THE BENEFITS OF PROTOTYPING EARLY IN DESIGN WORKSHOPS

Report and insights from an international collaborative workshop between Chiba University and Köln International School of Design, supported by Fujitsu

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Abstract: This paper chronicles and reflects upon the experiences gathered from a design workshop conducted at Chiba University, with students from Chiba University, Köln International School of Design and with the support of Fujitsu. During the workshop, participants were invited to continuously build and prototype their ideas, rather than following the conventional design process of idea generation, visualization and, only at a later stage, prototyping. Such a hands-on approach proved beneficial in the communication among participants as well as in simplifying the design process. In fact, by working on quick and approximate prototypes, participants could more easily express their ideas overcoming language barriers and visual representation skills. Furthermore, physical prototypes helped participants to identify the key aspects of their proposals and focus on those. Finally, those prototypes also served as useful props to enact the experience of using the proposed artefacts and services.

Keywords: Prototyping, Workshop, Design Education, Olympics, Making

1. Introduction

During the last decade, design schools across the world have increased significantly in terms of the numbers of courses, the degrees and curricula they offer. It is now commonplace for a design school to train their students in product, interaction, transportation, service, fashion, medical, contextual, conceptual, management, graphic, communication design, among myriads of other denominations. More recently, it has been observed that more effective results are achieved when heterogeneous teams are formed and professionals with different backgrounds and skills work together [1]. Terms like inter-disciplinary, multi-disciplinary, trans-disciplinary, alter-disciplinary [2] and even un-disciplinary are now very commonly used in reference to the education and practice of design [3]. Besides professional diversity, also cultural diversity in design schools has increased [4]. Students’ mobility across schools from different countries has contributed to build multi-cultural environments where different languages, cultures and lifestyles are brought together. This simply reflects the way our societies, and consequently our professional environments, are evolving. For example, it is common for design consultancies to bring together professionals from several different nationalities. Cultural diversity is welcomed in design. Professionals coming from diverse cultural backgrounds can bring a wealth of perspectives and experiences that enriches the design process, leading to results that encompass greater ethnographic complexity [5]. However, such a diversity of expertise, skills, technical and spoken languages raises real issues in terms of communication and collaborative processes. Part of our job as design educators is to explore
and train students to engage in ways to work, communicate ideas as well as generate and develop concepts in collaboration with colleagues from other professional and cultural backgrounds.

This paper reports on a workshop developed by Chiba University and Köln International School of Design (KISD) in collaboration with electronic technology company Fujitsu. Rather than focusing on the design outcome of the workshop, this paper reflects on the methods adopted which put an emphasis on the act of making since an early stage of the design process, adopting Quick-and-Dirty prototypes [6] as a technique to generate and develop concepts in a collaborative manner, as well as a tool for participants to communicate with each other.

2. Design Through Prototyping

In the context of industrial and product design, prototyping is a phase that conventionally takes place at a later stage of the design process. Normally, the creative process begins with brainstorming techniques in order to map the territory outlined by the brief. Directions are evaluated and explored. Once ideas of possible designs are clearer, visualizations through sketches are produced. Only at a later stage, time and resources are invested for models and prototypes [7, 8].

Traditionally, modelling and prototyping solutions represented a significant investment in terms of time, materials and skills. The recent emerging technologies for three-dimensional printing and rapid prototyping have reduced such investments [9]. This is helpful in better and more quickly understanding different design options, their physical features and so on. However, because models need to be created virtually on a computer before being materialized physically, and because any change needs to be made on the computer file rather than the object, the positive impact of these technologies in a collaborative team’s workflow is limited. Furthermore, the 3D printing technologies take away one key aspect of the act of prototyping, which is the act of making things manually.

The act of making, and especially the act of making together with others, has an impact on communication and the cognitive processes, and that is why it was an important part of this workshop.

2.1. Quick-and-Dirty Prototypes

In most design schools students tend to follow a rather conventional process that starts with verbal communication (i.e. brainstorming sessions), followed with visualizations (i.e. sketches and/or computer renders), and only towards the end – resources permitting – it leads to materializing the selected idea in a prototype. One objective of this workshop was to question such process and explore an alternative one. We were particularly interested in the act of making as a way to think, communicate and, ultimately, design [10]. The technique of prototyping ideas in a swift and approximate way is known in design and it is referred to as “Quick-and-Dirty Prototypes”.

