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A Multidisciplinary Examination of the Decision-Making Process Used by Designers

Jill E. Stefaniak
Old Dominion University

Monica W. Tracey
Wayne State University, Monicatracey@wayne.edu

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Jill E. Stefaniak
Monica W. Tracey
Wayne State University

College of Education
Wayne State University
383 Education Building
Detroit, MI 48202

Corresponding Author:
Jill E. Stefaniak
Jstefaniak17@gmail.com
248-762-4990

ABSTRACT

Design-thinking is an abductive and participatory process in which designers are required to manage constraints, generate solutions, and follow project timelines in order to complete project goals. This exploration study sought to look at how designers in various disciplinary fields approach design projects. Designers were asked to describe a project and a decision that they had to make. Decisions were analyzed to determine whether they were ready-made versus custom-made solutions and the process by which the designers arrived at the decisions was categorized as idea-imposition or discovery. Results indicated that designers work with multiple constraints while designing and the majority used a custom-made solution following a discovery process.

Keywords

Design-thinking, decision-making, custom-made solutions, decision processes

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There is an element of uncertainty that instructional designers face on every new project that they engage in. While our field has built an infrastructure consisting of models and systems approaches for problem solving, there is no prescriptive process that has been developed to assist with making decisions on projects. Many of the complaints from designers about instructional design models is that these models are too mechanistic and rigid, and do not reflect what actually goes on in the practice of instructional design. While designers may refer to the foundations of instructional design to approach their projects and decision-making, design is a complex and exploratory process in which the designer interacts with problem-solution relationships.

Design-thinking is an abductive and participatory process in which designers are required to manage constraints, generate solutions, and follow project timelines in order to complete project goals. There is an emerging body of literature that suggests that there are commonalities of design that occur across several professional domains (Cross, 2011, Cennamo & Brandt, 2012) and similarities with how designers approach the *design* process. While many people will not claim to follow a process or a step-by-step guide to making decisions, Mintzberg and Westley (2001) found within their research that people follow one of three approaches to making decisions: (1) thinking first, (2) seeing first, and (3) doing first. Decision making entails diagnosis, negotiation, design, and situational assessment (Means et al., 1993). While there is a body of literature growing in the field of decision-making, there is little empirical evidence to assist designers with making decisions, particularly in the area of design-thinking.

Designers and Decision Making

Designers recruited from the fields of instructional design, interior design, architecture, and graphic design, were interviewed by researchers and asked to explain how they approached

making decisions while working on a project from conception to completion. Basic demographic information such as the number of employees/individuals involved within the design team, gender and age of interviewee, number of years that interviewee has been with the organization, and the interviewee's position/title was collected during the interview. The designers selected one project that they had worked on and explained their role within the project, the decisions that they were responsible for making and how they approached making decisions during the length of the project. Decision processes that were illustrated were categorized as to whether they followed a discovery process where they experiment with different solutions and go through several iterations of design before arriving at a solution or an idea-imposition process where they rely on their gut instinct and tend to shy away from incorporating others in the decision-making process. Design solutions were categorized as to whether they were customized solutions that were unique to the specific project or ready-made solutions resembling more of a one-size-fits-all. The designers were asked to specify the number of iterations it took for them to review and settle upon the decisions that they had made during the course of the project.

Hubka and Eder (2003) state that "design problems range from those requiring relatively routine solutions based on generally well-developed knowledge and existing systems, to those demanding highly innovative solutions (p. 800). Once identifying constraints and project specifications, designers must make decisions that take into account personal constraints and biases (Jonassen, 2012). We examined designers' decision-making processes in four design disciplines: graphic design, interior design, architectural design, and instructional design. This study sought to explore three research questions pertaining to how designers in various disciplinary fields approach design projects:

Question 1: Are design decisions made using a discovery process rather than an idea

imposition?

Question 2: Do design decision-making processes predominantly include ready-made versus custom-made solutions?

Question 3: What is the effect of successive iterations through the reflection and acceptance or rejection of distinct solution alternatives?

Discovery Versus Idea-Imposition Process

Studies that have looked at processes followed when making decisions have indicated that decision making usually progresses through multiple phases (Mitzberg et al., 1976; Nutt, 2008). Hubka and Eder (2003) have broken down the process of designing into the following activities: defining the problem, searching for solutions, evaluating and making decisions, communicating, obtaining information, verifying information, and providing representation in verbal, graphical or symbolic form.

