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DESIGNERS IN DESIGN THINKING

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ABSTRACT
Design thinking has been a popular topic among the forward-thinking technology and business scenes. Even universities have joined the trend of adopting design thinking as a tool for innovation. While its popularity has opened up new and exciting opportunities for all design professions, when design thinking is packaged as a strategy to deliver innovation it is often implemented like a linearly gated step-by-step process. Thus the value and effectiveness of creativity offered in design thinking is weakened and the results are incremental at best. In these cases, designers, design consultancies, educators as well as business strategy firms have separated the **tools and methods** of design thinking from the **mastery needed to use them**. A designer's creative process is iterative, messy, uncertain, and often leads to failed attempts and frustration. These characteristics are inherent to its organic nature, but ambiguity and learning from failures often lead to opportunities to innovate past the comfort of certainty and status quo**.** In an attempt to develop an organized and reliable design thinking process for the business culture, we have diluted the role of the designer as the expert capable of navigating, managing and leveraging opportunities from the creative challenge. This design mastery is a necessary component to successful innovation teams just as much as mastery with analytical tools and processes, verbal communication, technology and business. This paper offers insight into the adoption of design thinking at a large university in the United States. The authors interviewed students and faculty from Design, Engineering, and Business who have participated on multidisciplinary teams seeking innovation. Though disciplinary tools and methods are successfully borrowed or adapted within multiple fields, this paper suggests that the discipline-based mastery of skills is essential for those tools and methods to be used to their fullest potential.

Keywords: Design thinking, innovation, industrial design, disciplined based expertise

1 INTRODUCTION

In today's globally competitive world, universities and businesses strive for innovation in order to achieve a competitive advantage. A focus on alternative approaches has sparked new interest in creative fields, and over the past decade, businesses have been using design tools and methods as part of their innovation strategies [1]. Subsequently, the practice of 'design thinking' has become complementary to analytical business processes and a desirable approach to innovation that addresses "wicked" or complex problems [2].

But what is design thinking? Do you have to be a trained designer to utilize the approach? Multiple definitions and models have emerged in the last decade. The models discussed in this paper are based on varying design applications and utilize theories and tools from multiple fields including product design, psychology, and anthropology. To begin, Johansson-Sköldberg, Woodilla and Çetinkaya outline a distinction between 'designerly thinking' and 'design thinking.' The authors suggest that 'designerly thinking' refers to the practical skills and innate competencies of a designer and is "rooted in the academic field of design." On the other hand, 'design thinking' refers to the use of design practices and competencies by disciplines outside of design. [3] Similarly, for Roger Martin, design thinking is a distinctive approach that businesses need to use to dive into unknown territory and "solve new heuristics."[4] Design thinking from this perspective is about borrowing designers' ways of thinking and working in order to promote innovation in businesses, as well as balance the analytical business mindset with the intuitive and creative design mindset. Tim Brown, CEO and president of IDEO, is also a proponent of using design thinking in business but he defines design thinking as the "human-centered approach that designers use in the development process". He believes that "drawing from the designer's toolkit allows businesses to better integrate the needs of people, the possibilities of

technology, and the requirements for business success" [5]. While all of these definitions of design thinking endorse the use of designers' tools and methods as a valuable asset in the innovation quest, one thing that is not clear is the role of the designer in the design thinking process. Brown suggests that the traditional role of designers designing products is *"tactical"* and the results are limited in terms of value creation; in contrast, the role of designers at the front end of the design process, before the design and development opportunities have been identified, is *"strategic"* and leads to dramatic new forms of value. [6]

Most designers agree that the popularity of design thinking has opened up new and exciting opportunities for the profession. Many design consultancies have changed their focus from product design to strategic design and are exploring new meaningful areas of application that have significant societal impact. Business strategy firms as well as business schools have embraced design methods and have developed entire programs around design thinking, but the effectiveness of these methods has been put into question. According to Brian Ling from Design Sojourn, "design thinking has not produced the results that business has been hoping for, and despite the best efforts, design thinking will continue to be something only a few can do well. Furthermore, design thinkers that have not been classically trained in design "doing" will likely not realize that great innovative solutions do not come at the end of the process; they come from any part of the process. Design is an iterative activity that only has broad guidelines but no fixed process. What's more important is that critical insights, sensitivity to consumer needs and beautiful solutions come from the creative chaos encouraged by an open design process. All of this got killed when the business mindset required design thinking to have structure, repeatability, and reliability." [7]

