

Reflecting on Reflection in Creative Design

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ABSTRACT

Reflection is an integral part of the creative design process. However, details of designers' reflective practices are less known, painting reflection as an enigmatic, un-orderly, and irregular process. This also resulted in design tools that offer little support for facilitating reflective activities. In this paper we discuss findings from our study of creative designers' reflective practice, aiming to understand the details of process of reflection, tools and techniques utilized, and needs surrounding this process. Through a set of contextual interviews (N=12) we found that reflection is predominantly an intentional, repetitive, and frequently practiced activity and designers have specific goals that trigger reflection. Additionally, we found that novel representations of design activities and artifacts can play an imperative role in supporting reflection. We also offer guidelines for the design of better reflection support tools.

Author Keywords

Reflection, creative design, artifact, creativity support tools.

ACM Classification Keywords

H5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

INTRODUCTION

Reflection plays a critical role in the creative design process, assisting designers in problem formulation, idea generation, refinement, and evaluation. Reflection also helps in self-monitoring and assessment. However, little is known about designers' reflection practice, making the process enigmatic; resulting in tools that offer little assistance for supporting reflection.

Reflection is viewed as a set of activities that allows designers to gain better understanding of the design space, generate alternative solutions, and test the alternatives by repeatedly reframing the problem [4]. Reflection is also considered as a form of knowledge gained through our

experience and influencing our assumptions and design choices [3, 5]. Researchers also acknowledged the effectiveness of reflection as a learning tool [1, 2] suggesting that designers, who adopt reflective practices, have better understanding of their design processes [2].

Existing literature confirms the significance of reflection on design and creativity. However, they don't offer details of the process of reflection, activities performed during reflection and its impact on the design outcome, types of artifacts associated with these reflective activities, and tools needed to support reflective activities. Our research aims to answer these questions.

In this paper, we present results from a set of contextual interviews aiming to offer better understanding of designers' reflection practice. Our findings indicate that some reflective activities are closely tied to the task at hand and the phases of design, but others are targeted for self-monitoring and self-improvement. Impromptu reflections are common and triggered by a need to get inspired, to compare and improve quality of artifacts, to remove creative block, and to recall design process. Intentional reflective activities are less frequent, but repeatedly performed to analyze project quality, to estimate invested effort, to learn, and to examine growth as a designer.

REFLECTION IN LITERATURE

Schön described the design process as a conversation with the design materials, associating the act of seeing with sense making, sudden discoveries, and learning from the present situation. He grouped these activities as "reflection-in-action", an activity that a designer consciously or subconsciously engages in [5]. Schön defined reflection-on-action as a post-design cognitive process that enables rethinking about design processes, decisions, and activities, which is closely tied to the notion of experience [4].

Embodied reflection is defined as an act or knowledge that arises through the experience of the designer and is revealed in her action [3]. This research focused on how tacit knowledge can lead the designer to unconsciously engage in reflection while working on a problem.

Critical reflection or reflective design is defined as a practice that brings unconscious aspects of experience to conscious awareness, thereby making them available for conscious choice [6]. This thread of research views reflection as a part of the designers' experience, instead of a

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What does reflection mean to you?
Why do you engage in reflection? How often do you engage in reflection?
In which phases of design do you engage in reflection?
What type of design artifacts do you typically access/utilize during reflection? What are you trying to achieve?
How do you capture/translate lessons from reflection in your design?
What techniques and/or tools do you leverage when engaged in reflection?

Table 1. Sample interview questions.

pure cognitive activity. The main focus is on integration of reflective practices in the design process, allowing the designer to identify unconscious aspects of the design problem, rethink dominant design choices, and even involving users in the design process to consider different perspective on an activity.

Research on reflection in design emphasizes the importance of adopting reflective practices and its impact on the design outcomes; however, it offers little guidance for designing reflection support tools. In our research, we investigate designers' reflective practices to gain insight about designers' needs surrounding reflection and offer guidelines for the design of reflection support tools.

METHODOLOGY

We conducted 12 in-depth, in-situ interviews with professional designers to learn about their reflection practice. Participants were recruited by posting an invitation in several local design organizations sites, various online design communities, design blogs, and listservs. We also employed snowball technique to recruit local designers after the first few interviews. Our participants came from different creative design domains (Graphic design, N = 6, Product design, N = 4, and Architectural design, N = 2) and are highly experienced professional designers (average experience 6.9 years). The participants received \$30.

In these sessions, participants were first asked to share information about one recent project where they have

consciously engaged in different types of reflective activities and to show us physical and electronic traces of these reflective activities where possible. This helped to ground the discussion about the various strategies they had utilized for engaging in reflection. Participants were then encouraged to discuss their overall experience surrounding reflective activities and how that influences their design outcomes. We also encouraged them to show us artifacts, traces of reflective activities, and outcomes of these activities where possible throughout the session. We utilized a questionnaire to guide the discussion, but welcomed tangents. See Table 1 for a list of sample questions asked during the interview.