Nutt (2008) describes the discovery process as being one that is derived from composite processes made up of steps and sequences that are believed to be useful to the decision-making process. Following various steps and sequences assist the designer with establishing direction while working on the project. An Idea-imposition process leaves directions implicit and often pays little attention to people's needs or interests. Decision makers who follow an idea-imposition process typically know what they want from the very start of a project (Nutt, 2008). Therefore, we explored the following research question:

Question 1: Are design decisions made using a discovery process rather than an idea imposition?

Ready-made Versus Custom-made Solutions

Depending on the amount of time available for a project, designers may be able to refer back to previous projects that they have worked on in order to come up with a solution to a current project. Hale et al. (2006) note that decision makers are more apt to resort to short cuts when making decisions if they are limited on time and are working in very stressful conditions. Ready-made solutions are solutions that are "fully formed and in little need of adaptation" (Hale et al., 2006, p. 311). Design thinking is a very complex and intuitive process where designers often rely on their previous experience as well as their intuition to solve design problems. Therefore, we explored the following research question:

Question 2: Do design decision-making processes predominantly include ready-made versus custom-made solutions?

Decision Process Iterations

In most instances when a decision is made, whether it is for a project or a major organizational change, very rarely is it implemented immediately. Leaders or project managers often take the time to review the decision that was made, even if it is reviewed informally once, prior to implementation. Mintzberg et. al (1976) note that this reviewing process of decisions, often referred to as *cycling*, typically occurs as project managers are able to gather more information and details and insight pertaining to the project. Stefaniak et al. (2012) define iteration "as formally or informally revisiting the problem as new information presented itself" (p.85). For purposes of this study we used that same definition and defined iteration as anytime the project or problem was revisited. Therefore, we explored the following research question:

Question 3: What is the effect of successive iterations through the reflection and acceptance or rejection of distinct solution alternatives?

METHOD

This study consisted of 20 telephone interviews with designers from four different design disciplines. Questions were designed to help identify the decision-making process that they followed when making a decision while working on a design project. Questions were developed to identify the decision being made as well as the solution that they chose and the timeline for implementing the chosen solution. All designers were asked the same questions in order to determine whether they were any similarities with how designers approach decisions regardless of their professional discipline.

Participant Selection

For purposes of this study, we wanted to recruit an equal number of participants from four different design disciplines: graphic design, interior design, architectural design, and instructional design. We obtained a purposeful convenience source from three sources. We sent emails to multiple professional organizations and societies asking leaders in the respective fields to participate. We reviewed alumni profiles from various schools and contacted individuals through Linked In. Finally, we also emailed individuals that we knew worked within the various disciplines asking for their participation. Ultimately, we were able to identify 5 professionals in each of the four disciplines who agreed to be interviewed bringing our total to 20 designers.

Content Reliability

An interview analysis rubric was designed to ensure consistency to the questions that key personnel on the study would ask during the interviews. The analysis rubric also contained definitions for key terms in this study: discovery process, idea-imposition, custom-made solutions, and ready-made solutions. These definitions assisted key personnel with answering follow up questions to determine which categories were most appropriate for the decisions being described.

In order to ensure consistency of how questions would be asked during the interview, the team of key personnel piloted the interview analysis rubric with a design engineer. During the pilot interview, the researchers asked the design engineer to discuss a design project that he had recently completed. The design engineer answered the questions and provided feedback as to whether any questions were too difficult to answer. After the interview, key personnel discussed how they would code and analyze the comments (Delattre, Ocler, Moulette, & Rymeyko, 2009). This not only assisted with ensuring that study participants would be able to answer the questions, it also improved inter-rater reliability amongst the research team.

Personal Interviews

Prior to interviewing the participants, we developed criteria to assist us with how we would classify the decisions that would be shared during the interviews. Key personnel had a firm understanding of the different categories under which the decisions would be classified. Telephone interviews were used for this study.

