

RE-ENVISIONING A HYBRID PARTICIPATORY DESIGN WORKSHOP: PEOPLE, PEDAGOGY, AND PROCESS

A CASE STUDY ON PAPER PROTOTYPING OF SMART FOOTWEAR

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ABSTRACT: During the pandemic, we leveraged resources from academia and industry to explore new and creative ways to conduct hybrid participatory workshops emphasizing product and service prototyping during the Human-Centered Design (HCD) process. In this paper, we define a “hybrid” workshop as one in which some participants are physically co-located while others join remotely. A descriptive case study is presented that examines how a three-hour hybrid participatory workshop might function as a format for teaching HCD by testing with 60 people. We created a series of educational toolkits: one interactive workbook and five tutorials on a website to show workshop participants how to prototype indoor footwear concepts out of paper and develop a service model for three different personas while also enabling them to have more transparent and interactive communication. The goal of the research is to identify and explore the design opportunities by conducting a hybrid participatory workshop.

Keywords: Co-creation, Participatory Workshop, Footwear, Design Process, Prototype

1. INTRODUCTION

The COVID 19 pandemic has greatly transformed the way we work and live, and how we teach, learn, and share ideas. We asked: How do we create an engaging design-focused workshop experience with both in-person and virtual participants to make them feel safe, engaged, welcome, and open to contributing their ideas? How do we develop toolkits or props to help us better facilitate hybrid workshops that create a positive and creative vibe? How do we make collective decisions about design solutions and ideas without “diluting” our opinion during/after the workshop? These reflective questions allow us to revisit the Human-Centered Design (HCD) process (IDEO, 2022) and how it is taught. There are many spaces where we can integrate digital touchpoints within the design-thinking process. In our case study, we conducted a hybrid participatory workshop and prepared an interactive workbook for the participants to download and print in advance for making paper prototypes of footwear design (Lee et al., 2020e). We also used a virtual Miro (Khusid, 2011) and Google slides for group collaboration paired with physical Post-it notes, which made the brainstorming more accessible for participants online and offline. Using the Miro, it was relatively easy to share content, ideas, and feedback and keep the design process organized. The hybrid approach is a scalable approach for brainstorming that we hadn’t experienced before the pandemic.

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We define a “hybrid” workshop as one in which some participants are physically co-located while others join remotely. In the case study, we designed and provided one interactive workbook and five tutorials on a website to empower workshop participants to build early indoor footwear concepts out of paper and their service model. The participants could experience inspiration, problem defining, ideation, and the prototyping phase on their own even remotely during the pandemic. Hence, we experimented with using the hybrid participatory workshop as a new research medium and design methodology to explore the following research question: How might we design an immersive hybrid participatory workshop experience that can inform and inspire participants across the globe to solve systemic social-technological design challenges, and create a series of assistive toolkits e.g., workbooks, tutorials (Lee et al., 2020d), devices, or services to facilitate the hybrid participatory workshop by empowering participants to have more transparent and interactive communication and extend connections through their group discussion?

Due to the limitation during the pandemic and the scope of the research, we started by using smart footwear as a product design example. Ideally, we need to consider footwear services innovation, systems-level solutions, user experiences and interface designs, and the application and impact of applying emerging technologies. Thus, it helps participants prepare to solve systemic social-technological design challenges.

2. RELATED WORKS

Our research topic covered the participatory design process (Lee et al., 2020b), co-creation workshop (Lee et al., 2020a), and HCD (IDEO, 2015), but there were limited materials, literature, and on-the-market product information to discuss the model of hybrid participatory workshops focusing on a remote product, service, and prototype before the pandemic (Spitz, 2021). One example we found was OpenIDEO. They help participants get support to make an invaluable impact on complicated societal issues, connect with suitable innovators across the globe, train and build participants’ skills by applying design thinking approaches and guide them to access the resources to make rapid prototypes (OpenIDEO, 2022).

