

An Exploration of the Creative Cognitive Process by Translating the Observation into the Early Stage of the Product Design Development – Apply the Experimental Project “Design Consciousness: Small Things with Big Heart” as an Example

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This study explores the designer’s creative process through the lens of the cognitive side and how it effectively influences early-stage product development by conducting the experimental project “Design Consciousness: Small Things with Big Heart”. This study contributes to design research by providing a creative framework which categorizes “seeing” into three layers with different definitions accordingly: Observation, Consideration, and Interpretation through an inquiry-driven process. The study facilitated the translation of observations from the daily life into twelve mindful and meaningful design works including the umbrella, brush, toothpaste, stamp, cup, toilet paper holder, clothes hanger and Post-it in the context of early-stage product design development. Using the overall design journey, methodologies and frameworks, the study seeks to explore the designer’s creative cognitive process and how it affects the early stage of product design development. In particular, the study captures interesting and thought-provoking moments through videos and photos, which are not visually attractive compared with professional photography, but most relevant to people’s daily lives. People tend to stay in a bubble of personal adaptive habits without knowing how to better improve their lives by taking small steps. By utilizing the creative cognitive framework, the experimental project endeavors to remind them that whoever is always aware of their own behaviors in whatever circumstances deserves a life with better quality. The study tries to “revisit” products of everyday use by adopting the creative process and framework from the cognitive side.

Keywords: Creative Cognitive Process; Design Consciousness; Creative Process; Observation; Daily Item; Product Development; Product Design

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1. Introduction

There are many design tools, creative methodologies, frameworks, and theories that are applied to the product development process, many of which were created by IDEO e.g. Design Method Cards (IDEO Product Development, 2003), Design Kit (IDEO, 2015). Among all the approaches for product development, one critical phase before the design phase is to listen to the target users, potential customers or people. ‘Designers—of products, fashion, service, space, or media—have long relied upon their observation of the world to understand what will resonate with the people they want to attract’ (Suri & Howard, 2006). Ethnographic research is a research tool that originates from anthropology to study users’ behavior and interaction to better understand their needs, pain points and expectations through in-field observation.

In the study, the team initiated a modified ethnographic research tool – the creative cognitive process to experiment with a new type of design-yet-context-defined research methodology that influenced the early stage of the product development process. The creative cognitive process was applied to one three-month design sprint project sponsored by EMMA Creative Center: Design in Residence Program (Lee, 2019b) to validate the hypothesis of the new experimental research tool as well as to refine the research tool itself for further study.

2. Methodology Overview

2.1 Ethnographic Research

Some studies define ethnographic research as one of the design thinking tools, which is an emphasis on reframing problems and experimentation (Liedtka, 2018). Other research views ethnography as ‘a branch of anthropology that involves trying to understand how people live their lives’ (Anderson, 2009). Ethnography is a culture-oriented research methodology. It is a tool to help the research team put themselves in the shoes of the target users such as the local people to observe their behaviour, habit, lifestyle and experience without interfering with their normal lives.

Ethnographic research tool is a context-driven approach that assists the research team in naturally capturing the texture of local people’s life pattern and trace and to transfer the learning to the design team for creating the tangible or intangible project relevant to the target group. Unlike the typical user-centered approach that asks the people/target group directly how they use the design/product, the project team should ask from the angle of ethnography how the design/product can be better integrated into people/target group’s lives.

2.2 Daily Diary Designs

Daily diary designs are also called daily process designs. The intention of daily diary designs is to minimize the influence from the research team on the subjects in order to ‘capture life as it is lived’ (Bolger, Davis, & Rafaeli, 2003), which means the subjects will be observed in the most natural way without the least artificial setting and design. The subjects have the flexibility to do self-reports of their daily behaviours in their environment through textual, visual, questionnaire, video, or other designed formats over a designated period of times e.g. daily, biweekly, monthly, depending on the scope of the research. In the field of psychology, Kurt Lewin (1935, 1936) mentioned the ‘topology’ of daily activity, which can trace back the origins of interest in daily life experience. He pointed out that in order to fully understand what affects people’s minds and actions, re-examining their psychological life could provide a potential solution.