Each semi-structured interview began with the member of key personnel explaining the goals of the study and ensuring that any participant identifiers would be kept confidential. No recording devices were used during the interview however extensive notes were taken during each interview. Mintzberg et al. (1976) explained that distortion may occur when interviewing decision makers as well as memory failure as to various events that may have led up to particular decisions being made. To alleviate distortion, we typed up our notes from the interviews and emailed them to the participant within 48 hours of the interview asking them to verify the accuracy of the notes.. This gave the participants the opportunity to clarify whether any of their responses had been misinterpreted. The interview protocol is shown in Appendix I.

Approach to Data Analysis

After each interview was completed, the researchers used the analysis rubric to type up the participant's responses. The typed interviews were sent to the participant to review for completeness and accuracy within 48 hours of the interview. This was done as a verification measure and to provide the participant the opportunity to clarify anything that may have been misinterpreted. Participants were asked to review the interview notes and provide comments as to whether any of the content needed to be changed or corrected.

Once participants had verified the content in the interview notes, the researchers reviewed notes individually and met as a group to categorize the decisions that were shared during the interview. Using criteria that was included in the analysis rubric, the researchers discussed whether decisions were ready-made versus custom-made, followed an idea-imposition or discovery process, and the number of iterations used to carry out the decision. This group activity was used as a means to help improve validity amongst researchers during qualitative analysis of the data (Lincoln & Guba, 1985).

RESULTS

Table 1 summarizes data for all 20 participants. Data points include: (a) a description of the decision, (b) design discipline, (c) decision process- discovery or idea-imposition, (d) chosen solution- ready-made or custom-made, (e) the number of decision iterations that took place, (f) the number of people that were on the design team, (g) the length of the project, (h) the amount of time into the project when the decision was made, and (i) whether or not the decision was implemented immediately.

Insert Table 1 about here

Table 2 summarizes the data for the graphic design participants. Table 3 summarizes the data for the interior design participants. Table 4 summarizes the results for the architectural design participants. Table 5 summarizes the results for the instructional design participants.

Insert Tables 2, 3, 4, & 5 about here

Research Question 1

Our first research question sought to explore whether designers used a discovery process versus an idea-imposition process. Of the 20 participants, 17 of 20 (85%) followed the discovery path. These participants followed a process that placed emphasis on logic and analysis (Nutt, 2008). Participants following a discovery process gathered the needs of the project and managed the interests of all constituents involved.

A graphic designer, working solely on a design project to determine what particular frames to use for an illustration display, used a discovery process as she identified different options to display her work that wouldn't interfere with her artistic vision. A challenge identified by the designer was that while graphic designers are often expected to be the vessel of the content, this particular project required her to be involved in the development and dissemination of the content. Budgetary and time constraints required her to evaluate options for displaying her work in a timely manner.

A second graphic designer followed a discovery process for practicality concerns. Tasked with designing a map highlighting landmarks, restaurants, and activities for a large city, this particular designer had to factor in the functionality of the map in making it large enough for tourists to identify places on the map but not too large where it would be impossible to stand on a

street corner and hold. His design team went through three iterations to review the size, cost, and features that could be highlighted on the map before deciding on a final end product.

An interior designer was tasked with designing window coverings that wouldn't compete with her client's architectural design of his home. Working with uneven wall space and space restrictions, the designer went through several iterations to try different types of material that would not encroach upon the limited window space and would highlight the unique architectural design.

Participants that followed an idea-imposition process did not feel the need to gather additional information prior to making any decisions and used an idea-derived direction (Nutt, 2008). Of our 20 designers that we interviewed, three followed an idea imposition process while working on a design project.

An instructional designer who was tasked with modifying a professional development course was able to rely on previous experience working with similar course content to make decisions that would rule out particular options. She was able to draw from past experience and challenges with similar courses to not waste time making the same mistakes. Working on similar projects also helped her identify solutions that were applicable to the new course that she was designing.

An architect that was tasked with designing a waterfront property home using local products also followed an idea-imposition process when faced with cost challenges. This particular designer had originally designed blueprints for a two story home for his clients prior to the 2008 recession. The project had been shelved for a year and a half and when revisited, the architect had to adjust the design to a single story home in order to continue to limit the design to local products as requested by the clients. The constraints imposed by the clients did not offer any opportunities for several options to be considered.

