

PROMOTING DESIGNER ORIENTED THINKING THROUGH THE EXPERIENCE OF MAKING

Saiful Hasley Ramli^{*1}, Christ Rust², Paul Chamberlain²,
Raja Ahmad Azmeer Raja Ahmad Effendi¹ and Mohd Shahrizal Dolah¹

¹Department of Industrial Design, Faculty of Design and Architecture, UPM

²Sheffield Hallam University, City Campus, Howard Street, Sheffield, UK

*Corresponding author:
shr@upm.edu.my

ABSTRACT

This paper was a part of a research, investigating design methods to enhance creative collaborations between designers and expert users. This part essentially was explored through designing workshops participated by designers and a laboratory chemist. A practice led approach was adopted in which the writer acted both as a researcher and a designer, where observation and reflection served as the method of this work. Through the research, data were collected in the form of video recordings of an interview and a co-design session with the use of mock-ups. The design methods that were explored through this research have enabled expert users to employ designer oriented strategies in design collaborations. The analysis of these workshops has demonstrated that these collaboration strategies can enable the expert users to mobilize their professional experiences and knowledge in design collaborations. The outcome of this research supports the development of further research techniques as well as the refinement of the design method.

Keywords: Design workshop, mock-ups, designer oriented strategies

1. INTRODUCTION

Vaajakallio & Mattelmäki's (2007) use of Steppers's 'Make Tool', showed that users can also be given the opportunity to become involved creatively in design processes. However, the 'Make Tool' approach imposes constraints based on the designer's preconceptions of what might be produced. So, this research has explored broader approaches which will offer the users a greater freedom in forming collaborations with the designer. Sanders and Stappers (2008), who studied co-design approaches, suggested that everybody possessed a "latent creativity". However, they also suggested that in order to be successful participants in co designing, non-designers will need to have a certain level of "expertise, passion and effort" (ibid).

"All people are creative but not all people become designers" (ibid p12)

2. BACKGROUND

Nigel Cross (2007) who also refers to Bryan Lawson (1990) offers a very useful discussion on this particular issue and Henry Gedenryd (1998) discussed how this design thinking happens. Cross (2007) discusses his and others' studies on what successful designers (e.g. Philippe Starck) do and this includes the co-evolution of problem and solution. This is a significant strategy used by the designers in regards of the design problems (which are also sometimes called wicked problems).

Designers formulate problems within the broad context of a design brief (Cross 2007 pp 103). They are not limited to the given problems and restructuring new problems from the given problem is the designer's way of attempting

to solve them. The co-evolution of problem and solution described by Cross (2007, pp 102) is a situation whereby problems and solutions are developed in a parallel manner.

In a very influential thesis, Gedenryd (1998) discussed about interactive cognition and uses designing as the example to develop his theory. His observation concludes that designers sketch out their ideas to both test and evolve solutions and propose another problem framing. In an interactive cognition, action and evaluation are inseparable. He added the fact that sketching out or producing artefacts is a designer's situating strategy. A designer's concern is the regards of something that does not yet exist. For that, they cannot use the existing cognition as they have to use the design artefacts e.g. sketches, model, and prototype, to create the future situation as a situating strategy.

2.1 Developing the mock-up 'kit'

A box of unwanted everyday materials and scraps were gathered and were set up as a 'kit' for a mock-up session with the participants (Fig.1). This was based on the Vaajakallio & Mattelmäki (2007) mock-up kit in conjunction with the Dennis Boyle's 'magic box' (Kelley T. & Littman J. 2001).



Figure 1. Materials gathered to set up a mock-up 'kit'

2.2 Co-design session with a laboratory chemist

This study was carried out to undertake a co-design session with participant(s) who work using tools and encounter(s) problem with the tools that they use. In this case, a laboratory chemist was invited to be a participant in this study. He was chosen because he has a vast experience of working in a laboratory and this could allow him to identify the difficulties when it comes to the design of the instruments. He was also pursuing his PhD at that time which enables him to understand the nature of a research. As an expert in his area, he possesses profound knowledge and could explain the development of the domain. Video recordings were taken as the data for a proceeding observation using Nvivo as the transcribing tool. Nevertheless, on-the spot observation as a participant observer was done during the co-design session.

