

# Collective Imagery

## A Framework for Co-Design

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**Abstract:** This research explores creative imagery shared between co-designers during cross-disciplinary design collaboration as a theoretical framework for co-design studies, which we term “collective imagery”. Collective imagery is a shared working structure of design concept consists of associated design elements such as facts, insights, ideas and concepts, often too partial and complex to envision and enact collaboratively. We carried out experimental workshops to identify co-design tools and processes, which aim to externalise and structure collective imagery for designing. We develop co-design tools to allow co-design process to unfold itself without adhering to traditional design development process: collective imagery board, skit improvisation and complexity weave. We trace over time patterns of co-design activities by using the collective imagery board to visually depict the diverse structure of design concept. We discover co-design process in a creative emergence cycle of activities such as: inspiration, deconstruction, association, clustering, threading and emergence. We show structuring collective imagery as core co-design activity, of which a coherent conceptual structure often suggests a coherent design solution. We conclude the notion of collective imagery as a theoretical framework to consider when development co-design tools to engage co-designers with diverse creative processes.

**Key words:** *Co-Design, Design Conceptualisation, Collective Creativity and Imagery.*

### 1.0 A Framework for Co-Design Practice

Co-Design as a new field concerns collective activity during designing. Research on co-design practice related to this paper focuses the studies of co-design tools and processes. Literature review identifies a recent call for a research framework to understanding co-design tools. [1] Sanders’ [2] research explores the diversities of co-design tools and identifies the level of creativity among co-designers and their role. She suggests that the fuzzy front end of design process as a stage when co-designing is at the most beneficial, and reports her suspicion that prototyping phase could be at the beginning of the design process, in oppose the later stage in a traditional design development process. It is problematic as most co-design research, despite the suspicion, focuses on process-led design methods. They often develop models of interaction and studies on the practice that takes place during conceptual design phase of a design development process, [3] poses epistemological difference in the studies.

Co-design process is challenged by the individuality of creative processes, posing difficulty in appropriately describe co-design discourse. Our earlier study on co-design epistemologies in a cross-cultural context [4] reveals necessities to understand individuality of creative process when study co-design practice. One of the suggestions is to understand the structure of imagery shared among co-designers by studying the structure of creative conceptualization. Related works are Gill et al.’s [5] experiment with imagery as a private experience for

architectural teamwork; and Bryan Lawson's extensive research on designers' minds [6-11] in architect practices. However, the works on individual practice does not explain the complexity of cross-disciplinary co-design often practiced with communities on the basis that anyone can be creative when given the right tools and activities. In this, designer is no long the sole idea generator, visualizer, or translator of design solutions; instead designer takes on the role of co-design facilitator who adopts, customizes and designs co-design tools to engage co-designers from all walks of life. The challenge of co-design with communities is in the individuality of creative processes that forms a complex design space. Also, co-design tools are often drawn from any disciplines by design facilitator when it sees fit. There is as yet a co-design framework to be taken into consideration for the development of co-design tools. [1, 12]

In view of this, this research aims to draw theories from practice-based research that engages co-designers from diverse background to envision and enact collaboratively. To do so, we set out to explore the complex informatics that lies in the structure of design concept embodied by the design team during co-design practice. What kind of 'things' that is being explored, enacted and envisioned during co-design. How can co-designers with diverse creative process co-design across tangibles and intangibles, visuals and words, rationales and intuition?

### 1.1 Collective Imagery

Collective imagery is creative imagery embodied and shared between co-designers during design collaboration. Finke [13] terms 'creative imagery' as a 'preinventive form' which can be manipulated inwardly through generating and exploring mental images. He proposes imagery as creative problem-solving tool capable to support the construction and structuring of ideas through an innate visualisation. [14, 15] It is not just visual picture and the reasoning works through inner dialogues or mental images in one's mind's eyes. Finke [15] noted 'structure' when describing his understanding on the process of convergent insight: *"one discovers a creative structure or solution that makes sense out of apparently disconnected facts. It is particularly useful in solving mysteries, where one must collect relevant clues and then discover a coherent explanation for them"*. We propose that the structure when externalised and collectively share, is a potential tool to study co-design conceptualisation. The challenge in co-design research is to develop tools to depict the structures of collective imagery during conceptual structuring to work with the preinventive forms that give rise to design solution.