OpenIDEO has created an online interactive collaboration platform to invite participants around the globe to brainstorm some of the most difficult, complicated, and systemic challenges either from companies or governments, but they don’t cover much about the remote physical prototype experience or how to create a hybrid platform with assistive toolkits and methodologies to empower participants to contribute their ideas in a democratic and tangible way. Therefore, we wanted to present our case study by integrating strengths from OpenIDEO and related works we found.

3. CASE STUDY—RAPID PROTOTYPING FOR SMART FOOTWEAR DESIGN

The hybrid participatory design workshop (Lee et al., 2020a; Lee et al., 2020d) partnered with -ing Creatives, a creative studio in Dubai (Alawssy, 2014), with a four-month brainstorming preparation for this workshop (Figure 1) to design and optimize its flow and content, and consider our target participants’ experience and learning objectives, and how to deliver our prototype materials (Lee et al.,

2021). The participants, from multiple backgrounds as we requested, were recruited through -ing Creatives’ event registration platform (Table 1).

Topic and date	<ul style="list-style-type: none"> • Topic: Rapid prototyping for smart footwear design • Date: November 7, 2020 (3-hour)
Number of participants	<ul style="list-style-type: none"> • Pre-workshop survey (35 people) • Workshop participants (21 people) • Post-workshop survey (4 people)
Benefit of participants	<ul style="list-style-type: none"> • Participants learn to build rapid paper prototypes designed for three different personas. • Participants learn to leverage storytelling to support the smart footwear products and service.
Virtual sections	We hosted the virtual lecture and facilitated the team discussion on virtual call (Zoom).
In-person activities	Participants printed the interactive workbook and made paper prototype by hand.
Facilitation tools	We created one interactive workbook with five tutorials, all available online.