Quick-and-Dirty prototypes are, as the name suggests, rough models built quickly in order to communicate an idea to other team members at a very early stage of the design process [11]. The benefits of using Quick-and-Dirty prototypes consist in the ease of modifying and refining the model. In fact, because the designers did not invest much time and efforts in building these sketchy prototypes, they are more likely willing to make changes or discard decisions. Furthermore, the resulting prototypes are approximate and very unrefined; this is seen as a positive aspect since it allows a degree of ambiguity that fosters the design process instead of blocking it. The roughness of the prototypes also prevents focusing on the details, which at this stage would be unnecessary and time consuming.

2.2. Making as Communication

The main reason for adopting Quick-and-Dirty prototypes as a method during this workshop is related to the difficulties of bringing together students speaking different languages, coming from different cultural backgrounds, with different expertise and skills. We – the organizers and facilitators of the workshop – learned from previous experiences that, when working in mixed groups, verbal communication among students can be tiresome and limits the creative process. In order to get around this concern, for this workshop we chose to adopt a different approach, giving greater importance to the act of making, as making can serve as a communication tool to better share thoughts and ideas [12]. We thought that by providing basic materials to build prototypes (i.e. cardboard, tape, PVC pipes) participants would have started manipulating objects together and so share ideas and thoughts.

3. Workshop Report

The workshop presented in this paper is part of CODE (COntinents Design Education program); a collaborative programme bringing together design schools from the US (i.e. Parsons New York), Europe (i.e. KISD, Politecnico di Milano, ENSCI, among others), Chiba University and Japan based companies (i.e. Fujitsu, Sony, Toshiba, among others).
3.1. Framework and Theme

While supporting the workshop, the involvement of Fujitsu in this workshop was also useful in formulating the underlying theme of the workshop. In fact, Fujitsu is one of the main sponsors for the Olympic and Paralympic games to be held in Tokyo in 2020. Therefore, Chiba University and KISD thought of a theme that could be related to such an event as it would have fit Fujitsu’s agenda and it would have been interesting for local and foreign students.

Under the title of “Olympics Forever”, the proposed workshop aimed to explore new ways of storing, broadcasting and building upon the experiences, interactions and memories generated by the 2020 Tokyo Olympics and Paralympics. Participants of the workshop were asked to reflect on the wealth of cultural and social experiences enabled by the Olympics and quickly prototype ideas in the form of installations, devices and services for individual users as well as for the public space. Participants embraced this challenge with enthusiasm and energy.

The workshop Olympics Forever was open to any type of outcome ranging from services, interactive installations, spaces and products that would have directly or indirectly tackled issues related to the Olympics and Paralympics games of Tokyo 2020, the impact on the city and its inhabitants and visitors during and after the event. In the next sections of the paper the set-up and organisation of the workshop is explained in further details the set-up of the workshop.

3.2. Participants

For this workshop a total of 23 students were recruited as participants. Of these, seven were German students of the Integrated Design department of KISD, fourteen were Chiba University students and two were exchange students from the Royal Melbourne Institute of Technology. The Integrated Design department of KISD embraces inter- and multi-disciplinarity as its ethos. Similarly, Chiba University students engage in a number of disciplines ranging from product, communication, interaction, transportation design and design management. It can be said that the participants of this workshop represented a heterogeneous group of students with no specific skills or expertise. Furthermore, the group included German, Japanese, Chinese and English native speakers. Participants were divided into six groups, with at least one KISD student and two Chiba University students in each group. The composition of the groups has been made according to the level of the students in terms of spoken English, design experience, age and gender, trying to keep a balance among groups as well as a mix of expertise and cultural diversity within the groups so to better test the effectiveness of making as a method for collaborative work.

The workshop was facilitated by two KISD members of staff (prof. Andreas Muxel and Eduard Paal) and three Chiba University members of staff (prof. Takayuki Higuchi, Giovanni Innella and Algirdas Paskevicius).