In the realm of daily life research, there are two well-established methodologies and framework, Experience Sampling Method, ESM, (Larson & Csikszentmihalyi, 2014) and Ecological Momentary Assessment, EMA, (Shiffman, Stone, & Hufford, 2008). Both can be applied to estimate and analyze the outcome of daily diary designs. ESM is a scientific research procedure to understand the subject’s daily lives, their behaviours physically as well as psychologically through systematic self-reports and other designed documents to answer the questions such as “How do the subjects plan their weekend time?”, “How do the subjects react when they face challenges?”, and “What are the subjects’ motivations in life?” (Kubey & Larson, 1996) Whereas EMA is an approach with established mechanism and process that can capture subjects’ timely information, behaviour, and experience

repeatedly in their natural surroundings to maximize the value of the ecological validity, to minimize response bias, and collect various meaningful data within a planned scope of the project (Shiffman et al., 2008).

According to *Handbook of Research Methods for Studying Daily Life*, daily diary designs have been applied in many diverse research areas, ranging in the fields from clinical, cognitive, psychology, to social, which capture and analyze the subjects’ micro-level processes providing informative source to the research team (Mehl, Conner, & Csikszentmihalyi, 2014). However, in this study, daily diary designs, ESM, and EMA serve as inspirational research methodologies, framework, and guidance to demonstrate: “How to study the subjects’ feelings, conditions, behaviours, environment, in a non-intrusive-yet-immersive way?”

2.3 Creative Cognitive Process

In the study, the creative cognitive process is an experimental research tool and framework that use ethnographic research, as inspired by the book *Thoughtless Acts?: Observations on Intuitive Design* (Suri, 2005). It categories the process into three key layers: Observation, Consideration, and Interpretation. Each layer focuses on one question to empower the team/user to think through the phenomena they’ve seen, experienced and reflected in order to enhance the quality of the research result and transfer the learnings and insight to the further step of creation.

The 1st Layer – Observation

When the team is in the field research, the first thing they need to do is to “open” their eyes to capture detailed observation. “What do you see?” is the critical question that needs to be constantly kept in mind. The first layer is the gateway to serve the input of the creative cognitive process. It does not mean that the team will get better outcome by capturing the more material. Instead, the team should document the target groups in its relevant context comprehensively, which will become more valuable in the further step of analysis and design. In Figure 1, the diagram uses the red line as a metaphor to indicate the reflection of the light source, therefore what people have seen is the exterior of the object/circle.

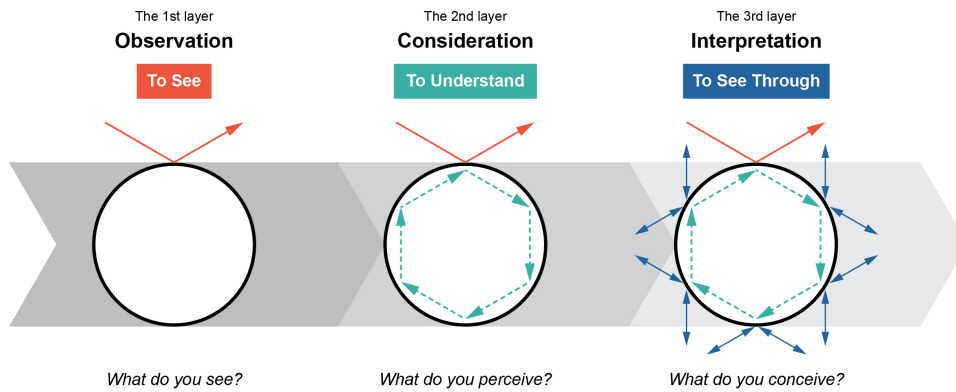
The 2nd Layer – Consideration

The second layer – Consideration is all about answering the question “What do you perceive?”, which means “Does the team ‘read’ the story behind the scene among the information and the data collected from the field?” The difference between the first layer – Observation and the second layer – Consideration is that the latter needs to decode the signal of the observation from the surface level and other perspectives in order to “understand and know” the hidden message from the materials including the photos, video, and audio the team captured from the field. In Figure 1, beside using red line as light source, the diagram also uses the light green dash line to represent the behaviour of people looking into the object/event/activity. People perceive the phenomena not only outside in, but also inside out.