A third designer who was asked to renovation living space for an older client who wanted to move their master bedroom and bath from the second floor of their home to the first floor followed an idea imposition process while working with a limited budget and the request to use existing cabinetry in the home if possible. The project was to be completed while the client was on vacation and the designer did not have many options for redesigning or reconfiguring space due to the limitation of time.

Research Question 2

Our second research question sought to explore whether the types of decisions that designers made were considered to be ready-made or custom-made solutions. Of the 20 participants, 19 out of 20 (95%) arrived at decisions that were custom-made. The majority of our designers utilized a custom-made solution that involved brainstorming alternatives to identify the best approach for their project (Hale et al., 2002).

An architect and his design team used scientific data to arrive at a custom-made solution to make a ceiling more functional for an educational institution. The client had built a meeting room space that had a glass ceiling. The intent for the space was to hold meetings and make presentations to prospective donors of the school. The glass ceiling caused sunlight to interfere with making presentations and the room was not functional three out of four seasons during the year. Additional sunlight streaming through the glass ceiling also played havoc with temperature in the room.

The architect conducted a simulated sun study in the room to measure the angle of sunlight coming in at various times throughout the team. The design team provided 52 renderings to account for 52 weeks in a year. They looked at the hottest spots on the floor. They used the data

from the sun study to figure out where they needed to catch the sun where they needed to block it out the most. By focusing on these spots, they were able to cut out 35% of the project costs.

An instructional designer that was interviewed described a project where she had to design an e-learning course for teachers at a charter school on the topics of effective transitions and instructional clarity. The client wanted a real-world environment depicting learning in a classroom that used real teachers and students. The instructional designer decided to take pictures of teachers from various angles as they would progress and maneuver throughout a classroom so that the learner would feel as though they were participating in the training while looking through the eyes of the teacher. This would provide the client with a custom-made visual experience for their teachers.

An interior designer arrived at a custom-made solution while developing a theater set that was to be used for two different operas. Tasked with designing two sets in one, the designer had to account for how the set would contribute to the whole visual look of the performances including the actors, costumes, and choreography. She factored in all of the activity that would be occurring on stage and various points throughout the operas and built visual models and samples, costume sketches, and color palettes and ran them by other members of the production team to make sure that everyone was on the same artistic wavelength. When asked how she brought everything together in the end she said that she couldn't explain it in words. "It was a visceral thing based on education and experience. I sketched first and I when I had a look that fit, I searched for a setting that it would work in."

During our interviews, only one of our designers arrived at a ready-made solution while working on a design project. Our interior designer who was tasked with renovating living space for an older client while reusing as many materials in the house as possible arrived at a ready-

made solution when determining what cabinetry to include in the new bathroom. The designer did not have the time or the budget to purchase new cabinets or materials.

Research Question 3

Our third research question sought to explore the effect that successive interactions through the reflection and acceptance or rejection of distinct solution alternatives. Successive iterations or cycles assist with gaining greater understanding of the problem and a reduction in complexity (Hale et al., 2002; Jonassen, 2012).

The number of iterations that our 20 designers followed ranged from one to 20. The majority of the decisions (16 of 20) were implemented immediately. Reasons for delays included waiting for materials to be ordered and shipped in that were needed for the continuation of the project, costs, and the number of individuals involved in the decision-making process. An instructional designer who worked with eight subject-matter-experts spent two and half years to decide on what content was appropriate to be included in an introductory college course. Due to limitations involving staffing shortages, the instructional design team had to wait an additional year and a half before their course could be posted online for students to access.

One of the designers that was interviewed had their project delayed for one year before being able to continue on with the project after it became clear that the client was not happy with the decisions that they had proposed. One of the lead architects involved in the project had imposed their own design values on the client and when it came time to making presentations to the investors, the intended purpose for the project had been overlooked and altered.

DISCUSSION

This study sought to explore how designers from multiple design disciplines make decisions. Designing is a complex process that requires designers to rely on intuition, managing constraints

and demonstrating a degree of bravery in order to arrive at solutions. Design thinking (Cross, 2007; Lawson & Dorst, 2009) and reflective design (Lowgren & Stolterman, 2004) are terms now used to describe the specialized activities and particular habits of thought designers exhibit during design. All of the designers interviewed in this study illustrated design thinking activities including utilizing design precedent, a form of design knowledge encompassing designer experiences that affords the basis for design decisions (Tracey & Boling, in press). Each designer regardless of discipline came with varying pools of experience and many were able to arrive at decisions with the assistance of prior learning gained from successes and mistakes.