Table 1. Description of hybrid participatory workshop

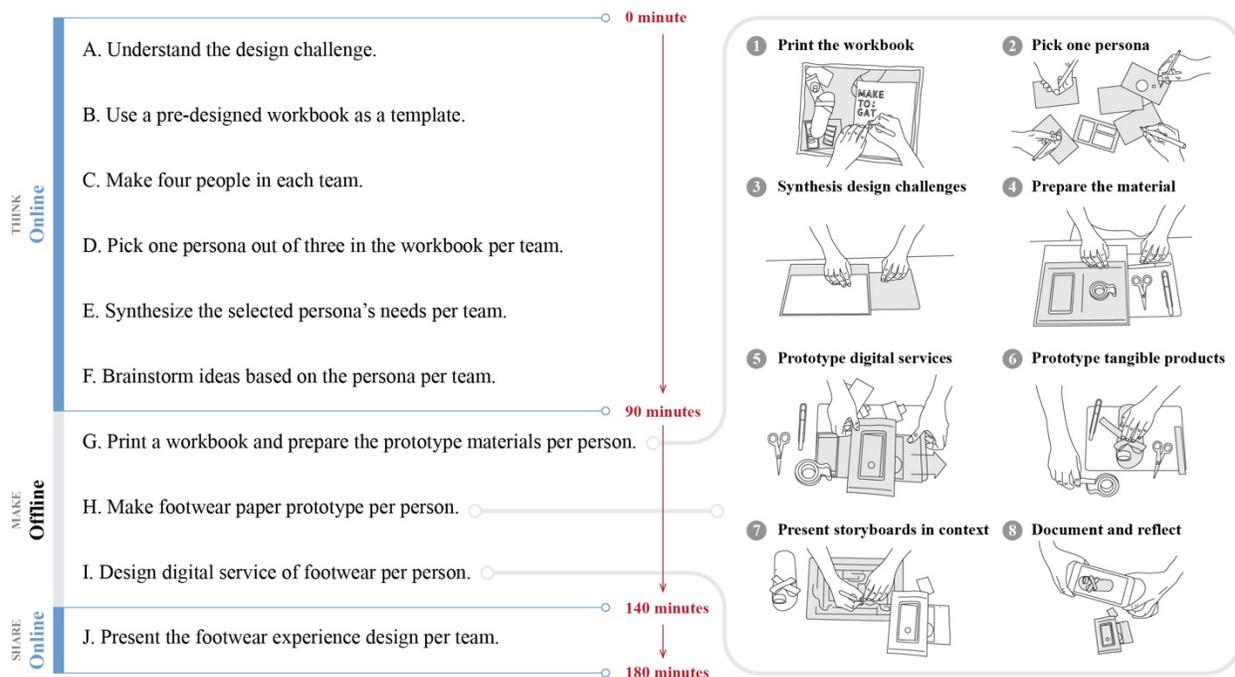


Figure 1. The flow of the hybrid participatory workshop

3.1 BUILD AN INTERACTIVE WORKBOOK AS A GUIDE FOR MAKING THE PAPER PROTOTYPE

Due to the pandemic, high shipment cost, and limited time, we could not ship prototype material (e.g., foam core board, scissors, glue, Post-its, and thick colored paper) to all participants around the globe. Therefore, we created an interactive workbook (Lee et al., 2020e) with clear instructions, visuals and a pre-designed paper prototype template, which the participants could download and print before the workshop (Figure 2). Our intention by using prescribed toolkits is to encourage participants to use these

accessible materials quickly prototyping their ideas by hand as practice in the workshop. In future studies, we want to inspire them to think about how to create their assistive toolkits out of accessible materials that are feasible, flexible, modular, and adaptive to solve other types of design challenges.



Figure 2. Design an interactive workbook, five tutorials, and paper prototypes for the hybrid participatory design workshop (co-designed by Sheng-Hung Lee and Ziyuan Zhu)

3.2 USE A PRE-WORKSHOP AND POST-WORKSHOP SURVEY AS A RESEARCH TOOL

To give a better immersive participatory workshop experience, we designed the pre-workshop and post-workshop survey to help us understand participants' learning objectives, backgrounds, expertise, and expected outcome of the workshop. From the pre-workshop survey (Table 2), we received 35 responses within a week and categorized the results into four groups by age range. Respondents were 51.4% male and 48.6% female. Participants were from the United States (22.8%), China (14.3%), United Arab Emirates (11.4%), Canada (5.7%), Germany (5.7%), and eleven other countries. A total of 37.1% were students, and 28.6% were trained as designers.

Age Range	21~30 years old	31~40 years old	41~50 years old	51~60 years old
Percentage (n=35)	57.1% (n=20)	31.4% (n=11)	8.6% (n=3)	2.9% (n=1)
Gender	Male (51.4%), Female (48.6%)			
Background	Students (37.1%), Designers (28.6%)			
Design Level	Scale 1 (28.6%), Scale 2 (11.4%), Scale 3 (25.7%), Scale 4 (17.1%), Scale 5 (17.1%) Scale 1 is for people with no design skill, whereas scale 5 is for people with professional design skills.			
Country	United States (22.8%), China (14.3%), United Arab Emirates (11.4%), Canada (5.7%), Germany (5.7%), and eleven other countries.			

Table 2. The demography of pre-workshop survey

3.3 KNOW PARTICIPANTS' MOTIVATION TO JOIN THE HYBRID PARTICIPATORY WORKSHOP

We were curious about what prompted them to participate in workshop and why it mattered to them. Some were intrigued specifically by the prototype phase to increase their proficiency in design and creation. "I've always been intrigued by the prototype process, from ideation to building something tangible. It's also an opportunity to be creative in a completely new way," said one participant. Others felt that prototyping was important in their work, and they would love to learn technical skills to integrate into their work.

The new hybrid ways (online lecture/offline making) to conduct a participatory workshop motivated some people to reflect on what had been transformed in the process of creative design thinking, echoing the pre-workshop survey result.

3.4 ANALYZE THE PRE-WORKSHOP SURVEY

After we understood the participants' motivation, we used the pre-workshop survey to not only know their expectations, but also briefly introduce the workshop topic, emphasizing wearable devices and footwear-related content. In the pre-workshop survey result, we covered 1) the automation level of smart wearable devices, 2) ideal smart footwear design, and 3) ideal IoT wearable device design.

