

CHI Paper Review

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HCI; Sketching; Design; Physical Design Tools; Digital Assisted Design

Camporro, M., & Marquardt, N. (2020).

Live Sketchnoting Across Platforms: Exploring the Potential Limitations of Analog and Digital Tools. In Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems (pp. 1-12).

Kianzad, S., Huang, Y., Xiao, R., & MacLean, K. (2020).

Phasking on Paper: Accessing a Continuum of Physically Assisted SKetchING. In Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems (pp. 1-12).

1) What are the research methods used in each paper? Describe each research method, and then compare and contrast the methods used in each paper.

Each of these papers used similar methods comprised of observation followed by interview, but each employed these differently. Kianzad, et al, for example, first tested without users, then used two different small groups comprised of seven novices and three expert sketchers. Researchers used a Likert scale to identify the reactions of both groups, while also conducting interviews with only the expert sketchers. Although both research teams used fairly small sample sizes, in Kianzad, there is a focus on proof of concept, or “conceptual viability,” leading to generally more focused questions and discussion. The expert sketcher participants were all landscape architects, and were therefore in a similar field. I noted that this field tends to lend itself toward general clear focus on geometric shapes, which fits the pen as it was designed at the time of research, but this may be a future concern, and the team may want to expand out to participants who use different styles of sketching. Additionally, these experts all use sketching as an integral part of their jobs, and so had familiarity with it in a working sense and from a process point of view. It would have been interesting to see the interviews opened up to the novices to see their point of view, too, especially given the experts’ assertion that this could be a good learning tool.

Camporro et al’s research participants were comprised entirely of users, and similar to the Kianzad study, conducted research using observation followed by interview. However, the participants this team recruited were all familiar with the medium, but not the tools, and the researchers used a within-subjects design. Participants used both a digital writing implement, and traditional pen and paper. They were able to choose to use their own tools for the pen and paper section if they wanted, and were able to choose between two software programs to use for the digital section. The researchers traded the medium for participants between two videos, to make sure the video wasn’t impacting the outcomes.

This research focused on sketchnoting, a style of note-taking that incorporates free-drawn sketches and text elements. This is well beyond the limited look at geometric shapes of the research described in the Kianzad paper, likely given the divergent goals of tool-specific research and more broad use research. This study had a clear social science viewpoint focused in psychological theory, and undoubtedly had distinct goals from the Kianzad research, which was based more in actual product use and study of movement. The Camporro research provided more options in terms of aesthetic differences in tools, but there were no real indications as to how this played into the responses for each research team. As mentioned, the participants were able to use their own tools and pick between software, which was in line with focusing more on how the digital style impacted the artistic process itself, rather than just movement. Another noted difference of the Camporro research is that participants were able to interact with the tools prior to testing, in order to become more familiar with them. Generally, they interacted for no more than ten minutes, but this does mean that they got to develop some comfort before participating in the actual study piece.

Two additional small differences I noted were that the Camporro paper directly mentioned the approvals they received declaring this was ethical research, while this was left out of the Kianzad paper, and that when I was looking through the cited texts I saw that the Camporro paper cited one of our class’s textbooks, *Research Methods in Human-Computer Interaction*, showing good judgment in sources.

2) What are the key results from each paper? Describe each paper, and then compare the results.

The Kianzad research showed that participants had interest in the product and saw applicability to their and others’ work. It also showed the need for further research. The results were generally positive, with only one section showing any responses below neutral. Given the limited and non-randomized sample, and articulated goal of the research, it seems unlikely that this will generalize at all, but will rather inform continued refinement of this or a similar concept. The researchers succeeded in testing their concept in order to validate continued research, and were able to solicit input from knowledgeable users which can be used to drive their future studies. These suggestions included additional application of the tool in educational and more applied training settings.

The majority (seven out of ten) of participants in the Camporro research preferred the new tool at the end of the experiment. This is interesting, because this sentiment wasn't necessarily reflected in the observations. Although they mentioned flexibilities and options, they failed to use these during the testing application. Does this indicate they felt like there was a "correct" viewpoint to take, or does it rather imply a discomfort with the technology that played a strong part in their usage. Sketchnoting, and in fact, this research, is generally performed in real-time while a person is speaking. Although they had some time to test the new tool, it most likely wasn't enough time to make the participants confident in their ability to learn and use the digital tool concurrently.

While participants did have differences in the way they used the sketching tools, they most often tried to make the digital tools work more like the analog. They only embraced the variety of different options in post-video editing, where they felt they had the time to focus. This led some of the participants to voice concern that they would actually spend more time with the digital tool, because with options like line changes, color changes, and undo, they felt they were reaching for a more perfect final product. The more tangible marker method led them to accept some imperfection, although some admitted it actually caused them to throw out their work and start over on more than one occasion.