Design thinking, in any discipline, involves a balancing act where designers cannot rush decisions but also cannot wait too long to gather necessary information. Design is complex and iterative (Visscher-Voerman & Gustafson, 2004), requiring designers to embrace uncertainty as a motivating force. All of the designers interviewed had to cope with uncertainty as they all had to make decisions that were not present at the beginning of their projects. While this study does not provide a model for arriving at decisions, it does shed some light on how designers visceral approach combining education, experience, and intuition to solve design challenges.

Limitations

A major limitation of this study is that due to the convenience sample that was obtained, we cannot generalize the results beyond our study participants. All study participants that agreed to participate were interested in the topic and were willing to discuss their projects and share their opinions of challenges that they faced. Since this study involved participants recounting a project that they had worked on, there is the possibility that they may have left out details or presented themselves in a more positive light.

While individual designers were interviewed, some of the projects that they shared with us involved working with design teams ranging from one to 20 individuals. The number of individuals involved in the projects and the decision-making processes also make it difficult to generalize the results of this study. We tried to address this issue by asking the participants to clarify who was responsible for making decisions on the project and explaining the reason why any delays had occurred during the process.

Future Research

Every participant that we interviewed discussed how they had to work with constraints during their projects. Constraints identified during the interviews included scheduling, budgets, involvement of clients, managing client expectations, functionality of design, and working with subject matter experts. During our interviews, several participants discussed challenges that involved clients not understanding functional limitations, having unrealistic expectations, or not being forthcoming with necessary information. We think that it would be of interest to see how design decisions are made when clients are involved in the process compared to when they are not.

During the interviews, participants shared information pertaining to the number of individuals who were assigned to work on a project as well as the number of individuals responsible for making decisions. It would be interesting to conduct further studies identifying challenges that arise when making decisions while working with design teams as compared to individuals.

While the majority of our participants used discovery processes and arrived at custom-made solutions, many mentioned referring back to previous experience when making decisions. Additional research should be done looking at how previous experience can assist a designer

with expediting decisions on a project based on their years of experience in their respective design discipline.

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APPENDIX
Interview Protocol
A Multidisciplinary Examination of the Decision-Making

Participant Name: _____ M F
Organization Name:_____
# of Years Participant with Organization: _____
Participant's Job Title: _____

First, I'd like to thank you for taking the time to talk to me today. My colleagues and I are conducting a study to explore how designers in various fields approach making decisions while working on a design project. Our goal is to learn about the decision-making process that you use while working on a project.

The information that you share with me will be kept confidential and will not be used to identify you individually. It will be analyzed along with the responses from other participants in order to determine if certain themes emerge that help explain the decision making process. Your participation is strictly voluntary, and you may withdraw from the study at any time.

Do you have any questions before we begin?

1. Can you provide a brief description explaining your job and some of your responsibilities that you have?
2. Can you tell me about one specific project that you recently worked on and completed?
3. What was the approximate duration of the project?
4. How many people were involved in the project?
5. Can you explain what everyone's role was during the project? (i.e. were there subject-matter-experts, project managers, etc?)
6. Can you tell me about one specific decision that you've had to make during the project that has had a significant impact on the outcome?
7. Can you explain the process that you used to make that decision? (i.e. Did you have meetings with other individuals? Did you make the decision on your own without consulting anyone?)
8. How did you weigh your options?
9. Why did you feel like you had to make this decision?
10. What made you choose this decision over the other possibilities?
11. How many times did you review/refine decision over other possibilities? Describe these iterations.
12. Who was involved in the process?
13. When did you finally arrive at your decision? How soon after did you implement it? Why did you implement the decision immediately/after a delay?
14. Looking back now, is there anything you would have changed or done differently?

These all the questions that I have for you. My next step is to type up a summary of this interview and email it to you within the next 48 hours. It would be a great help if you could review the summary that I send to you and make corrections if you feel like I have misstated anything or left anything out. Thank you for sharing your time and input. We really appreciate your help.