We were amazed that some participants were eager to learn the participatory workshop skills to apply to their own domain: *"I am interested in bringing co-creating approaches to the design of large, complex socio-technical systems such as nuclear reactors, fission, and fusion."* and *"I am highly interested in footwear design, and hope to learn how to do the rapid prototype through this workshop and develop my own shoes afterward."*

Automation Level of Smart Wearable Devices: A wearable device with a level of "smartness" would be popular for the participants. As results showed, 34.3% of participants wanted the device to self-improve based on their behavior, but didn't want it to predict their next step; 28.6% were neutral, whereas 25.7% felt their devices should treat them as friends that understood them and could predict their next step. In further studies, we could explore people's concerns about technology use, cognitive constraints, physical limitations, or social norms that made older adults prefer the least automated option.

Ideal Smart Indoor Footwear Design: The top four options selected in Figure 3 were: detect health conditions (65.7%), make people relax (65.7%), help people do exercise (37.1%), and track in-home trajectory (28.6%).

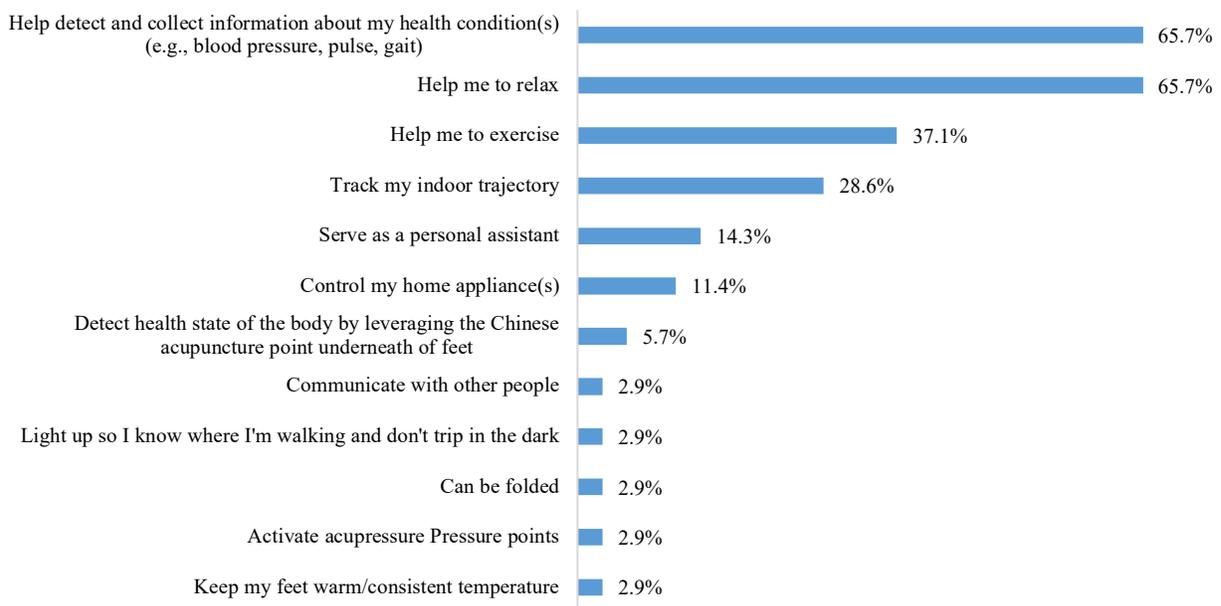


Figure 3. If you had a pair of smart indoor footwear, what functions would you want the footwear to have? (n=35)

Ideal IoT Wearable Device Design: Besides designing ideal smart indoor footwear for older adults, we extended the survey questions to discuss the functions of IoT wearable devices that users wanted (Figure 4): 85.7% wanted the IoT wearable devices to make their life convenient, 74.3% hoped the devices could optimize their time, and 71.4% wanted the devices to help improve their work efficiency.