The 3rd Layer – Interpretation

The third layer – Interpretation is to answer the question of “What do you conceive?”. The team has obtained first hand materials from the field through the Observation layer. In the layer of Consideration, the team has processed the material from multiple perspectives to read the message underneath the surface. Ultimately, the third layer is the stage where the insights and learnings are organized to form the team’s value proposition toward the challenge itself. The team will present their viewpoints as an invaluable source for the next design phase. In Figure 1, the black double arrows indicate that the team/people should acquire the ability to appreciate and form their own perspectives.

Three layers of the creative cognitive process are interdependent in a sequence. It is a useful research tool and framework when ethnographic research is conducted in the field. In the case study, it will show the details of how to apply the creative cognitive process to document the notes, learning and insight to different layers accordingly.



[Figure 1] The Three Layers of Creative Cognitive Process

[Table 1] The Creative Cognitive Process Overview

Layer	The 1 st Layer	The 2 nd Layer	The 3 rd Layer
Layer Name	Observation	Consideration	Interpretation
Key Question	What do you see?	What do you perceive?	What do you conceive?
A Brief Definition	The first layer is the primary gateway of the creative cognitive process input. The observation can be captured through photo, audio, video, or text in the context of the field research without any further interpretation. It is a natural approach to document the meaningful moment, conversation and interaction.	The second layer is about decoding and understanding the hidden message from the observation material captured from the first layer. It is the section to “read” the assets from multiple angles starting from outside-in to inside-out in order to get comprehensive views before analyzing the material.	The third layer is the moment to form the perspective out of the synthesizing process and the observation material from the field research. The result of the Interpretation layer can serve as the design brief in the early stage of the project development.

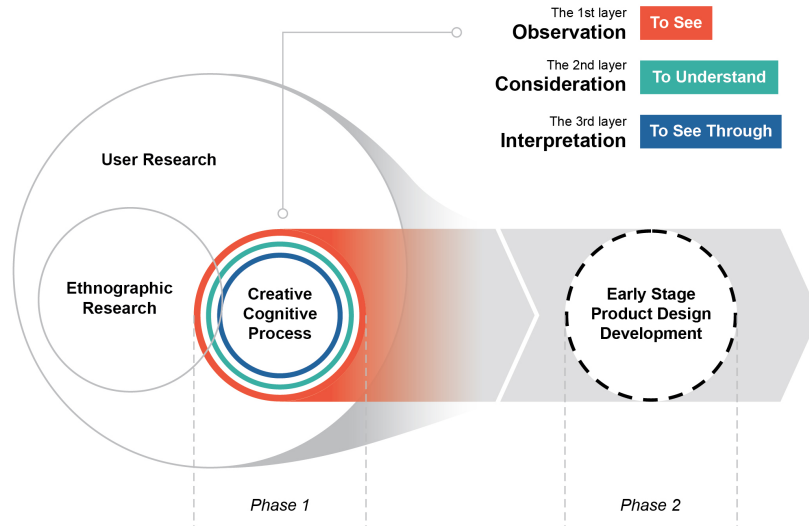
3. Case Study – Design Consciousness: Small Things with Big Heart

3.1 Project Overview

Design Consciousness: Small Things with Big Heart was a design experiment social impact project sponsored by EMMA Creative Center Design in Residence Program in 2019. The creative cognitive process and the twelve tangible design outcomes were part of the deliverables of the three-month design sprint project. The intention of the project was to create a series of context-defined life items to improve life qualities for local people through the innovative cognitive research processes.

3.2 Design Process

In the three-month design sprint project, the team planned the project in two main phases. The first phase was to conduct the field research to collect the context-defining-yet-life-relevant raw material. The second phase was about the transitional period to influence the early stage of project development. Figure 2 showed a brief design process of the project.



[Figure 2] A Brief Design Process of the Project


Field Research and Inspiration Materials

The team gathered ninety selected observation photos taken from the three-month stay at Pforzheim, Germany as an input source of the creative cognition process. Before the team went to the field for the research, it was engaged in designing out the template to capture the field learning connected with the creative cognitive process. The template contained four items: context, demographic, considerations, and concepts. The following Figure 3 was one of the examples from the project.

In the template, taking and selecting the right photos were the most critical. As the old saying goes “a picture is worth a thousand words”, it was one of the most intuitive ways to capture the observation in context. The photos could easily encapsulate the key moments, behaviour or conversations about the subjects including the product (the tangible part) or service and experience around the subject (the intangible part).