Each of the interviews lasted two hours, was audio recorded, and later transcribed using thematic analysis method. We collected all electronic artifacts from one project from each designer a priori. We also collected images of the physical artifacts and captured screen shots of the electronic tools and techniques detailing strategies utilized by our participants for supporting reflection. We followed up via e-mails for collecting additional materials that might clarify their reflective practice.

REFLECTION IN PRACTICE

Dimensions of Reflection

Reflective activities can be categorized as impromptu and intentional depending on how designers became engaged in this process. Impromptu and intentional reflections can be further categorized depending on their relationship with any specific project and designers' motivation behind engaging in these activities. Table 2 summarizes characteristics of the common reflective activities.

Impromptu, Task-Centric Reflection

All participants mentioned engaging in impromptu, task-centric reflective activities frequently, several times a day. Reflective activities of this nature involve artifacts from current and prior projects and involve using physical or electronic artifacts depending on the design phase. For example, to refine the style of a web site a designer typically explores several existing web sites. Primary motivation for engaging in impromptu, task-centric reflection is to improve the quality of the task at hand.

Nature of Reflection	Impromptu-task-centric	Impromptu-non-task-centric	Intentional-project-centric	Intentional-non-project-centric
Timing	During design	Any time	Post design	Any time
Frequency	Very frequent	N/A	Frequent	Occasional
Artifacts	From current and past projects	Can be triggered by anything	One project	One/more projects
Goal	Generation, refinement, and assessment of artifacts	N/A	Project evaluation	Overall design and self-assessment
Example activity	Refining an idea by examining other ideas	Getting inspired by looking at an object	Estimating time spent on design	Examining changes in the design process

Table 2. Characteristic of different types of reflective activities.

Questions that designers try to answer during these reflective activities are: “what types of inspirational materials can be used?”, “is it possible to change the direction of the current project?”, “what are the alternate approaches available for solving this problem?”, and “how can I improve this design?”

Impromptu, Non-Task-Centric Reflection

This type of reflection is subconscious, can occur any time, usually not related to any specific design task, and is not triggered by a specific design need. These reflections are typically triggered by any external event or object. For example, visit to a medieval show in a museum provided an idea for a cell-phone cover design. All designers consider these reflections imperative and a natural part of who they are. Eight out of 12 participants mentioned carrying notebooks or recording devices to capture these in-the-moment reflective thoughts for later utilization.

Intentional, Project-Centric Reflection

This type of reflection is initiated by the designer to assess the quality of a completed design task or to gain a high-level overview of a completed project. For example, after designing a social networking site, the designer was examining client e-mails specifying the requirements for the site design and feedback provided on the early ideas. During these sessions, designers want to revisit the process utilized, the design choices made and rationale behind them, challenges encountered and solutions generated, and lessons learned. The most frequent questions that designers try to answer are: “what was the goal of this task (project) and did the final design satisfy that goal?”, “what did I learn from this task (project) and how can I apply these lessons in future?” One designer nicely expressed her motivations as:

“You reflect on your past design so that you can have that informed decisions, definitely reflecting on what has occurred and use it always to improve your design. It’s a learning experience, what have worked and what haven’t, and you also go back and think about (the problem).” – P1

Intentional, Non-Project-Centric Reflection

All participants mentioned engaging in infrequent (ranging from once a week to three times a year) but repeated reflection sessions throughout their design career to evaluate their design style, to assess design quality, to refresh memories of success or failure, and to reminiscence. For example, designers go back to their favorite designs just to feel good. One designer stated this behavior:

“When I go back to previous projects intentionally, it’s not necessarily to find something important; it’s more like those projects are also personal memory to me.” – P2

This type of reflection is driven by questions such as: “am I making progress as a designer?”, “are my designs illustrating my signature?”, “how can I grow as a designer?”, and “how can I replicate my successes and avoid failures?”

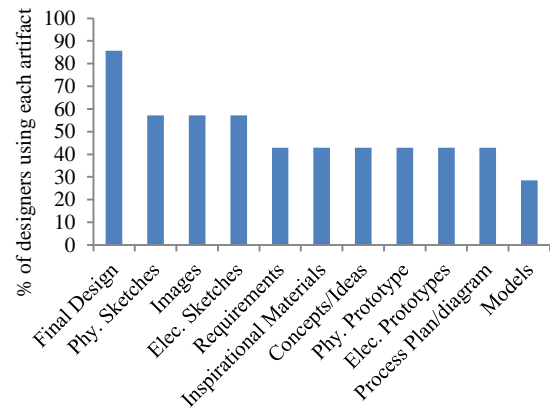


Figure 1. Use of different types of artifacts during intentional-reflective activity.

