenson, R. (1973) *The Animated Film*, Tantivy Press.

Tran Luciani, D. and Lundberg, J. (2016) 'Enabling Designers to Sketch Immersive Fulldome Presentations', *Proceedings of the 2016 CHI Conference Extended Abstracts on Human Factors in Computing Systems*, May 2016, San Jose, ACM, pp.1490-1496.

Vertelney, L. (1989) 'Using video to prototype user interfaces', *ACM SIGCHI Bulletin,* 21(2), pp.57–61.

Vistisen, P. (2015) 'The Roles of Sketching in Design', *Nordic Design Research (Nordes)*.

Vistisen, P. (2016) *Sketching with animation: using animation to portray fictional realities – aimed at becoming Factual*, Aalborg Universitetsforlag.

Wells, P. (1998) *Understanding Animation*, Vol. 1998, Routledge.

Ylirisku, S. and Buur, J. (2007) *Designing with Video: Focusing the User-centred Design Process*, Springer Publishing Company Incorporated.

Zarin, R., Lindbergh, K. and Fallman, D. (2012) 'Stop Motion Animation as a Tool for Sketching in Architecture', *Proceedings of DRS, 2012*.

Øredev. 2016a. *Øredev 2016*, [Online], Available: http://www.oredev.org/2016 [30 March 2017].

Øredev. 2016b. *Session*, [Online], Available: http://oredev.org/2016/sessions/experience-how-animation-based-sketching-can-help-you-develop-your-early-concepts [30 March 2017].