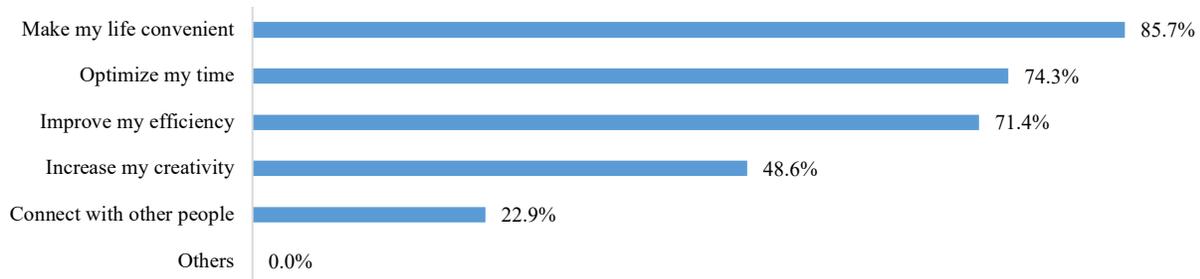


Figure 4. Which of the following functions would you want IoT wearable devices (not just a pair of smart footwear) to help you with? (n=35)

3.5 HOST THE HYBRID PARTICIPATORY WORKSHOP

Three key steps—THINK, MAKE, and SHARE—were the flow of the hybrid participatory workshop, shown in Table 3 and Figure 1. Our intention was to design a workbook to make the content clear with self-explanatory visuals and few steps that were easy to follow.

Step	Brief explanations	Instructions
THINK	The THINK section aims to help participants understand the design challenge according to their persona and assist them to quickly generate ideas and concepts and share them with their teammates. Before participants start brainstorming, they each read the persona cards carefully to know his/her frustrations and potential problems. Next, participants reframe the design challenge we provided combining their insights about their persona.	<ol style="list-style-type: none"> 1. Reframe the design challenge for the persona’s needs and pain points of participants. 2. Find inspiration for participants’ design by creating mood boards. 3. Generate ideas with the participants’ team.
MAKE	In the MAKE section, participants engage in making the rapid prototype. Having already printed the materials they need, participants follow the steps to start their “MAKE” journey with their hands and minds. We provide detailed instruction to help participants start the making process, and encourage them to use their imagination. To create the slipper part for the users/persona, they need to think about the behavior of the user.	<ol style="list-style-type: none"> 1. Make meaningful rapid IoT product prototypes with guidance. 2. Consider the data and technology parts and implement them into your IoT product design. 3. Connect participants’ IoT product design with space.
SHARE	In the SHARE section, we help participants create a beautiful, meaningful story for their design with the team. We encourage them to create scenarios in four scenes, and add more scenes to fit their design concepts. SHARE is a teamwork session. Participants share their ideas with team members before discussing the team’s stories. After finishing their storyboard, they take photos of their design and create a storytelling panel to share with us.	<ol style="list-style-type: none"> 1. Make a storyboard (suggested with five frames) with team based on participants’ product and interface design. 2. Refer to participants’ design challenge and persona to evaluate their storyline. 3. Take photos and document participants’ final design deliverables.

Table 3. The workbook covers instruction on the three key steps: THINK, MAKE, and SHARE of the hybrid participatory workshop (co-designed by Sheng-Hung Lee and Ziyuan Zhu)

3.6 ANALYZE THE POST-WORKSHOP SURVEY

After the three-hour workshop, we invited 21 participants to write feedback about their experience. However, only four filled out the post-workshop survey, possibly due to tiredness from participating online for three hours. Although the number was small, we valued each response and reached out to each participant for a debrief session. One participant shared: *“The three-hour workshop was well-organized in terms of time and content. Step by step, I learned the whole procedure of prototyping through the workbook. It was very interesting to make a pair of slippers by hand. By connecting each paper part of the slipper together, I translated my thoughts into a real product by making. It’s a very amazing experience to me.”*