Artifacts are an integral part of the reflection process. Figure 1 shows utilization of different types of artifacts during intentional reflection. While electronic artifacts are preferred for easy accessibility, physical artifacts are often preferred as memoirs. All participants mentioned going back to their old notebooks just to feel good or to see changes in their design styles.

Motivation and Process of Reflection

Designers want to relive design moments

Reflection is strongly tied to *memory* and *feelings* and a desire to *relive experience*. Designers engage in reflection to recreate specific design moments “to feel good about their design” and access artifacts to get a glimpse of past design activities. Artifacts work as memory triggers in this reminiscing process, helping them not only to recall past activities, but also to get inspired.

Designers construct stories to convey the design process

Designers reflect to understand the process involved, rationale for choosing a particular direction, and project milestones in terms of ideas selected, prototypes generated and refined to recall and construct the design story. However, existing systems do not offer any support for recalling these high-level design activities, putting the burden on the designers to manually create these summaries by utilizing different types of artifacts.

Designers analyze changes in their design process

Designers want to analyze and compare the process employed in different projects, often to gauge their progression as a designer. Designers utilize information such as number and types of completed projects, types of design materials collected, created, and utilized, feedback received at different stages to assess the change in their process. Gaining insight about the utilized process only by examining artifacts is extremely difficult and requires a lot of manual effort and time.

Designers want to understand the context of design

Designers often ask themselves, ‘what was I thinking at that time’ and believe that recalling the design activities would help them to understand the context of design. Artifacts are

the only representations of design activities available from current design tools. As a result, designers select an artifact and continue exploring other artifacts accessed during that time to understand what inspired, motivated, or led to the design activity. This process of exploration continues until the designer finds enough artifacts that offer ‘sufficient context’ or abandons it after several unsuccessful tries.

Designers estimate effort invested as a function of time spent on different design activities

Designers reflect on past projects to estimate effort for a similar new project. While design involves a lot of cognitive activities, lack of external representation of such activities forces designers to consider time spent on collecting, creating, and refining artifacts as an approximate estimation of invested effort. However, it is almost impossible to estimate effort by only looking at physical artifacts or exploring file names or electronic artifacts.

Designers’ associate preference to support revisit

Designers explore favorite/successful artifacts to feel good, to train their eyes and mind, and even to achieve a creative state of mind before ideation. Indicating preference by adding special markers such as “stars” is common for physical artifacts, but most designers discard this practice for their electronic artifacts (see Figure 2). For the electronic artifacts, accessing “preferred artifacts” involves searching and browsing several project folders using file names, locations, file types, or any other information the designer can recall about them. Few designers (3 out of 12) also created separate folders for storing these “preferred artifacts.” However, the difficulty associated with recalling attributes of artifacts and translating these into a search query leads to the abandonment of this process.

DISCUSSION AND IMPLICATIONS FOR DESIGN

In this section, we offer guidelines for designing better reflection support tools based on our observations of designers’ reflective activities and findings from our study.

Visualize the underlying design context

Designers try to get an understanding of the design context, often to recall specific design information or events, such as, design decisions, refinements, inspirations, etc. Visual representations of the artifacts can provide access to the associated design activities. For example, temporal relationship between artifacts’ access history can offer insight about the underlying design activities and thought



Figure 2. Markers indicating designers’ preference.

process involved. Such representations could provide support for understanding the underlying design context.

Interactive, categorical representation to mirror the design process

Designers sift through the stored artifacts to recall the design process utilized. Interactive, time-based representation of artifacts can facilitate analysis of design process in terms of the different design phases, highlighting number of artifacts created and refined in each. Additionally, designers could use artifact types to automatically create a categorical representation of all inspirational materials, prototypes, and models. Such representation could provide better support for understanding the flow of design, helping designers to recall the process utilized.

Capture design thoughts and integrate it with the artifacts

Nature of reflection changes depending on ongoing task, design needs, and status and phases of a project. To create a record of these changing thoughts, options for lightweight note taking could be integrated with the current design tools. For example, electronic post-its, notes, or embedded comments can be used to provide a space where designers can capture their reflective thoughts, explain their design choices, and indicate milestones. This free-form space could facilitate creation of an evolving reflective memory that designers can access to revisit their changing thoughts.

CONCLUSION

The influence of reflection on the creative design process is well-acknowledged; however the details of reflective activities, processes, and needs surrounding reflective practices are less-known. Existing design tools provide little support for facilitating reflective activities. In this paper, we offer deeper understanding of reflection practice, especially focusing on reflective activities and designers’ needs surrounding them. Our findings indicate that novel representation of design activities and artifacts are crucial for supporting reflection in design.

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