Co-design practice with the framework of collective imagery, can be seen as an activity of one's creative thinking to make association in one's metacognition. [18] The powerful cognitive faculty to visualise in our heads is a kind of visual modelling of ideas. [19] This ability develops late and is used during the incubation stage of creativity. This ability is quite unconscious as *"conscious attempts to guide and control creativity too early in the process seem doomed to failure"*. [18] This type of associative formation is a type of design reasoning used to associate disperse and partial ideas into a coherent design concept made possible by abductive reasoning, which Cross [20] describes as the logic of design.

Co-design practice is embodied in fuzzy situation, often involves the embodiment of designers' tacit knowledge, which can be innately visual. Consequently to study conceptual structure, it requires an alternative system that directly enacts our mental imagery as preinventive form to structure and associate ideas. Goel (1995) suggests that we cannot explore human conceptual structure without understanding symbol system. In view of this, Varela et al.'s [16, 17] work on the embodied quality of one's imagination forms the basis of this research.

## 1.2 Creative Emergence

Conceptual structuring requires an elimination of a controlled order and prior planning without fixing structure at the beginning of designing. Rather, plan, is situated and our actions are situated in *“an emergent property of moment-by-moment interactions between actors, and between actors and the environments of their action.”* [21] The creative emergence cycle is different from the abstract-concrete progression of a process-led design models. Earlier work by first author reports Chinese designers’ structuring of design concept: internally through creative imagery in preinventive form, and externally through sketching. In which they are traversing the creative space of design possibilities for the solution to emerge. Problem setting, in this creative space, is also an on-going process of structuring and restructuring. In this, designers traverse between their imagery and sketches to find patterns in ideas in a creative space of possibilities.

## 1.3 Co-Design with Analogy

A process-led co-design model may not be useful for collective imagery to work as conceptual structuring tool. We require a system of ideas that can accommodate both the abstracts and the concretes in the same space and often at the same time while gives rise to imagination. Analogy inspires [22] and is a useful tool to traverse in a creative space of design possibilities. Analogy is a kind of generative metaphor that helps transform design space into an inquiry space [23] from which design concept can be abstracted through analogical representation. [24]

Designers need to work with material to detect certain ambiguities and that this is only possible by working with the concretes. Analogies are concrete words that can be visual and therefore more flexible than abstract representation as a means of design. [25, 26] The use of analogy works at this concrete yet abstract early stage of designing, allows one situation to transform to another one, through similarities of their relationships. [27] The transfer is made possible through the activation of the cognitive mechanism of mental visual imagery. Similarly visual oriented, Imageries can be concrete, yet possible to be manipulated in abstract through analogical representation. With the analogical representation operating, the duality of abstract and concrete is therefore unnecessary.

The collective imagery framework outlines above informs this practice-based research in the development of co-design tools. In seeking for an organic ways to engage co-designers for collaborative imagination that are situated and collective. We adopt tangible props [28], storytelling activities [1] within the ethos of design game [29], embodied creativity [30], emotion and empathy design and theatrical performance design. [1]

## 2.0 Research Methodology

The research aims to identify co-design tools with a framework of collective imagery. Co-design originates from participatory action research [31] in which they share a similar cycle of action and intervention. In order to identify co-design practice that informs co-design theories [32], the research was set out to be explorative and practice-based. It is a mixed method practice-based research that adopts the interventionist action research methodology, the interpretive and observational reflexive ethnography and the inductive nature of grounded theory approach. In order to explores and develop co-design tools whilst observing the emerging co-design process, we carried out the workshops without imposing a prescriptive design process with intervention depending on situation.