Some of the issues participants noted were spatial awareness, becoming overwhelmed by choice, cognitive load concerns, and a lack of haptic feedback. At least one participant mentioned that they found the digital tool to be even too precise. Some benefits they articulated were flexibility, availability of choice, ease of transport, ease of finding tools, ease of sharing digitally, and the ability to have several sources of information. (One participant mentioned liking the opportunity to trace a digital picture onto her final product.) The researchers saw differences in perceived time vs. actual time, and perceived use vs. actual use, but were able to use the semi-structured interviews to delve deeper into these contradictions.

Amusingly, but perhaps not too surprisingly, despite differences in goal, tone, and somewhat in methods, both teams did find participant interest in an undo button.

3) Compare and contrast the writing style of each of the two papers.

The Kianzad paper read as a bit more formal, and was certainly written from a stronger technical perspective. It was explanatory rather than persuasive, and spent a fair amount of time discussing the current offerings in the digital pen and digital drawing world. The paper had graphs and figures, but this proved to be somewhat problematic as they were based on color differences, and the copy I was reading was in black and white. Although I was able to differentiate between findings, this made for a bit more difficult interpretation. A very minor nitpick is that the paper also had some issues with labeling in that they referred to figure 9b, but then there was no a/b/c labeling in figure 9.

The Kianzad paper was meant to look at only one product, and was looking for very specific technical concerns. This drove the tone of the paper, and so, far more technical specifications were included. It describes such parts of developing the study as constructing environments, control sharing, modality of tool selection, and the "bound" and "bring" constraints. In this study they use the terms bound and bring to describe the different way the pen influenced the participant's movements. In the bound condition, participants could move freely to the boundary line, but could not go beyond it. The bring condition used what the paper describes as "a force field (to) draw(s) the user in a particular direction or rate..." (Kianzad et al, 4) Largely, this paper devoted less space and time to the methodology, related experiments, and associated results, and dedicated much more of the overall paper to the tool design and related concerns.

I immediately regarded the Camporro paper as much more straightforward, making this assessment even after only looking at its abstract. This appraisal made me prepared to be more interested in the paper, so I understood that I had to make sure to temper that bias. The paper was clearly organized and used a form that repeated findings in an obvious way, which is good for understanding, but also somewhat boring moving through the paper. As the paper is explanatory, this choice makes sense as a way to accurately convey the specifics of the research and its findings. The researchers were very clear about the basics of the statistics in their write-up. They highlighted their use of the within-groups method, and also directly identified their

independent and dependent variables. This paper included more comparison to existing research, and related their results back to theory, which fit its more psychology-disciplinary background. The research wasn't looking at a specific product as much as the mode of design and general sketching programs, so there was far less deep discussion of technical specifications. It really only differentiated between the analog and digital tools, and a few features of both. The authors of this paper seemed far more interested in discussing their results in depth, rather than the technical specifications.

These papers were both based on visual design, which led to some similarities in style. They both used what seemed to be a larger-than-typical number of pictures, diagrams, and/or graphs, which makes sense given the visual topic. Each also took some time to discuss drawing and sketching processes, and how those would impact the use of the tools.

4) What are your perceptions of this research topic, and the specific contributions made by the authors in their papers?

I found the topic of both papers to be really relevant areas of research, and both had relation to my real-world experience. I use a Livescribe digital pen (which I love), so I was interested to see innovation in that realm. In my organization development days, I worked with a consultant who focused exclusively on sketchnoting. I saw her work often, and learned about her process, tools, and the positive and challenging aspects of completing this work.

I'll also discuss the wider relationship between these studies and the field. The Kianzad paper focused on a product that can work in terms of learning and re-learning. Although they focused on one professional specialty, landscape architecture, this implies the opportunity for a much broader application of the tool. The study gave a good show of their first testing experiences, and this can work as a jumping off point for future research that extends the characteristics of the tool much farther. Their tool was built upon existing technology, so they didn't have to entirely reinvent the wheel, but they've taken it a step further, using haptics to implement either "bound" or "bring" conditions, to force the user's drawing to follow defined shapes and lines.

The paper discusses use of their product by professionals, but I wonder about the need and/or desire for this. It seems many people who are sketching enough to make this worth incorporating into their suite of tools probably have a sense of the basics of drawing already. It will definitely need to become more robust and refined to even gain traction in this realm. Interestingly, though, the Kianzad research might lead to further research into application for physical therapy- type needs.