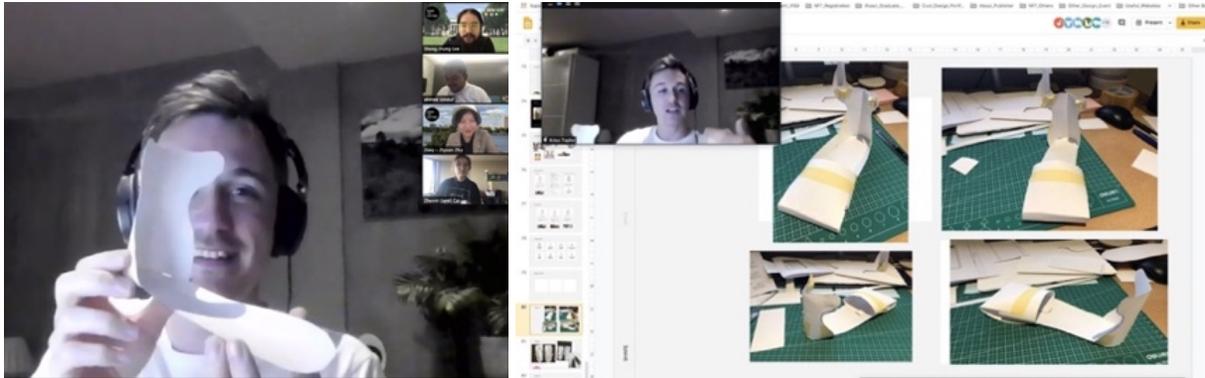


Figure 5. The workshop participants presented their future footwear ideas and paper prototypes emphasizing product innovation.

The debrief elicited great discussions and valid suggestions to help us design better hybrid participatory workshops. One participant said that her team Zoom breakout room had no prompts to start a conversation or tools to facilitate making decisions collectively. She shared that the workshop works best when participants get uncomfortable at the start and go out on a limb to answer or give their thoughts. This allows others to feel comfortable, moving the collective into better design thinking.

Overall Hybrid Participatory Workshop Experience: The participants were satisfied with the workshop in general. All thought the content was easy even though they didn’t have any design background. We asked them to write three keywords to describe their experience, and we received: inspiring, broadening, creative, intrigued heart to engage, accomplished, time well-spent, new, interesting.

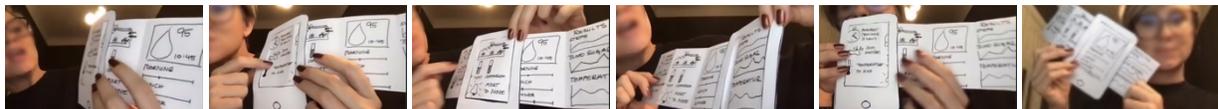


Figure 6. The workshop participants present their future footwear ideas and paper prototypes emphasizing interface redesign.

Interactive Prototyping Components: We wondered how participants might feel if we changed prototype material from paper to electronic components, to make the prototyping process more engaging. We were also curious to explore whether using electronic components (e.g., Arduino) would be more interactive and conversational than a paper prototype for the hybrid participatory design workshop. Figure 7 shows that most (50%) participants were excited about the advanced version (e.g., adding

electronic components), but 25% participants without design or engineering background worried that it could be more difficult if the workshop still stayed virtual.

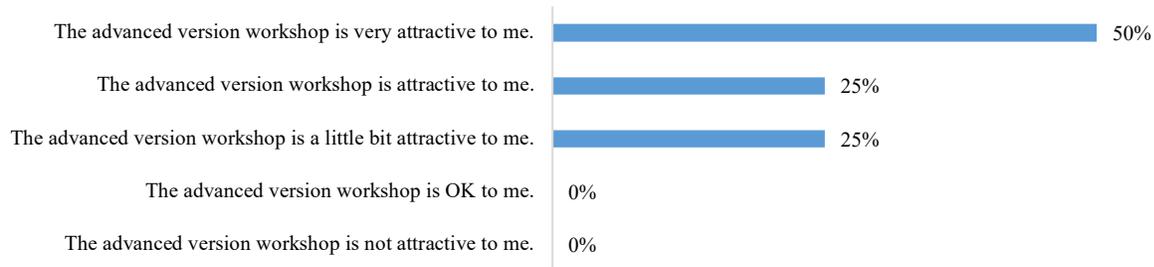


Figure 7. If there is an advanced version of the workshop (with electronic components), how would you like to attend? (n=4)

Ideal Time Hybrid Participatory Workshop: 50% of participants thought a two-hours workshop was best length for their attention span, 25% thought three hours worked better, and 25% preferred less than two hours. No one wanted more than three hours.