The first item - context was designed to help the team articulate the first-person-perspective story of the photo in a short paragraph, paired with the demographic item to provide the accurate information such as when and where the team took the photo and which category (product, space, experience) it belonged to. The context and demographic were tied closely to the first layer – Observation. The item of Considerations in the templet was to decode the inexplicit message of the photo from multiple angles by composing three to four “How Might We” questions. The purpose was to reframe the existing pain points from the observation as well as to discover the potential new opportunity areas for the third layer – Interpretation. The item of concept was to inspire the team to form their unit value propositions, opinions through the idea generation process. The concepts ranged from some straightforward design solutions, a sophisticated execution plan to futuristic conceptual envision. There were no specific limitations towards the ideas in the diverging period of the process and it was also in the very early stage of the project development phase. Table 2 provided a brief definition of each item in the template.

"Jellyfish" shows up under faucet with water.



Context

This was the tomato I bought from Penny, one of the local supermarkets. I loved the moment when we washed the fruit simply by putting the packaging under the faucet. It looked like a small waterfall.

Date
April 5, 2019

Category
Product

Place
Kitchen sink, second floor, EMMA Creative Center

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Considerations

- How might we design a caring packaging with the consideration of user behavior?
- How might we design a user experience that not just caters to functional needs but also is designed for fun?
- How might we rethink about the relationship between fruit washing and water?

Concepts

- Design a fruit packaging beyond a container. The packaging could be reused, recycled and repurposed.
- Consider other possible materials for fruit packaging. The packaging may come from natural materials like banana leaves for containing other fruits.
- Designer should not only come up with ideas around the product itself in a static moment, but also design out concepts in the process of using product in different scenarios.

[Figure 3] One of the Examples from the Creative Cognitive Process Document Sheet

[Table 2] The Creative Cognitive Process Document Sheet

Connection with Creative Cognitive Process Layer	The 1 st Layer Observation		The 2 nd Layer Consideration	The 3 rd Layer Interpretation
Document Item	Context	Demographic	Considerations	Concepts
A Brief Definition	The column is about explaining the story of the photo on the surface level in a short paragraph written from the first perspective. It helps the readers and other team members to understand the story, observation, design, phenomena in the right context.	The column is to capture the "demographic" of the story including the tile of the photo, when and where the team took the photo and which category (product, space, experience) it belonged to. It is the column to document the facts and data.	In order to help the team to read the photo from diverse perspectives and decode its invisible message, three to four "How Might We" structure questions are applied to reframe the existing pain points and discover the new opportunity areas.	The column is to empower the team to form their opinions through idea generation ranging from simple design solutions, conceptual ideas, and envisioning future platform, which also served as the work-in-progress transitional brief for the next stage of design.

Transitional Phase from the Creative Cognitive Process to the Early Product Development Stage

One of the applications and outcomes of the creative cognitive process was to create an inspirational design brief and material for the early stage of product development. The team documented ninety selected photos (Figure 4) by applying the creative cognitive process to make an image diary, which was a great asset and reference for designers. In the scope of the project, the designer translated the image diary into ten daily item product designs (Figure 5). The inspiration came from local people’s lives, their interesting behaviors, day-to-day routine, community culture and subtle interactions, which were all captured in the image diary.



[Figure 4] The Studio Wall with Ninety Selected Photos from the Field Research



[Figure 5] Ten Daily Item Product Designs (Photo Credit: Benedikt Adler)

3.3 Design Highlight and Outcome

The section presented the selected document and photos by applying the creative cognitive process to the early project development stage of the ten daily item product designs.


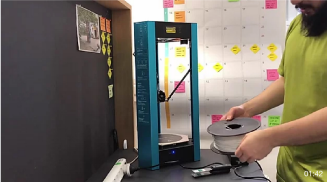
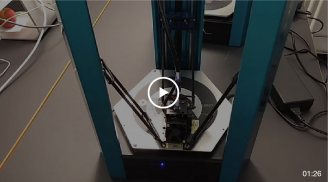