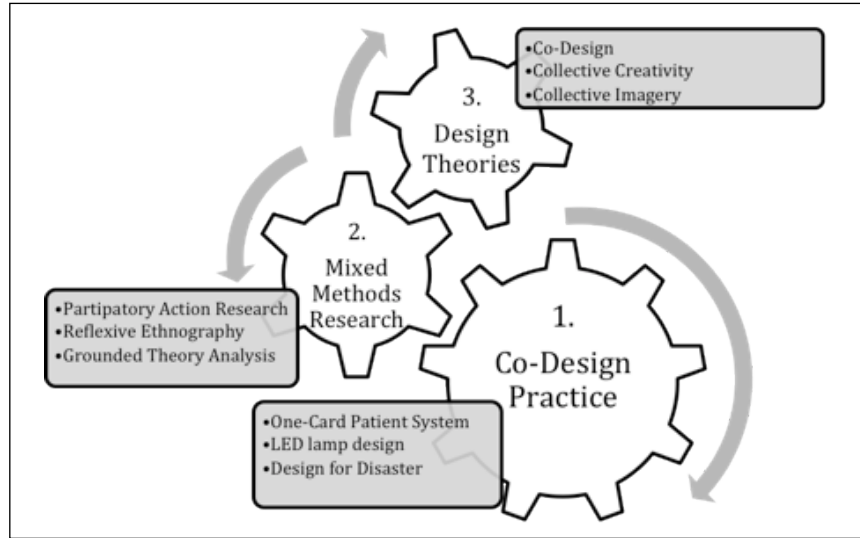


Figure 1 Practice-Based Research Process

Figure 1 shows a general pattern of the practice-based research process. We carried out longitudinal studies over two years through experimental co-design workshops at the DESIS Lab, School of Design, Jiang Nan University; currently ranked fourth in China's for higher education in Arts and Design. The choice of case studies was partly opportunistic, and partly due to Chinese's holistic thinking orientation [33] with their preference to use visual imagery for conceptual structuring reported by earlier studies. [4] First author leads the research as workshop facilitator while carried out reflexive ethnography with the assistance of workshop assistants who are also design researchers. Everyone in the workshop including participants are closely involves in the research as if we are colleagues working towards a common goal.

A mixed methods research approach was adopted for data collection and triangulation. [34] Ethnographic observation on designers during practice reveals the complex world of design studio and uncertainties of the designerly act. [35] Video observation is an especially useful tool for capturing both social and cognitive cues important for the reporting of design discourse. [36] Recent studies also see the use of researchers' own interpretation and reflection to give rise to more detailed study on complex phenomena. [32] We observed and recorded the workshops by writing field notes and ethnographic narratives, and when possible with additional video observation. Design evidence such as sketches, processes, and objects are also collected. We triangulate these qualitative data and analyse them using grounded theory approach. [37] The research as a whole is situational and realised in a hermeneutic circle which earlier studies inform later studies and both contributed to inductive analysis.

Table 1 summarises workshops contributes to this paper: 1) "Design for Disaster" requires design teams to identify a holistic service, product and interaction design to deal with natural disaster; 2) "LED Lamp Design" sets to design product with interaction to adopt LED technology for household. 3) "One Card Hospital Outpatient Service Design" seeks to explore the possibility for patients to have a holistic user journey utilising personalised smartcard. Workshop 1 and 2 set out to develop a co-design tool that is able to externalize team's conceptual structuring with the basis of sharing and embodied through collective imagery without adhering to a process-led design method. Workshop 3 set out to develop an embodied tool that uses analogy through storytelling and theatrical performance.