3. METHOD OF STUDY

The study consists of two methods that focus on different objectives. First, the techniques adopted from the action research (Swann 2002) as the research's approach. This method was used to study the significant actions in the early stage of a designing process that can add a new perspective in co-design and co-creation. Another method was taken on from the co-design (Sanders and Steppers 2008) as the design technique with the objective to address the designing problem expressed by the participants. So, during the designing activity, the researcher solely became the designer and he facilitate the users with the design environment e.g. mock-up kit. Then, he observed the video recording of the co-design session and put back his research hat. Two different methods with different objectives nevertheless supported each other as Swann (2002) suggested that action research is suitable with the design circumstances.

Sessions were taken in a suitable setting and questions were developed from the earlier study were applied in this exercise which included:

- Background and experience
- Current practice + instruments used
- Needs to improve equipment

The session lasted for 2 hours. The mock-up kit was supplied to the participants from the beginning and towards the end of the interview. Papers and pencils were also provided for the participants. Two digital camcorders were set, one at an overall angle to capture the whole process, and another was focused on the discussion area, where sketches and mock-up activities could be viewed in detail (Fig. 2).



Figure 2. The view from the two cameras

3.1 User's need

The participant was undergoing the research at the time which involved experiments in a laboratory. One particular instrument that he needed to use was located in another laboratory. This particular instrument is a tool used to make a transparent chemical mixture visible to the eye for result purposes. It has two fluorescent lights, which have different units of illumination (lux) to show different levels of mixture. Due to the experiment being an iterative process, the participant needed this instrument to be near him to avoid traveling from room to room during the experimental processes. He suggested that the instrument needed to be mobile for this purpose.

3.2 Observation on video recording technique

Video recordings were taken in this study as the main source of the research data. Two videos were observed (Fig. 2), but only one was chosen to be transcribed using the computer-aided research software (Nvivo) (Fig. 3). The video was chosen simply because it had a clearer audio for the transcription purposes. From this video, it showed that the camcorder's distance and angle are acceptable if the device was set near to the participants or their working area.

The chemist did not show any discomfort or change in behaviour because of this close proximity. Maybe this was because the camcorder was small

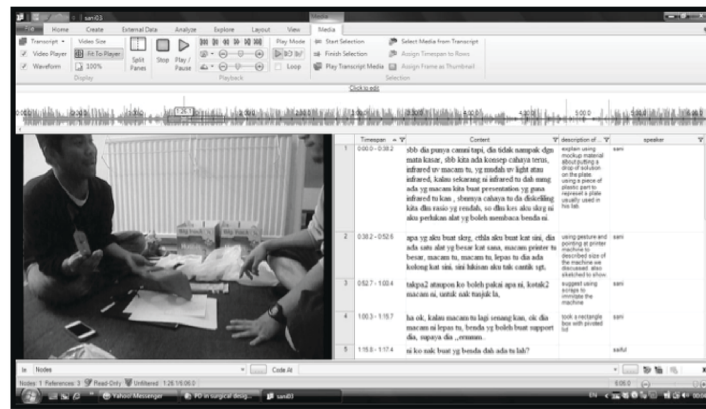


Figure 3. Video transcribed using the Nvivo software






and barely noticeable by the participant. As an addition, the portable size of the camera has allowed the researcher to move the camera around easily, for example, to bring it closer to catch clearer images of the mock-up. This approach follows Wood's (2012) suggestion of how to use a camcorder to record participants' actions.

3.3 Analysing the video recording

The research focuses on actions in the designing process that shows the interaction between participants and the tools they use, in this case, the mock-up. To do this, Nvivo was used to transcribe the video. Participant's actions were described in the additional section made in the Nvivo. This is important because the participant's actions in using the mock-up kit can be observed while he explains the current practice, needs and ideas

Significant actions from the video were selected during the re-observation period of the session (with the use of Nvivo). Below are the chosen actions:

Table 1. Significant participant's actions

DESCRIPTIONS	IMAGES
Participant explained about his current practice and instruments involved using sketches. He drew some diagrams to explain the chemical reaction he experimented.	(1) 
Then, he used the 'kit' to explain the main instruments he used during the experiment. The machine will make the transparent chemical visible to see with some colour to differentiate the different level of mixture. He made this mock-up using a hinged red box which he opened to replicate the machine's physical form. He also used the hole on the box's lid to imitate the 'viewfinder' equipped on the real machine. Then he took a plastic strip and role played how he put the test strip with the machine.	(2) 
Participant used general terms and analogies rather than jargon used in his domain to explain his work.	No clip applicable
Participant used mock-up to express his proposition in a form of idea. Participant showed and pointed at mock-up kit used and says 'like this' or 'like that'. He was not explaining in detail with words to show what he meant.	(3) 
He continuously used the mock-up kit to design the instrument.	(4) 
The designer proposed the use of other suitable material to do the mock-up. He also proposed the use of material and some solution to encourage usability so it can be manufactured.	(5) 
Participants suggested the usage of technology on new designs.	No clip applicable

4. RESULT

The mock-up was used by the user to substitute the real instruments he used in order to demonstrate the current practice (Table 1, row 2). This was shown by the participant by simply picking a material from the kit that he thinks is suitable to simulate his current practice. For instance, the participant took a red plastic box and detached its cover to represent the current equipment that he used in the lab.

He also used mock-ups to express needs and ideas through the process (Table 1, row 3 and 4). He stated that he needs the instruments to be mobile while the current instrument is only available in a particular room. This was shown by selecting some materials and putting them together without fixing them with any tape. Materials that he chose indicated the form he wanted to have for the new design, such as the pink disk as a casing for the light. He also selected some materials to show the function of parts of the new design, such as a mini disk; this was selected because it had a reflective surface which he used as a reflector for the light. Here, then, the participant suggested the basic technology to be used in the new design. Figure 4 illustrates the materials used and the meanings the participant gave to them:

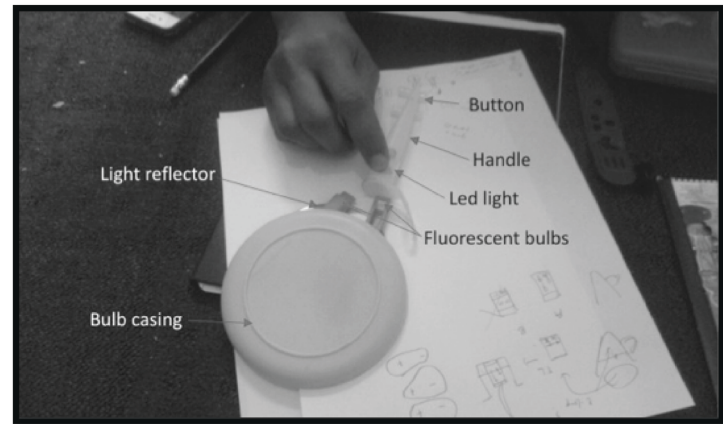


Figure 4. The Mock-up built by participant.

4.1 The designer oriented strategy adopted

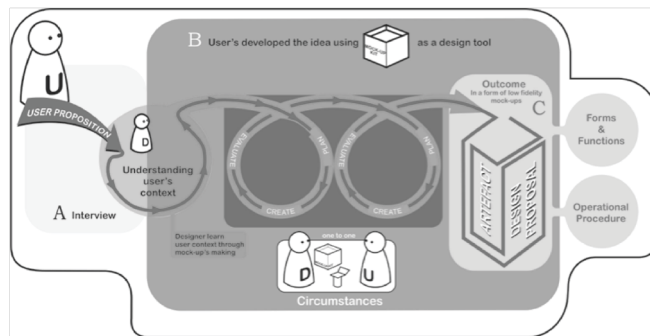
Cross (2007) describes how designers understand problems through the exploration of problem solutions. Gendenryd (1998) then suggested that this happens because it is the way designers use and test their knowing (problem setting + proposal of possible solution). Sketching out the possible solutions is a way for a designer to see and reflect on his idea (Cross 2007) and as a way to use and test the problem setting. The artefact from making is not always the product of designing but the means of designing (Gedenryd 1998 pp 85). This was shown during the co-design session where the participant used the mock-up kit to construct a representation of his idea, as a means of solving the design problem that he encountered.