The Camporro paper described research that goes beyond sketchnoting. It addressed common concerns brought up in general in relation to digital writing and drawing. It addresses the feel of the product, ease of use, and inherent flexibilities. Because the paper was planned to focus wider, it was able to build off of, or at least expand, its findings. Although a limited study, this does seem to lend itself to more generalization in future research. The tool-agnostic nature of the Camporro research helps to see differences between the influence of the tool itself, and the process, in ways that may address sketching/note-taking challenges. They also provided a good comparison in that they had the same participants use both analog and digital tools within the same study.

5) What do you think the next steps in future research on this topic should be?

These papers both lend themselves to a wide variety of future research implementation. The Kianzad paper, with its focus on the physical tool, likely leads toward looking into figuring out how to make it less cumbersome. They can also research ways to release the pen for use beyond exclusively dot paper, which will allow more freedom to the user. They also have the option to look into the feasibility and usefulness of adding various additional characteristics to the tool. As mentioned in the paper, they can try to address color, developing a "non-linear relationship between pressure and control", introduce modifying elements like resize, rotate, copy, paste, undo, and implement virtual constructs and systems. (Kianzan 10) Their ultimate goal of digital twinning, described as, "modify it on-screen, then bring it back to paper with guided tracing." (ibid) This leads to further refinement and research into ways to make that a more viable reality.

Further, I suggest the option to involve participants with more varied backgrounds more deeply in the research. Look to participants who have less formal sketching and design experience and requirements, and include them in the interview portion. Perhaps create a sub-set of subjects by looking at art teachers, while moving beyond basic geometric shapes.

There is an opportunity here to see if there are assistive applications for the tool. The researchers would need to identify if sketching is even a challenge or important to various groups, and if so, how does this present a solution. From this, the researchers could invite participants who have various related disabling characteristics to test out different functionalities. This, and other domains, may introduce the opportunity to research altering the types of pens to expand to different sizes and shapes, but also using markers, erasable pens, or other forms for the tool.

Further research could compare how close participants drew specific shapes and lines to the initial participants' results. It could also be more intentional in considering handed-ness (all three expert participants were right-handed,) perhaps by considering different age groups and different hand sizes. An important additional consideration might be different domains for sketching – they show use for professionals and learning, but what about free-sketching, or those who sketch for fun and relaxation? Features they could consider that weren't mentioned in the paper include recording options, or learning ability in the pen (that is, it learns from the user's grip, pressure, etc. and adapts.) This research also derived information about participants' interest in spatial area. They identified large areas as often used and a bigger problem for drawing straight lines, which then lends itself to researching using larger surface/drawing area.

I wonder about the determination to keep people working with analog tools. It seems that people often lament the move from analog to digital, particularly with respect to creative and highly nuanced tools, but does that mean that research should focus on trying to indulge that? It seems people think they like hand-sketching better, but why not make the technology feel more like hand-sketching, while still focusing on moving toward exclusively digital platforms? This is particularly relevant to the tool used in the Kianzad paper, which doesn't accurately simulate free sketching as it stands, anyway.

To further the Camporro research, they might consider bringing in participants who have extensively used digital tools for sketching. This was identified as perhaps the difference between adopting the digital tool or not, and could lead to more robust understanding of the difference between issues of tool use, and issue of the general format. Additionally, further research could play with the topic/format of the sessions participants created notes for. They could switch to lessons vs. TED talks, live presentations vs. recorded, and differed lengths of presentation. The intended customer could also vary – would they be taking notes for themselves, for learners, or maybe for corporate clients? These scenarios might change the way they interact with the tool. Future research might also consider moving from the lab to the field, so see how useful digital sketchnoting is in real-world application.

The researchers could vary the composition of the participant pool for future research. The participants all had similar experience in terms of length of time they have been sketchnoting, and previous use of digital note-taking tools. To add, there could be varied tools that are intentionally included. Although they were allowed to use their own tools, perhaps more than one type of digital tool could be supplied by the researchers to be used by participants. Similarly, they could consider expanding the software options that are used during the evaluation. The tests used mostly one program, with one user choosing another, but there are many programs beyond those two, and their features and functions may impact adoption of the tools. Finally, because there is text involved, it probably makes sense to conduct at least one look into differences between writing systems employed. Is there something about Roman vs. ideographic or pictographic writing that makes this tool more or less valuable to the user?

Both these papers explore the possibilities of digitally assisted design, but each uses a different lens. In comparing the papers, I saw clear differences in methods and approach, but also alignment with the stated goals of the research. Both studies offer ample opportunity for continued research, and will help to build a better understanding of digital drawing, sketching, and writing.