Table 1 Summary of Workshops and Research Details

| <b>Design Workshops</b> | <b>1) Design for Disaster</b>  | <b>2) LED Lamp Design</b>   | <b>3) One Card System Patient Design</b>                               |
|-------------------------|--|---|--|
| Number of participants  | 50   | 30  | 40   |
| Workshop Duration       | 8 weeks of 9 hours each  | 8 weeks of 9 hours each   | 4 full days  |
| Design Disciplines      | Service, Product, Interaction  | Product and Interaction   | Service, Product, Interaction  |
| Number of teams         | 10   | 5   | 7  |
| Research Methods        | Action Research<br>Experimental workshop<br>Ethnographic Observation | Action Research<br>Experimental Workshop<br>Participant Observation | Action Research<br>Experimental Workshop<br>Video Observation          |
| Data Collected          | Field notes, Visuals   | Field notes, Visuals  | Field notes, Videos, Visuals   |
| Research outcomes       | Collective Imagery Board<br>Creative Emergence Cycle                 | Collective Imagery Board<br>Creative Emergence Cycle                | Collective Imagery Framework<br>Skit Improvisation<br>Complexity Weave |

The research process takes on the action research cycle of ‘plan, act, observe, reflect.’ [38] Informed by the theoretical framework of collective imagery, we plan a tentative schedule for workshop with flexibility to change. Table 2 shows the final schedule after the workshop has taken place. We take action during the workshop to experiment with tools designed by first author. We observe the actions and reflect at the end of each day and sometime after each session or as often as we can, to inform the next cycle of the action research. We revise the plan for next session. For example, session 1 to 4 were planned when the workshop commence with only session 2 with a specific title, session 5 to 9 were schedule rate. The outcomes from the skit improvisation 1 then informed the topics of session 5 to 9 as the workshop evolved over the four days.

Table 2 Workshop 3: A summary of activities

| Day  | Session | Co-Design tool            | Topic  |
|------|---------|---------------------------|--|
| 1    | 1       | Collective Imagery Board  | Contextual Exploration                                 |
|      | 2       | Skit Improvisation 1      | Experiential: A health visit to hospital               |
|      | 3       | Collective Imagery Board  | Creative Emergence: The possibility of ‘one card pass’ |
|      | 4       | Skit Improvisation 2      | Imaginative: Being happy with ‘one card pass’          |
|      | 5       | Design Research Fieldwork | Fieldwork: Visit to hospitals                          |
| 2    | 6       | Collective Imagery Board  | Inspiration and deconstruction                         |
|      | 7       | Skit Improvisation 3      | Simplicity in Complexity: Self chosen topic            |
|      | 8       | Complexity Weave          | Embodied design in teams: Threading stories            |
| 3, 4 | 9       | Combined Skit             | Envision and Enact Final Design Solution               |

### 3.0 Co-Design Tools: Experimental Workshop Outcomes

Several research outcomes resulted from the experiment workshops. We developed three co-design tools: Collective Imagery Board, Skit Improvisation and Complexity Weave.

#### 3.1 Collaborative Imagery Board

First design workshop was carried out with ten teams of third year undergraduate industrial design students participated in three sessions each week to 'design for disaster'. Each team was required to design integrative for service, interaction and product design. First author introduced a collective imagery board for team members to

visualize, imagine and conceptualise design ideas during co-design. The framework gradually emerged into a method through interventions by researcher drawing upon the success of earlier sessions.

In general, each team went through at least three cycles to find a coherent structure of ideas as design concept. We intervene by giving them cues to activities such as deconstruct, adding, sorting, discarding, labelling and linking of design elements which consists of collected facts and imaginative ideas (Figure 2). Once learned, teams begin to use these activities when situation arise. Each team collaborated through the manipulations of elements and recording the display of collective imagery by taking photos of the collaborative board throughout the sessions. The method allows team to rapidly structure and construct design concept within the creative space. Verbalization becomes a supporting channel for the hands on activity of restructuring team's collective imagery.

At the start of the workshop, we ask participants to prepare a large print out of information collected on the design brief and cut them into keywords as design element that are relevant. They then add further elements often in the form of words and also visuals, which sprung into their head as they read the elements spread out on the board. As the board filled with elements, we intervene the activity depending on situation by asking them to either a) link the elements on the board, b) discard the irrelevant elements into a see-through bag, which may be reuse later, c) sort elements into patterns (not just categories), d) take a photo and clear the board to restart with existing elements, or d) label the elements to categorise. Along the way, the team will continue to add, select and discard element as they are see fit.