3.3. Schedule and Activities

The complete duration of the workshop was two weeks: a Research Week and an Intensive Week. The first week was dedicated to field research and it included visits to Tokyo, in particular to the Yoyogi area where some facilities are still in place from the Tokyo Olympics held in 1964, including the National Gymnasium designed by Japanese architect Kenzo Tange. The goal of this research week was to get a sense of what hosting an Olympic and Paralympic event means for a city like Tokyo, to learn more about the local context and culture and ultimately get inspiration and socialize.

The second week of the workshop was the Intensive Week and it was fully dedicated to hands-on and design activities. During the Intensive Week, the workshop has been held in a large open space room in Chiba University campus, where students could design, build their prototypes and talk to the facilitators. A final presentation was organized in another room in Chiba University campus.

As of the Monday of the Intensive Week, participants were divided in the six groups and, after an introductory presentation on the workshop theme and methods and a couple of ice-breaking games, they began working. Following the workshop guidelines, participants started exploring possible directions while handling the materials and tools made available. Each group had been given a context to focus on. Proposed contexts included: sport facilities (i.e. stadiums and gyms), public spaces (i.e. parks and streets), accommodations (i.e. hotels and room rentals), convivial spaces (i.e. restaurants, bars and cafes), transition spaces (i.e. public transportation and stations), cultural and commercial spaces (i.e. museum and shops). Great freedom was allowed to participants in interpreting the given context and in the typology of outcome.

Facilitators were available all the time to talk to the groups of participants. At the end of each day, the facilitators would provide feedback to the groups. At the beginning of each day, each group would briefly summarize what they learned from the previous day and update the rest of the participants on their direction. Fujitsu designers and managers were present on the first day of the Intensive
Week to provide some input on the activities of Fujitsu and their visions for the future, and on the last day, to give attend and discuss the final presentations. The ideas and projects produced during the workshop were not meant to be implemented further outside of this intensive week. However, the results were published in a report book and distributed to Fujitsu Design and other Chiba University partners.

3.4. Materials

During the Intensive Week of the workshop, students could use the materials and tools made available. These materials ranged from cardboard sheets to PVC pipes, from ropes to plastic fasteners, paper and plasticine. Tools included glue guns, heat guns, cutters, markers, an inkjet printer and so on. These tools and materials do not require any particular skill in order to get participants to produce sketch models (Fig. 1). This aspect was important to help overcome barriers that are evident when in a team there are members who have higher manual and technical skills than others, with the former usually taking the lead over the latter. Furthermore, some basic electronics including sensors, LED lights, thermic printers and the software and hardware to make them work with computers were made available. Because students did not have the competences to use the electronic components, the workshop facilitators were available to help them with those in case they needed to. Once produced, prototypes can be readily tested thus providing useful feedback for the progress of the design process. Quick-and-Dirty prototyping was chosen for this workshop as a method for communicating with team members and present to other participants and facilitators in order to progress in the design process.

3.5. Workshop Results

The workshop resulted in six concepts of services, events, and technologies. Outcomes ranged from a deconstructed capsule hotel where units could be arranged freely; an automatic machine that wraps anything into a present; a photo-booth where photos are taken only if users cheer loud enough thus collecting and then creatively re-using the cheering instants; a mobile application integrated with the public transportation system that allows anyone to be an Olympic torchbearer; a restaurant to foster ingredients, share and improve recipes; and a monument that invites visitor to destroy it while it replicates itself elsewhere.

In order to present their final concepts, students enacted the functioning of the sketch prototypes they built and gave short slide presentations on the final day.

4. Workshop Evaluation

The workshop has been evaluated by taking an ethnographic approach, by simply observing participants, their interactions and the group dynamics [13]. Since the authors of this paper are also the organizers and facilitators of the workshop, it was easy for them to make observations throughout the whole duration of the workshop and engage in informed conversations to check on the participants’ progress as well as have a sense of their experience.

4.1. Materializing the Intangible

The adoption of Quick-and-Dirty prototypes as a technique had an impact on the design process of the students. The most evident effect lies in the tendency of students to physically express every aspect of their concepts. Then, the participants would simplify their concepts by physically taking off the unnecessary parts. The possibility of working on material objects seemed to help them to refine their concepts and define the meanings of their proposals.