Integrated Engaging Section for Hybrid Participatory Workshop: We examined the survey results in Figure 8 to decide what to include in future hybrid participatory workshops. Based on the results, we want to explore other design thinking processes, e.g., ideation (100%), prototype methods (75%), and product design (75%), for more holistic perspectives to design future footwear with our participants collectively.

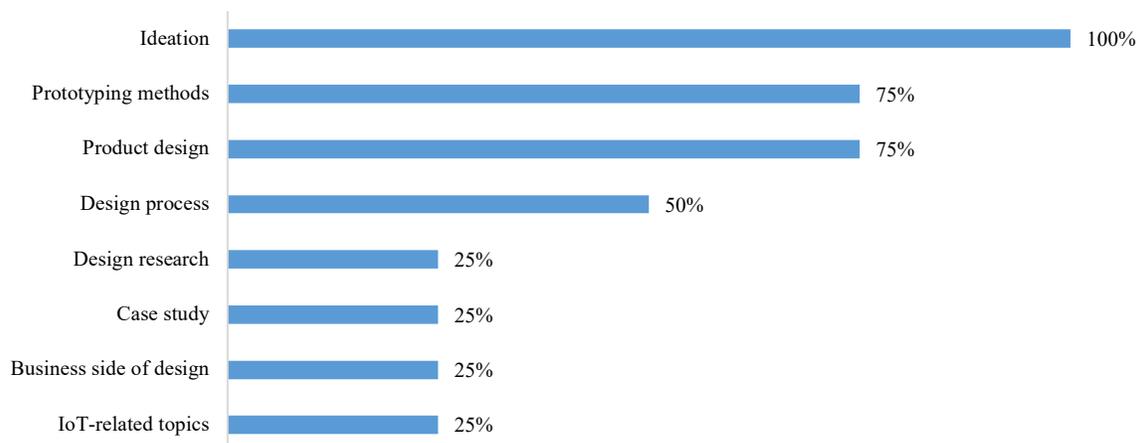


Figure 8. Things you want to learn more from the workshop (n=4).



Figure 9. Group photo of the participants and their paper footwear design after a three-hour hybrid co-creation workshop

4. CONCLUSION AND DISCUSSION

1) Consider the hybrid participatory workshop design from toolkit to user experience: The workshop was a hybrid design collaboration between Massachusetts Institute of Technology (MIT) and -ing Creatives, a design studio in Dubai. In this paper, we define a “hybrid” workshop as the one in which some participants are physically co-located while others join remotely. It made us think about the transitional moment between the digital lecture/meeting and physical hands-on experience. Our co-creation toolkits include a workbook (with online co-creation slides), five tutorial videos, and a website designed to integrate seamlessly the online and offline design experience. We redefined it from inventing assistant collaboration toolkits to refining the frameworks and creative methodologies.

2) Design a set of interactive toolkits: The workbook design was the highlight of the project, a medium to bridge the online design and offline hands-on making to achieve an immersive, responsive, and engaging team collaboration. The co-creation toolkit contains presentation slides, workbooks, prototyping materials, well-trained hosts, facilitators, tutorial videos, and online communication software.

3) Use a circular process for the hybrid participatory workshop: The hybrid participatory workshop was a circular design journey—THINK, MAKE, SHARE—consisting of four touchpoints: 1) learning asset, 2) medium converter, 3) interactive section, and 4) community platform. The goal was to enhance cross-disciplinary collaboration, diversify the format and interaction of hybrid learning, facilitate meaningful and efficient communication, extend the learning experience from online to offline, encapsulate the hybrid learning service into an education toolkit (e.g., workbook, tutorial videos, website), and ultimately help spread impactful social ideas globally. For further steps, we will consider the circular process in depth and make the virtual team co-creation experience more comprehensive and compact.