Creative Cognitive Process Document and Photos



[Figure 6] The Process of Making the Creative Cognitive Process Document Sheet

2019 DESIGNERS IN RESIDENCE IN PFORZHEIM

Design Consciousness
Small Things with Big Heart

 <p>Designer in Residence - Week 1</p> <p>Thank EMMA Creative Center team: Almut, Alex, Bärbel, Matilde, Fabian and Dabin and Ganit, two other awesome designers-in-...</p>	 <p>Designer in Residence - Week 2</p> <p>I am so glad that the two 3D printers have finally arrived at EMMA Creative Center! Therefore, I can start to print cool stuff next week an...</p>	 <p>Designer in Residence - Week 3</p> <p>We all loved the city tour last week. It was fascinating for us to explore and experience the beauty of Pforzheim. We were also very excited t...</p>
 <p>Designer in Residence - Week 4</p> <p>This is a short week for me at Pforzheim, since I head to LA for a design award ceremony as a jury and host. But Dabin and I worked...</p>	 <p>Designer in Residence - Week 5</p> <p>How time flies. It was hard to believe it's already May. The highlight of this week was an interview we conducted with Alex and Erwin Wagn...</p>	 <p>Designer in Residence - Week 6</p> <p>I am on my way to NY to attend my design exhibition opening ceremony at Cooper Hewitt Smithsonian Design Museum, but I will...</p>
 <p>Designer in Residence - Week 7</p> <p>In fact, we are just in the middle of week 7, but I feel it's already a very rich, colorful and intense week for me. And I can't wait to put all the...</p>	 <p>Designer in Residence - Week 8</p> <p>It is the last week before the arrival of June. I can't believe that we've stayed here for more than 50 days. Therefore, the theme of video thi...</p>	 <p>Designer in Residence - Week 9</p> <p>My designer-in-residence project has entered into a phase that requires me to stop and think for a while. It doesn't mean I become lazy or tire...</p>

[Figure 7] Documenting the Weekly Field Research Videos by Applying the Creative Cognitive Process

It’s time to make umbrellas “stand up”.


Context

I captured the photos in the back of the door at the jewelry lab. It was interesting to observe not just the umbrella (product) itself individually, but in the actual whole context regarding how people put the umbrella (product) into storage and interact with it.

Date
April 9, 2019

Category
Product

Place
Jewelry Lab, University of Pforzheim



Considerations

- How might we store daily items that fit in our everyday routine?
- How might we enhance the proper image of product usage?
- How might we design a product or curate an experience that is easy to read and understand?

Concepts

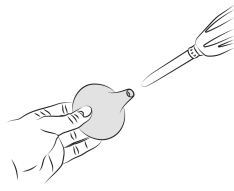

- Improve and design an existing product in a more user-friendly way, such as repurposing the tip of umbrella to make it stand up and keep it in better storage.
- Design a series of multi-functional hangers for people to place their umbrellas, clothes, appliances and other consumer electronics devices.

[Figure 8] One of the Examples from the Creative Cognitive Process Document Sheet Related to Table 3

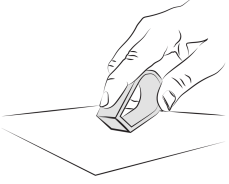
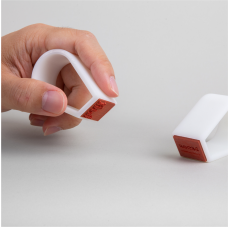
Daily Item Product Designs

The following six tables (Table 3 ~ 8) were part of the early product design concepts by applying the creative cognitive process. The scenario column explained how to use the product with the actual prototype photo shown below. The motivation column presented the synthesized result that mixed the Observation layer with Consideration layer, which resulted in the Interpretation layer to inform the design concepts in the solution column. The full version and process of daily item product designs can be referred to on the project website – *Design Consciousness: Small Things with Big Heart* (Lee, 2019a).

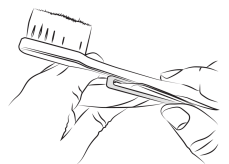

[Table 3] Daily Item Product Designs - Horn Hat

Scenario	Motivation	Solution
	<p>On rainy days, people normally went out with an umbrella. The design of the umbrella structure made it convenient for people to use. But the design didn’t fully solve its storage problem. It became slightly inconvenient when people wanted to put the umbrella away for dryness if they could not find a place to hang it.</p>	<p>The team designed a small horn-shaped stand to be attached to the tip of umbrella. It was made of light weighted PLA materials through the 3D printing technology. People could select different styles online to print out the one that fitted their umbrellas. Once the umbrella stand was attached to the tip of umbrella, the umbrella could “stand up” and dry easily, making its storage more convenient.</p>
<p>Prototype</p> 		