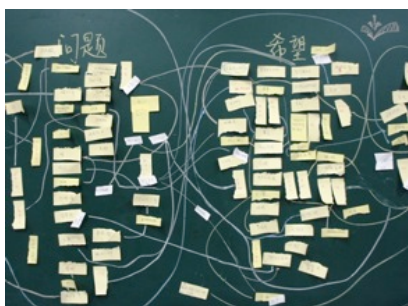
a. Deconstruction



b. Adding and Selection



c. Sorting



d. Association by linking



e. Clustering by labelling



f. Clustering by linking

Figure 2 Collective Imagery Board

These activities on the board bring ideation beyond brainstorming. It successfully visualizes, envision and enact team's collective imagery within their design space. The absence of a prescriptive design process allows creative process to unfold itself. The tangible and tactile method allows team members to engage with each other. The one square meter table and board was designed to be small enough to gather around, giving a social sense of



unity between team members, and allows every one to reach every corner of the board. The workshop room that holds the ten teams was filled with voices as members work with their hands on the board.



Figure 3 Diverse Structures of Collective Imageries collected from workshop 1



Figure 4 Visually Rich Collective Imageries at workshop 2

Figure 3 displays the diverse structures of collective imageries collected from workshop 1. The picture was taken after three sessions during workshop 1. Each board belongs to a team. The early collective imageries depict the formation of conceptual structure that is unique to the team. The diversities of pattern show that same design brief gives unique structure of collective imagery. The uniqueness also coincides with the iterative creative

process that has taken by each team. Due to the possibility to externalize collective imagery, we also reveal individuality in creative process in team settings with some co-designers prefer to work on association, while some prefers to label for categories. Not only so, workshop with differing research focus such as Workshop 2's LED light design, resulted visually rich collective imageries (Figure 4) and a forms to functions process. It could be also due to the training background of the teams, that workshop 1 is mainly science-educated designers and workshop 2 are arts educated designers. The differences suggest that every design project and team is unique and so its design process and way of working.

### 3.2 Skit Improvisation

Drama emerged during workshop 1 as one of the tools used by the participants when their collective imagery board saturated and in need of a method to quickly find a design solution. One workshop assistant suggested using storytelling to thread the elements. First author suggested participants either to tell the story in visual or in drama; the latter proves to be engaging for the class. Consequently, Workshop 3 set out to explore the interaction between collective imagery board and drama that subsequently evolves into skit improvisation.

Workshop 3 focuses on cross-disciplinary design for health with a brief to design one card patient system for hospital. We aim to discover an engaging method to experiment with coherent structure which may suggests plausible design solution. First author designed a co-design tool adopting the concept of Skit. Skit is sketch comedy with script often improvised by actors for their roles, scenes and scripts. Seven teams of four or five designers from leading design practice in Shanghai, design professors and postgraduate designers participated.