The researchers believe that designers, design consultancies, educators as well as business strategy firms have separated the **tools and methods** of design thinking from the **mastery needed to use them**. A designer's creative process is iterative, messy, uncertain, and often leads to failure and risk taking. These characteristics are inherent to its organic nature, as ambiguity and learning from failures often lead to opportunities to innovate past the comforts of certainty. Because the process involves both "problem solving" as well as "problem setting", an analytical approach that relies on a prescribed set of methods often leads to unsuccessful results. By redefining the given problem, the goals, and the means by which to achieve those goals, the problem expands and the process changes [8]. As a result, designers continually adapt their processes in order to manage the instability of a problem. So in an attempt to develop an organized and reliable "design thinking process" for business, the organic processes used by successful designers have been diluted. Designers are trained to expertly navigate and leverage opportunities from the creative challenge, and that design mastery is a necessary component to successful innovation teams. This paper explores mastery in engineering, business, and design, and specifically addresses the value that the design mastery of tools and methods adds to the design thinking process. The paper also addresses how design mastery enhances the 'strategic' role that designers can play in the front end of the design process.

2 DESIGN MASTERY WITH TOOLS AND METHODS

Design mastery is found in the practical skills and innate competencies of a designer. Designers are trained to frame problems and reason through abductive thinking [9] in order to solve problems in new ways and create products that serve the people who use them. The process of problem solving and creative thinking is engrained in the practice of design, where tacit knowledge plays an important role [10]. Beginning in the foundations of design education, future designers are taught and encouraged (through practice) to see problems from multiple viewpoints and approach them through different strategies. These thinking strategies help designers build a framework [9] within which they are taught to "see" things differently, to play, to experiment, and to physically manipulate objects and forms in order to gain a better understanding of how things work, how people interact with things, and how to generate new possibilities. From the moment students are accepted into design school, they are immersed in an environment that rewards experimentation and encourages them to question the challenges presented to them. One of the initial goals of foundational design projects is to break the mindset that is developed through secondary education where there is a "correct" answer and that there is a completely objective way of evaluating work. The process in which students are able to identify opportunities from ambiguity takes time, and occasionally some students are so uncomfortable with the 'moving target' that they switch programs early on. The ones that recognize opportunities in this organic process often thrive in this environment.

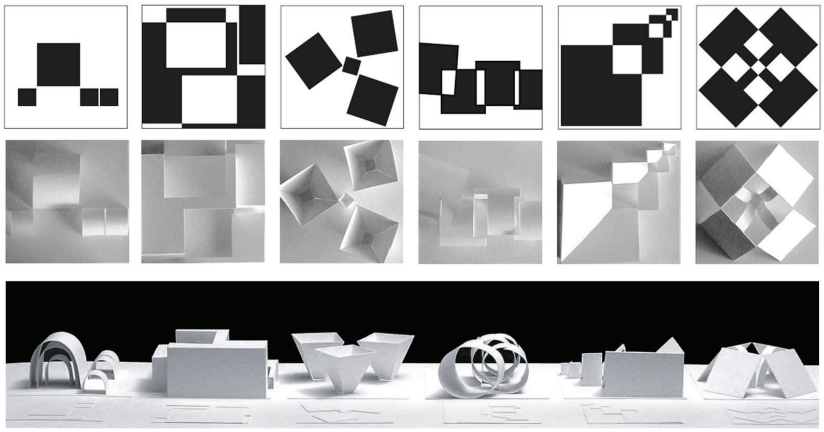

Figure 1. What is the 3D object described by the 2D projection?

This process is also systematic; it typically begins with short exercises that allow individuals to discover sophisticated ways of "seeing" and understanding form (Figure 1). Then the exercises focus on developing refined skills in generating and representing an object (Figure 2) and gradually evolve into more complex exercises and problems that address issues from materials to manufacturing processes to ergonomics to envisioning future experiences for people (Figure 3).

Figure 2. Multiple representations of a concept for a child resistant spray bottle

While the initial perception of Figures 1, 2 and 3 is about the "pretty" illustrations, each one of them is a visualization that represents a different level of complexity in terms of the problems being addressed. The challenge addressed in Figure 1 is to understand projections, proportions, materials and form, the challenge in Figure 2 is to develop a physical concept through different materials and levels of resolution, as well as testing the results, and the challenge in Figure 3 is to identify a need for a service, researching the environment, evaluating alternatives and proposing a complex service that can alleviate the stresses of being a student parent.