For example, the group that was given transition spaces as a context soon started building a large arch-like structure using the provided PVC pipes and other materials (Fig. 2). This structure supposedly replaced the gates on the platforms of the metro-train in Tokyo. In the group’s intentions, regular commuters would have been celebrated similarly to the winners of a marathon and would have been exposed to a number of historic information about the Olympic games, just before entering the train. This first prototype was useful for the group to identify some key aspects in their initial idea. For example, the daily ritual of commuters passing through the same path and the resulting sense of participation felt like a strong point in their idea. In the following days, the group refined their concept and the more they refined it, the more they would take away
physical elements from the structure they built. The
prototype made evident the unnecessary informative
structure the group proposed. All those screens providing
trivial information about the history of the Olympics soon
felt redundant and distracting from the commuter’s
experience and participation to the event. Physically, the
group started stripping off all the unnecessary parts. It was
easy for the group to start this reducing process because the
components were physically there, even just as mock-ups.
So, in the beginning the group materialized each aspect of
their concept, then they started a process of “de-materialization”.

Finally the work of this group resulted in a digital
application for mobile phones to be used before the
Olympics game of Tokyo 2020. In the group’s design, the
public transportation company would have released a
number of digital Olympic flames. If a commuter was lucky
enough, he or she would have got this Olympic flame
glaring on the screen of his or her mobile phone when
scanning it to check-in at the station gate. The same
commuter would have carried this Olympic flame on the
mobile until the check-out, where the digital Olympic flame
would have been passed on to the next commuter
checking-in at the same gate; and so on. On the final day of
the event during everyone could have the digital flame
glowing on the devices (Fig. 3). Under the title “You Are
Olympic”, this participated and somewhat choreographed
campaign would have made every commuter feel like an
Olympic torchbearer and therefore feel more like part of the
event. Interestingly, the group initially had to initially build
something big and solid in order to get something intangible
like a mobile application.

Another group went through a similar process of
materialization and de-materialization. The group that was
assigned convivial spaces as a context started straight away
thinking of tools that would encourage interaction in a
restaurant. The first attempts were ironic; almost jokes that
the team members felt compelled to prototype in order to
learn more about their direction. The props they made
included chopsticks with LEDs that light up when crossed
with others, a call-button for waiter that makes someone’s
chair vibrate and similar other tools (Fig. 4). Their idea was
to offer to the guests some tools that would generate
unexpected interactions. While building all those
Quick-and-Dirty prototypes and testing them with other
participants, the members realized that, in a convivial
environment, interactions are usually triggered by more
intangible aspects related to food. The aspects that spark
conversations range from recipes, traditions, ingredients
and flavours. So, the group finally designed “Seedling”, a
restaurant where customers can pick up the available
ingredients from a vegetable garden, seed vegetables for
future customers, and so share existing recipes, modifying
other people’s recipes or invent new ones and share them
through a digital system. As a result, the group made a
rough prototype of a machine and its interface that
customers could use to input their recipes. Similarly to the
other group, also in this case the participants had to make a
number of failed physical experiments before identifying

Fig. 2 Participants building an interactive gate for the Tokyo
Metro

Fig. 3 Scheme explaining the functioning of the You Are
Olympic concept
the intangible value of tradition and knowledge that is hidden behind recipes and cooking.

We observed that making Quick-and-Dirty prototypes helped participants materialize intangible aims, whether it was participation, or interaction, sense of belonging or knowledge. The physical presence of the prototypes also made it easier for the students to identify and eliminate features and props. So, the further participants would progress with this technique, the more the prototypes were becoming smaller, while their objectives would become more ambitious (i.e. get the all city to participate in the Olympics, get people to collaboratively build new recipes and grow vegetables for future guests…)

Quick-and-Dirty prototypes helped the participants to better understand the key aspects and aims of their concepts; whether it was participation, or interaction, rather than focusing on the way things look.

4.2. Acting as Prototyping

Prototyping the artefacts also produced another effect; it pushed students to enact the use and the functioning of the designed services and experiences. As a result, the physical prototypes turned into experience prototypes.