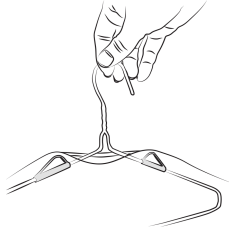
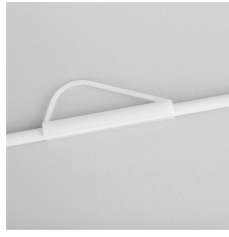
[Table 4] Daily Item Product Designs - Meaningful Chamfer

Scenario	Motivation	Solution
	<p>When people used stamps, one of the pain points was to make the stamp perfectly aligned with the paper. How might we use stamps to create a better alignment experience?</p>	<p>The team viewed the stamp holder design as a table sculpture. We added an element of playfulness to its function. The team designed a new interaction of using stamp holder to make the overall user experience more interesting as well. Lastly, the hollow structure design actually saved the material and manufacturing cost and unnecessary weight for users.</p>
<p>Prototype</p>		
		

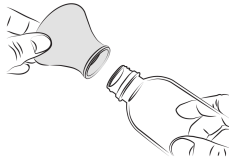

[Table 5] Daily Item Product Designs - Symbiosis Structure

Scenario	Motivation	Solution
	<p>Think about the relationship between the cup, tooth brush and toothpaste in the restroom. After brushing their teeth, people unconsciously put the tooth brush in a cup and left the toothpaste on the side. How might we redesign the “relationship” between the tooth brush and toothpaste to keep both the cup and tooth brush clean and hygienic?</p>	<p>The team designed a small rectangular tunnel to be attached to the back of the tooth brush. The rectangular tunnel served two purposes: first, helping squeeze the toothpaste more easily; second, forming a triangle structure that made the tooth brush and toothpaste stand intertwined without leaning back on the side of the cup.</p>
<p>Prototype</p>		
		



[Table 6] Daily Item Product Designs - More Than 30 Degrees

Scenario	Motivation	Solution
	<p>In fact, the clothes stands on the market were the result of a manufacturing process. It was not really designed for hanging people’s clothes. Very often, when people used clothes hangers made of metal wire, the clothes’ collar became looser time after time. The problem lay not in the clothes’ quality, but in the angle of the structure of clothes hanger.</p>	<p>The team designed two adjustable components that could change the angle of clothes hangers. The flexibility of the angle of the clothes stand could stabilize clothes hanging in a right position to protect clothes from getting loose.</p>
<p>Prototype</p>		
		

[Table 7] Daily Item Product Designs - Give Used Bottle a Second Life

Scenario	Motivation	Solution
	<p>The idea came from people’s everyday waste such as the water bottle, tissue paper or plastic bag. How might we make full use of people’s garbage by way of product innovation to further influence people’s behavior and cultivate a healthy mindset?</p>	<p>The team designed and 3D printed the bottleneck/lid part combined with used bottles to turn trash into a vase. It might not be a(n) novel/innovative idea, but we still thought it was important and meaningful for shaping people’s perception and action in the process.</p>
<p>Prototype</p>		
		

[Table 8] Daily Item Product Designs - Save the Last Drop of Water

Scenario	Motivation	Solution
	<p>People tended to leave the last drop of water in the glass, which always caused waste. People also seldomly took note of the little amount of water inside a glass.</p>	
<p>Prototype</p>		
		<p>The team designed a glass whose base had a twelve-degree slope. When people attached the sloped base to the glass, it did not really make a huge difference compared with the normal glass. But when a small amount of water remained inside the glass, people did notice it naturally as the tilted glass made it visible.</p>

4. Summary and Suggestions

4.1 Key Learnings and Reflections

Design in Context

The entire project Design Consciousness: Small Things with Big Heart was done in Pforzheim, Germany for three months. The project process and its deliverables were relevant to local people’s life and behaviour. In order to successfully achieve the idea of “design in context”, the team immersed themselves to experience the local people’s life covering work, religion, policy, culture, entertainment and etc, which were an essential fuel to the creative cognitive process: Observation, Consideration, and Interpretation. The idea of “design in context” was to help the team set up a feasible-yet-meaningful project goal to not only cater to local people’s invisible needs through tangible 3D-printed product designs but also make a positive influence through the design process.