Figure 3. Future Scenario of a University Service for Student Parents

The tools used to arrive at these images are typically not deliverables, so it is easy to see the final "form" of the artifact as the primary output and the visualization or form giving as the main value offered by the designer. Expertise in form development and visualization eclipses the mastery needed in arriving at the insights that lead to the development of the new "form". Typically the "form" has a very well defined function that is directly related to the users' needs. The process that leads the designer to this form is messy, uncertain, unstable and unique. The research and design "toolkit" used in developing the child resistant spray bottle from Figure 2 included mind mapping, sketching, prototyping, testing, 3D modeling, focus groups, observations, interviews, etc. To effectively manage,

analyze, and evaluate the information gathered and the ideas generated by the group of designers, expertise in the use of these tools was necessary in order to develop an original solution. These same methods are used in "design thinking" when the application, or problem, takes designers outside the realm of products and physical "form". The need for mastery with the "toolkit" is not as obvious to other disciplines but the capacity to comfortably manage the uncertainty and "messiness" of using the many components of the "toolkit" is the same, regardless of the application. Therefore, in any design project, the designer plays both a "*tactical*" and a "*strategic*" role throughout, which benefits the final outcome or solution.

3 INNOVATION AND DESIGN THINKING IN HIGHER EDUCATION

Seeing the value in producing design thinkers, many universities have begun embedding design-thinking practices into their engineering and business curriculums. At The Ohio State University, this training looks very different across disciplines, as design thinking is modified to meet varying disciplinary demands. To add to the variability, self-help-style books describe hundreds of tools and methods and present design thinking as a strategy for product innovation and business innovation. However, these tools and methods are often removed from the design mastery needed to excel in the design thinking process. As a result, some of the complexities and nuances of "design thinking" are lost in translation, and the results can be limited. A trained designer offers a clearly unique thinking approach to the complex practice of design thinking.

At The Ohio State University, the best examples of innovation-driven courses at the undergraduate and graduate level often bring together students and faculty from Business, Design, and Engineering. Collaboration between disciplines is encouraged, be it a highly specialized project led by mechanical engineers, or an explorative research project led by designers. Members from all three disciplines often use a type of design thinking in the early stages of a project, whether a project is collaborative or not. As a result, in a collaborative setting, the value of design mastery in design thinking is seldom recognized. When designers are invited to participate in multidisciplinary projects their "tactical" roles are frequently called upon, however, their mastery with design thinking and "strategic" roles are underutilized—even when design thinking is being used.

To gain a broader understanding of how design thinking is being adopted into the curriculums of Business and Engineering programs (including mechanical, human factors, and computer science), the authors (a team of design graduate students) conducted interviews with fourteen students (both current and former) as well as six faculty across the three disciplines in question: Design, Engineering, and Business. Participants were asked to describe the value they thought students within their discipline and the other two disciplines brought to group-based projects. During the interview process, participants were also asked to diagram and/or describe the process they go through when trying to solve a problem, shedding light on the "innovation" process and associated methods used by each discipline. Because of the small number of participants, the results of the study are of limited significance, but the qualitative data was useful in understanding the way in which students and faculty perceive their expertise and the value of other disciplines.

By comparing how the members from each discipline responded, the research team was able to gather insights into the skills, processes, and mindsets inherent to each discipline and their general perceived value. It was clear that each discipline offers unique skills and proficiencies, as well as a somewhat predictable way of thinking about a problem. To analyze the survey results, the research team separated answers from Engineering, Business, and Design and coded similar responses. The results offer a summarized self-description of each discipline's creative process and competencies followed by their value as perceived by the other two disciplines.

The engineering students expressed a common focus on accuracy, precision, and reliability, and believed these strengths to be valuable in all stages of the design and development process. Participants in both design and business believed that engineers offered a high level of expertise and a practical approach to the decision making process. All team members perceived engineering processes as established, repeatable, and well defined. The engineers felt most at ease when dealing with physical and technical constraints, and believed that focusing on a workable solution was more important than continuing to explore possibilities or reframe the problem. These findings suggest that engineering training is abstract, intuitive, deductive and sequential, and focuses on optimizing solutions within a given design challenge.