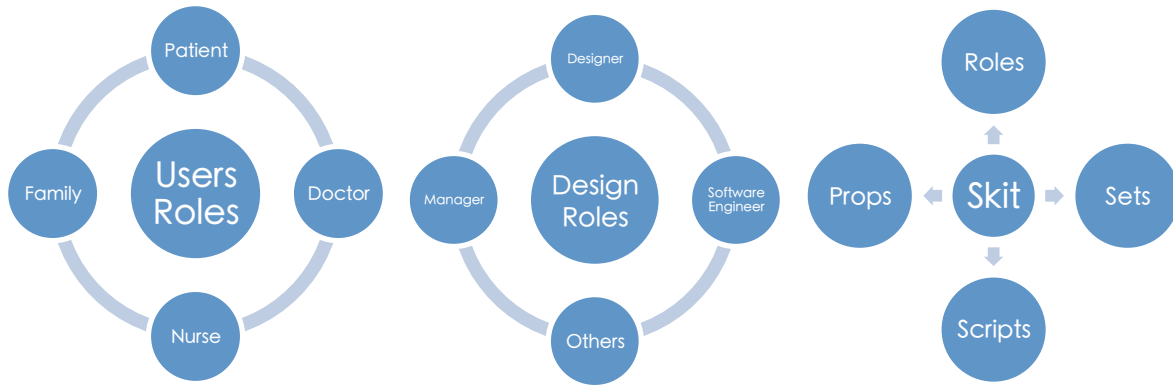


Figure 5 Various Roles in Skit Improvisation

Over four full days, participants were given collective imagery board to work in interval with skit improvisation. Table 2 summarizes the activities during the workshop. Team members were free to improvise important elements of a skit – roles, props, sets and the script. (Figure 5) Each team gets to prepare for an hour before presented two minutes skit to the audience of stakeholders. Fieldwork was carried out to engage with the real situation. During the third days, all the teams were combined to construct a twenty minutes play to envision and enact the final design solution.

Skit improvisation is a useful co-design tool to thread and link design ideas into a coherent structure and provides an intuitive engagement for scenario settings. The embodiment nature of acting out requires actors to be empathetic to the design. The improvisational nature of a skit allows teams to quickly explore various perspectives. Designing using drama effortlessly represents various design disciplines whilst overlap: Script as service design;



Props as product design; Set as environmental design; and Acting as interaction design. The only drawback is that the final play emphasized too much on to perfect the performance instead of the design itself.

### 3.3 Complexity Weave

Before the final drama during workshop 3, first author designed ‘Complexity Weave’ as a co-design tool to converge and thread stories which were earlier improvised separately in teams into one final solution. Workshop participants sit in a big circle and begin to pull woollen thread to symbolise association of their roles, design elements and stories. Red threads represent sharing of roles while blue threads represent sharing of ideas (See Figure 6). The tangible and tactile tool and the activity of weaving brings an understanding of convergence as well as give previously separated team a way to unity. As a result, their collective imageries were able to combine and inform the final drama.



Figure 6 Complexity Weave

### 4.0 Research Outcome: Creative Emergence Cycle

The creative emergence cycle emerged as a pattern from data analysis with six types of activities: inspiration, deconstruction, association, clustering, threading and emergence (See Figure 7). The activities may not happen in a sequential manner with difference sequence in each cycle and some activities can occurs at the same time. The cycle is situational, and more than one activities can occurs at once. Drawing from visual evidence depicts in section 3.1, we report a generic cycle that most teams have taken.

Design begins with **inspiration** when information is collected and inspires further expansion on the information through diary writing. **Deconstruction** concerns the formation of design elements in both words and visuals from this information. Facts and concepts are separated into basic element of ideas in the forms of short keywords, even visuals or objects to allow possibility for the elements to be linked for association. While doing so, co-designers continue to add or select elements inspired by existing ones on the board. Once the board is full or saturated, co-designers begin to work on **association** by linking design elements or labeling design elements to group them. Linking is logical yet intuitively, as two elements only have two possibilities: Linking or not. Once the board is saturated again, participants will be asked to reshuffle the elements to create new collective imagery.

The cycles happen rapid until they eventually ‘feel’ that there is no other way to work with the structure. That is when ‘**clustering**’ often appears. Clusters represent significant areas of interest and importance, which should

be pursued. Also, a very empty space could present design gap. The intervention now requires team to match gap to clusters. These clusters will be chosen to be expanded into a new board.