4.2 Designer's/ researcher's role in the study

As a participant's observer, the author took two roles in this study. On one hand, he was a designer who is taking a role in the simulation of co-designing. On the other hand, he was a researcher who was studying the use of mock-ups in the co-design process and other methods included in this pilot study, including the use of video recording to gather the research data.

Some of the mock-up materials used by the participant at the start were not suitable for the form of the purposed design and its relation to its function, as envisaged by the participant. So, in this study, the designer used his designing skills and knowledge in manufacturing to suggest and change the materials used earlier by the participant and then fixing them together using temporary sticky tape and blue tack. The designer also suggested some materials to be used for the new design anticipating manufacturing possibilities.

Based on the above observation, the research may be illustrated as below,



5. CONCLUSION

A contextual interview equipped with a mock-up kit showed that this technique offered an opportunity to participants to use mock-up as a communication tool to share their experience of using equipment at respective workplace. This act of sharing was also expressed through sketches made during the process. Some of the uses of the sketches were to explain concepts and the working flow.

The mock-up kit was also used to express the participant's needs and ideas. The materials gathered were used by the participant to design new instruments by putting them together to give meaning to the mock-up. The participant looked for functional equivalents, for example a part which opens in a similar way to a real object that he uses. A mini disk was used as a light reflector because of its reflective side. Then, the pink disk was used as the casing because of its round shape, which could fit the mini disk. He was not only motivated by his needs, but was also able to come up with an idea for a new design.

This developing design approach can be considered as a beta version as it later reviewed and refined through several design sessions with other experts. In this study, it suggested that a suitable mock-up kit can be used as a tool for co-creation between designers and expert users in one to one situation. There is a distinction between this approach and other similar approaches and this will be illustrated as below. This method was designated as 'Mock-up play Beta' to differ it from other comparable methods.

5.1 The method's circumstances

The practical designing sessions were about exploring the chemist's idea and the collaborators were focused on transforming the idea into reality. But, can this design method be employed in different circumstances, e.g. exploring other solutions/ideas or having other expertise in the collaboration?

This question may only be answered in the further study of this research. As for now, 'Mock-up play Beta' shows that it can be used in certain situations as below,

- The project starts with user's ideas and explores them in the session.
- Issues or ideas explored are limited to the function and features that can be explored by mock-ups.
- Experienced and skilled designers provide making skills and the ability to explore and know the consequences.
- Availability of a mock-up kit with flexible low fidelity materials e.g. corrugated cardboard.

Table 2. Projects using mock-up as a design tool with non-design background participants

Design Approach	Descriptions	Participation size	Techniques	Objective
Mock-up play beta By Saiful (2015)	Co-creation using mock-up kit between an expert user and a designer	One to one	A construction of eclectic everyday things to suggest a new product starting from scratch	To understand and visualize users' proposition through a 3 dimensional artefact for chemistry lab instrumentation
Mock-up by Ehn and Kyng (1992)	A method described by Ehn and Kyng (1991) where they use low fidelity materials to do mock-ups.	10-20 people	Using corrugated boxes and paper to suggest new design through language game	A way to enact current users ways of work and also possible future ways of work to inform new design in HCI or work using computer system
Make Tool by Vaajakallio & Mattelmäki (2007)	co-design project with elderly workers in maintenance, catering and security service firms in Finland. They used Sanders's 'Make tool' (1999) and came up their own mock-up kit	5-10 people	mock-up kit consisting of a set of shaped materials that suggest hand held devices and also other materials that suggest components to form physical interfaces	These mock-ups used along with language game in a way to enact current users ways of work and also possible future ways of work to inform new design in security and catering service.
Magic Box by Dennis Boyle in Kelly and Littman (2001)	a collection of mechanical parts, odd materials and other unusual artefacts.	vary	has used kits of such artefacts as a brainstorming kick starter	To get new ideas from a brainstorming session
Mock-up used by Long & Hughes (2007)	made a review of mock-up usage in designing operator cabs and interfaces involving train crews	2-3 people	the mock-ups used a variety of materials, for example card for 3D and drawing for computer interfaces. Users will review and comment through	To get user's feedback on ideas and proposed design in situ.