Observation Comes from Your Mind. Inspiration Originates from Your Heart

In the study, the first layer of the creative cognitive process was Observation. The Observation layer was critical to serve the purpose of input for the rest of the process. It was the key step for the team to capture learnings, feelings and facts before synthesizing all the raw materials such as people’s audio or video recording, photos, quotes for the Consideration layer. Aiming at high research quality out of the Observation layer, the team suggested the following three key questions before starting the first layer.

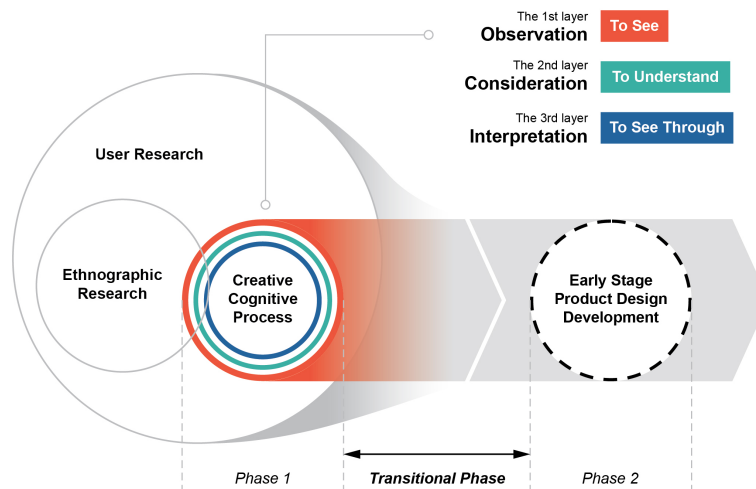
- Why and how to select and set the right range of the observation subject and capture it without interfering with the observation subject?
- What kind of material does the team need to capture and in which format should it be documented in order to optimize the value of the asset?
- What are the core message and extended values after the Observation layer across the creative cognitive process?

The three key questions above help the team control the quality and the outcome of the observation. The more comprehensive and in-depth the observation is, the better result the team will get, which can trigger invaluable inspiration for the following layers.

4.2 Next Step for the Project

The Transitional Phase from the Creative Cognition Process to Design Concepts

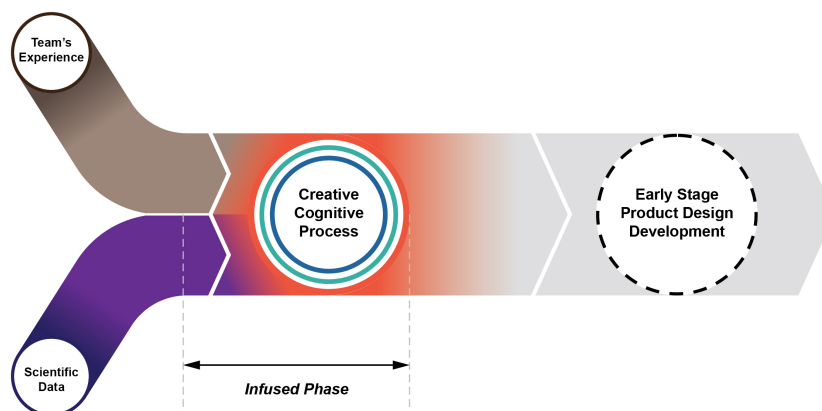
In the study, the creative cognitive process was part of the human-centered approach with one strong influence factor – design in context. Since the team designed for local people, the project started from detailed observation to gather their stories. The transitional phase from the creative cognitive process to design concepts was a mix of designer’s intuition, inspiration, observation, and some relevant research data in the audio and video format this part of which wasn’t included in the project (Figure 9). In future studies, the research can define and develop a series of refined stages to inform the research team and users of the type of stages that should be applied through certain methodologies and input from the participants, and how they function in terms of the resources the team needs, how much the participants are engaged, as well as the scope of the project and its budget.



[Figure 9] The Transitional Phase from the Creative Cognitive Process to Design Concepts

The Tension Between Designer’s Intuition, Experience and Scientific Data

When the team applied the creative cognition process in decision making, there was always a tension between whether the team should trust the designer’s intuition based on their past experience or the data including research material, and observation photos the team collected in the project. For further study, it is critical to integrate the invaluable experience from the research team or designer into the creative cognition process by utilizing the scientific data to build a robust research methodology (Figure 10).



[Figure 10] Infuse the Experience from the Research Team and Scientific Material to the Creative Cognitive Process

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