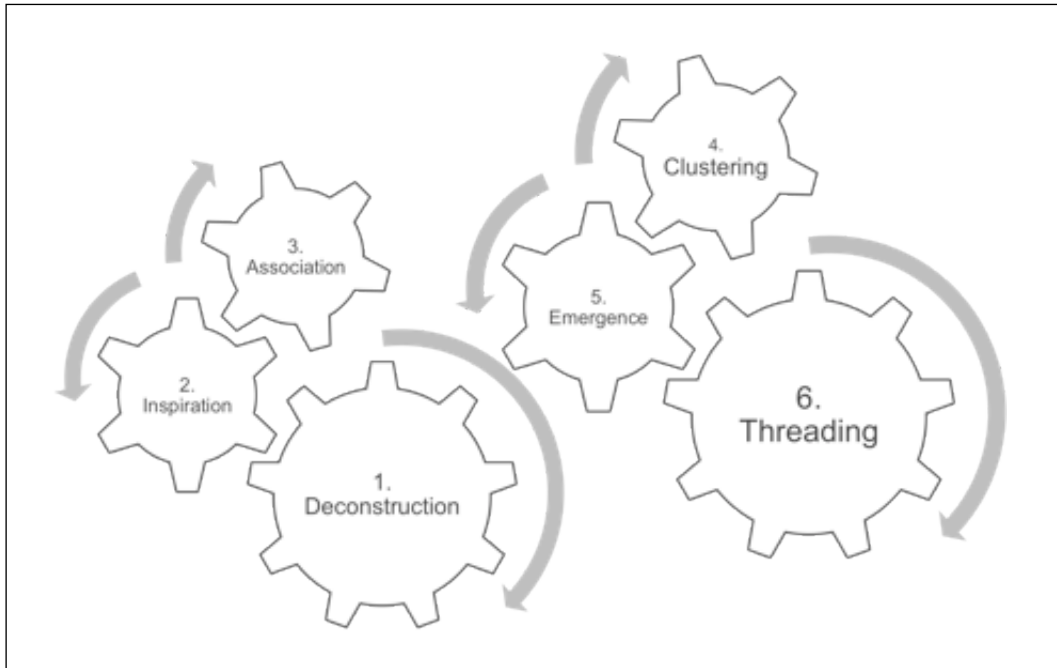


Figure 7 Creative Emergence Co-Design Cycle

**Threading** is an intervention when the board are saturated, facilitator would ask participant to create stories to thread design elements into a coherent argument or structure. Threading through story composition activities such as skit improvisation, is useful to find a very simple and coherent structure through abductive reasoning. Skit improvisation effortlessly allows co-designers to thread simple story from the complex design space, and often very logical. To do so, we intervene at various stages with three types of stories to compose: context story, user story and product story. Context story explores the context of the design brief. User story explores user interaction with the topic and product story allows a projection on what the design can be. Emergence happens when these stories can be mapped with patterns of the design elements, and often inspires insights, research and reflection on the design. The cycle ends with a saturated emergence of a collective imagery that is also a finished structure of concept with patterns mapped and stories told.

## 5.0 Conclusions: Collective Imagery as Co-Design Framework

The embodied co-design tools we developed successfully externalize collective imagery and gives visual evidence to explore the conceptual structuring during cross-disciplinary designing. This research is built upon that anyone can co-design by envision and enact using their collective imagery through conceptual structuring activities supported by embodied co-design tools. In summary, this paper reports a co-design theoretical framework constructed from design practice. It contributes to the field of co-design studies and design theory in primary, and creative cognition in secondary. Three co-design tools were developed based on the framework of collective imagery, in answering to the need of a co-design framework to organize co-design tools. [12] We identify with visual evidence the creative emergence cycle in answering to the suspicion that the co-design process

is different from traditional design development process. [39] Collective imagery is an extension of knowledge in the context of co-design studies built upon Finke's work on preinventive imagery in the field of creative cognition. [15] The tools developed are tangible to allow embodied practice, which was identified by Brandt (2007) as important quality for co-design.

Drawing from this contribution, future research involves 1) further exploration on the informatics of collective imagery how it can inform integration of existing co-design tools and to inform new tools; 2) the development of a co-design theoretical framework base on conceptual structuring of collective imagery instead of a process-led model; and 3) experimental research to combine the tangible and intangible tools in the form of a pervasive system, or a distributed system of elements in both physical and digital form, as a tool to structure concept using the collective imagery framework.

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