4) Manage converging and diverging design processes collectively without losing perspectives.

The goal of a hybrid participatory design workshop is to gather more comprehensive suggestions and involve participants in the design process to make it inclusive, transparent, and diverse. This is a very

different research approach compared to conducting traditional user interviews or surveys. A participatory workshop builds a mutual communication channel considering team dynamics, discussion flow, co-working, and co-creation sections. Another intention is managing the converging and diverging design process while collecting insights from the groups without losing or diluting original ideas and creative perspectives.

5) Form inclusive, diverse sources as design input by conducting a participatory workshop.

A benefit of hybrid participatory design workshops is making the design process more transparent, inclusive, and diverse without geographical or economic limitations. Although our topic was designing future smart footwear, the brainstorming was a critical input before investing in the indoor footwear product design. Inclusive and diverse responses allow more holistic views on the target group/users, from their lifestyle, hobbies, homes, health condition, and relationships with family members.

5. REFERENCES

- Alawssy, R. (2014, May). *Ing Creatives*. Ing Creatives. <https://www.ingcreatives.com/>
- IDEO (Ed.). (2015). *The Field Guide to Human-Centered Design* (1st. ed). Design Kit.
- IDEO. (2022). *IDEO Design Thinking*. <https://designthinking.ideo.com/>
- Khusid, A. (2011). *Miro*. <https://miro.com/>
- Lee, S.-H., & Zhu, Z. (2020a). Reshaping the Online Learning Experience: MIT Co-creation Workshop. <DESIGN>, 14. https://kns.cnki.net/kcms/detail/detail.aspx?dbcode=CJFD&dbname=CJFDLAST2021&filename=SJTY202114022&uniplatform=NZKPT&v=W3Tyvp9suGk_4GLzuAaguQyNFHMYO5tOUXNwbDxCvyDSo1g9Sx_D9CEws1ldi8K-
- Lee, S.-H., & Zhu, Z. (2020b). Preliminary Discussion on Design Process of Online Workshop “MAKE TO: GATHER.” <DESIGN>, 22. https://kns.cnki.net/kcms/detail/detail.aspx?dbcode=CJFD&dbname=CJFDLAST2021&filename=SJTY202114022&uniplatform=NZKPT&v=W3Tyvp9suGk_4GLzuAaguQyNFHMYO5tOUXNwbDxCvyDSo1g9Sx_D9CEws1ldi8K-
- Lee, S.-H., & Zhu, Z. (2020c, November 7). *MAKE TO: GATHER*. <https://www.maketogather.com/>
- Lee, S.-H., & Zhu, Z. (Directors). (2020d, November 7). *MAKE TO: GATHER—Rapid prototyping for footwear design (prototype tutorial videos)*. <https://youtu.be/lhoDpDRKch8>
- Lee, S.-H., & Zhu, Z. (2020e). *MAKE TO: GATHER—Rapid prototyping for footwear design (workbook)*. https://www.maketogather.com/_files/ugd/2a12f3_8732823f897f434089ec8adf007ef695.pdf
- Lee, S.-H., & Zhu, Z. (2020f, November 7). *Rapid Prototyping for Product Design*. <https://www.ingcreatives.com/online-workshops/rapid-prototype-iot-product-design-user-experience>
- Lee, S.-H., Zhu, Z., Mora, S., & Coughlin, J. F. (2021). *Manufacturing Creative Impact: Co-creation Toolkits and Service Design for Remote Hybrid Collaboration Experience*. 5.
- OpenIDEO. (2022). *OpenIDEO*. <https://www.openideo.com/>
- Spitz, R. (2021). *Designing Design Education: White Book on the Future of Design Education* (C. Böninger, S. Schmidhuber, & F. Frenkler, Eds.). avedition.