The business students expressed a common focus on communication, creativity, analytical thinking, reliability and repeatable processes. These students believed their strengths to be important for understanding the market as well as identifying and communicating unique and marketable solutions that create value for the consumer. Team members from engineering and design viewed business students as leaders who were capable of seeing the larger scope of a project and keeping the team on schedule. Business students were also viewed as analytical and the go-to person for understanding and optimizing the economic value of a project. These findings suggest that the characteristics of thinking styles taught in MBA programs allow the business professional to bring big-picture managerial skills to the design process.

Finally, the design students expressed a common focus on creativity, visualization, process flexibility, and continual iterations of new ideas (reframing problems, building upon and improving ideas through prototyping). Designers reported that their training focused on making connections and finding patterns, as well as being encouraged to create, take risks, and experiment. The other disciplines viewed designers as creative visualizers who were able to make connections from research and make decisions based on users' needs. These findings suggest that a designer's training in empathy, divergent and convergent thinking, tolerance for ambiguity, as well as concept iteration allows designers to take risks while developing meaningful creative solutions.

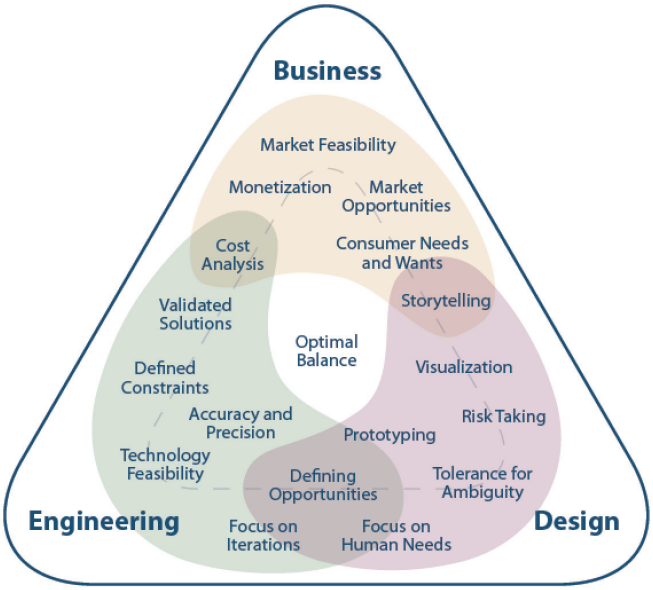

Figure 4. Discipline Based Mastery for an Effective, Balanced Innovation Team

The research findings provide a unique perspective of the perceived value each discipline brings. After reflecting on these differences, participants were also asked if they preferred working in multi-disciplinary teams or teams with people from their own discipline. The overwhelming response was that working in multi-disciplinary teams offered many advantages, and the optimal disciplinary make-up of the team depended on the project. Inspired by the research findings, the above diagram (Figure 4) illustrates the relationship between the three disciplines and the value each discipline brings to an innovation-driven project. Some of these disciplinary skills or masteries are overlapping, but each discipline offers a very distinct role in the design development process. Project needs may lie anywhere within the framework, and depending on the project, certain disciplinary tools and methods may be more appropriate or heavily weighted. However, complex multi-dimensional projects typically benefit from an optimal balance of all three disciplines.

4 CONCLUSION

Although students in Business, Engineering, and Design all use design thinking tools and methods, non-designers typically do not use them to their full potential. As noted in the interviews, business and engineering students use a deductive, linear, and repeatable analytical process. Designers practice a more open-ended, abductive thinking approach that can be challenging for non-designers to adopt. The designer's mastery is critical when using the tools and methods from design thinking.

In addition to the mastery with their tools and methods, the "*strategic*" role designers are able to play makes them a valuable asset during the early stages of any innovation endeavor. Designers can be most valuable within multi-disciplinary team projects when they are addressing open-ended complex problems. Unfortunately, designers continue to be more frequently called in to contribute with aesthetic and form development skills—in their "*tactical*" role. The distinct "*strategic*" skills and design mastery of the trained designer in the early stages of design development are currently undervalued.

While it is clear that designers have not been effective in conveying what design mastery entails, the larger problem may be that the adoption of design thinking and improper use of the tools and methods threatens the future of design and the credibility of designers. There is a need to better communicate the value of design mastery with the methods in design thinking, but there is also a need to develop complementary methods that can combine empathy, analytical and intuitive, deductive, inductive and abductive approaches that allow all three disciplines to equally participate in the innovation process.

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