REFERENCES

- Blomberg J. , Giacomo J. Mosher A. & Wall P.S. Ethnographic method and their relation to design in Schuler and Namioka (1993). *Participatory design: Principle and practice*. Erlbaum, pp 123-156.
- Bødker S. & Grønbæk K. (1991). Design in action: from prototyping by demonstration to cooperative prototyping in *Greenbaum J. & Kyng M. Design at Work: Cooperative design of computer systems*. New Jersey: Lawrence Erlbaum Associates, pp 197-218
- Burns C. M. & Vicente K. J. (2000). A participant –observer study of ergonomics in engineering design: how constraints drive design process. *Applied Ergonomics* 31, pp73-82.
- Cross N. (2007). *Designerly way of knowing*. Basel: Birkhäuser.
- Cross N. (2011). *Design thinking: Understanding how designer think and work*. Oxford and New York:BERG.
- Ehn P. & Kyng M. (1991). Cardboard computers: Mocking-it-up or Hands-on the future in Greenbaum J. & Kyng M. (1991) in *Design at Work: Cooperative design of computer system*. pp 169-196. New Jersey: Lawrence Erlbaum Associates.
- Gedenryd H. (1998). *How designers work: making sense of authentic cognitive activities*. Doctoral dissertation. Lund University.
- Heath C. & Hindmarsh J. (undated). Analyzing interaction; video, ethnography and situated conduct. *Qualitative Research in Practice*, Pp. 99-121.
- Holzblatt K. & Jones S. (1992). Contextual Inquiry : A participatory technique for system design in Schuler D. & Namioka A. (1993) *Participatory design : principles and practice*, pp 177-179, Lawrence Erlbaum Associates.
- Kelley T. & Littman J. (2001). *The Art of Innovation: Lesson in creativity from IDEO, America's leading design firm*. London: Harper Collins Bussiness.
- Kyng M. (1991). Designing for cooperation: cooperating in design. *Communication of the ACM*, Volume 34, No 12, pp 65-73.
- Lee Y. (2006). *Design participation tactics: redefining user participation in design*. Proceeding of Design Research Society Conference. pp 0174/1-0174/15.
- Pedgley O. (2007a). Capturing and analyzing own design activity. *Design Studies* 28, pp467-483.
- Rasoulifar R., Thomann G. & Villeneuve F. (2008). *Integrating an expert user in design process: How to make out surgeon needs during new surgical instrument design case study*. Proceeding of TMCE 2008 Symposium, Turkey.
- Rittle H. & Webber M. (1993). Dilemmas in General Theory of Planning. *Policy Science* . pp 155-167
- Sanders, E. B.-N., Dandavate, U. (1999). *Design for experiencing: New tools*. In First International Conference on Design and Emotion. Delft

- University of Technology, Delft, The Netherlands .
- Sanders E.B.-N.(2000). Generative tools for CoDesigning in Scrivener, Ball & Woodcock (2000), *Collaborative Design*. London: Springer-Verlag London Ltd.
- Sanders E.B.-N.and Stappers P. J. (2008). Co-creation and the new landscapes of design. CoDesign: *International Journal of CoCreation in Design and the Arts*, Volume 4, Issue 1, pp 5-18.
- Schuler D. & Namioka A. (1992). *Participatory Design: Principles and Practice*. Erlbaum Associates Steen M.,
- Swann C. (2002). Action research and the practice of design. *Design Issue* 18 (1), pp 49-61
- Vaajakallio K. & Mattelmäki T. (2007). *Collaborative Design Exploration: Envisioning Future Practices with Make Tools*. Proceeding of Conference; Designing Pleasurable Products and Interfaces, Helsinki.
- Wood N.(2012). Silent witness, using video to record and transmit tacit knowledge in creative practices. In: ALMEVIK, Gunnar, (ed.) *Hant ver karee mellan. Between crafts person*. Mariestad, University of Gothenburg, Craft Laboratory. (InPress)
- Wood N. (2010). A good record? The use of video in practice-led design research. *Reflections*, 13, 114-125.