For example, one group found their design direction at an early stage. They noticed that in Japan, the way things are packaged and wrapped plays an important role. In many ways, in Japan the packaging is more important than the content and the care put in the wrapping is peculiar of Japanese culture. They thought that the visitors coming for the Olympics would have liked to bring some authentic souvenirs back home. At the same time, they noticed the abundance of machines in the public space of Tokyo. In particular, they were attracted by “Purikuras”; the Japanese photo-booths that take pictures, apply distorting and decorative filters and print them for a few hundred yens. So, they thought of “Purikupack” a machine where people could introduce any artefact and this would be returned into a souvenir wrapped into a paper bearing a photo of the tourist. The group built a cardboard machine, big enough for a member to sit inside with a phone and a printer. In this way they enacted the functioning of the machine (Fig. 5). The humoristic and fun value of the concept emerged clearly because the experience of such a service was well simulated.

Also another group focused on photo-booths. They designed a photo-booth that takes a short video when the user shouts as to celebrate. Users can get frames of the video printed on their ticket, while these videos are collected and used for a series of interactive installations in the public spaces of Tokyo after the Olympics, so to leave a memory in the space. Also this photo-booth was quick-and-dirty prototyped and enacted during the process and final presentation.

Other groups followed a very similar process. We observed that the approximate physical prototypes where extremely useful for participants to simulate experiences, discuss their concepts internally and communicate them to an audience in an engaging way.

4.3. Making Sense

The goal of communication in a collaborative team is ultimately the one of creating meaning. This process is not linear, but it comprises iterative cycles of trial and errors, building on each others’ ideas and getting inspired by what is being shared by other team members. When barriers related to cultural differences, expertise and – above all – language are present, this process becomes harder. The Quick-and-Dirty prototyping approach of this workshop helped participants to express themselves and exchange ideas. Observing the participants handling the materials, building and modifying the models was like observing people having a conversation. Simply, instead of using
words and their hands to gesticulate, they were using them to build objects and forms (Fig. 6 and 7).

Fig. 6 and 7 Participants communicating while modifying their prototypes

The materiality of such language made clearer the message they represented. Obviously we do not advocate that “making” could possibly replace “talking”. In fact, making rather facilitates and supports verbal communication. By working in such a way, the participants that are not fluent in a certain language – in this case English – have better chances of expressing themselves, avoiding the lead being taken by native or better speakers. So, the methods adopted in the workshop also proved efficient to enhance communication among and with the participants.

5. Discussion and Conclusion

Olympics Forever was a collaborative design workshop between German school KISD and Japanese school Chiba University, supported by Fujitsu. The particularity of the workshop lies in adopting a hands-on approach from the very early stages of the design process. Participants collaboratively built Quick-and-Dirty prototypes while their ideas were still shaping, so to facilitate the design process and the communication among them.

This workshop proved useful in better understanding how to create more effective and engaging design activities. Particularly when working with diverse groups of students it is important to provide the right tools and methods so that participants can generate and refine their ideas, communicate with each other and present to an audience. From this experience, three key findings can be highlighted.

Firstly, by pushing participants to prototype their ideas since the very beginning of the design process, students were able to identify the valuable elements and meanings of their concepts more easily. By prototyping ideas in this way, students give a material presence to every aspect of their ideas and then start a reducing process that gets rid of the unnecessary parts of their projects. This allowed students to easily understand the key aspects of their concepts.

Secondly, by handling physical materials, we noticed that communication among participants was more efficient. Even participants with poor spoken English skills could show and share their ideas or intervene on someone else’s concepts by modifying prototypes that – because they were made in a quick and approximate fashion – were easy to change.

Thirdly, the physical prototypes pushed students to enact their functioning and the services or interactions they entail. This resulted in more compelling and clearer presentations and allowed students to find flaws in their proposals.

In conclusion, when working with mixed groups of participants with diverse skills, cultural backgrounds and speaking different languages, a hands-on approach can be useful. Quick-and-Dirty prototypes proved themselves valid on both the communication and the creative processes.

In the future, we plan on running more thorough studies to learn more on hands-on approaches and the advantages they offer in comparison to more traditional ways of working.

6. References