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Theme 6: Design Thinking - From Process to Product

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Why do we need design thinking?

Abstracts

Design Thinking, which began as a design methodology used in the field of architecture, is no longer the exclusive domain of designers, but is now recognized as being able to help people other than designers to solve problems. However, the overwhelming endorsement of Design Thinking begs the question: is Design Thinking really all-powerful? This paper completes the understanding of design thinking by analyzing several specific questions about it. The main points of the paper include: the definition of Design Thinking, how Design Thinking works, the unity and uniqueness of Design Thinking, the five stages of Design Thinking, Practical Examples of Design Thinking Success, and the specific problems designers face in Design Thinking. Among them, this thesis focuses on analyzing the problems faced by designers in design thinking and the reasons for the problems, and mentions the precautions to be taken to cope with these problems. This paper aims to provide some reference for those who are not yet familiar with design thinking.

Introduction

Design thinking, a term that has become very popular in recent years, emerged at the end of the twentieth century and was initially applied by engineers and architects in product and building design, but has since gained recognition in the business world for its contribution to improving innovation and competitiveness. Education has also begun to adopt design thinking as a means of developing students' problem-solving skills. The evolution of design thinking has involved experts from multiple fields, such as engineers, designers, business strategists and educators, who have collectively contributed to the evolution and popularization of the concept. Brown believes that design thinking, as a method of innovation, is powerful, effective, and broadly accessible, and can be integrated into all aspects of business and society, where it can be utilized by individuals and teams to generate groundbreaking ideas that can be implemented to thereby making an impact. (Brown & Katz, 2009, p16)

However, is design thinking really omnipotent? What exactly is it? Can it be replaced by other tools? Does the use of design thinking create problems? This paper will examine these questions to understand the nature and workflow of design thinking, as well as some of the problems that can arise when designers use design thinking.

What is Design Thinking

To study design thinking, first we need to understand what design thinking is. Design thinking is considered to be a creative approach to problem solving and has become popular as a method in design. It is also said that design thinking is an important tool for designers to think when designing or a way of reasoning/creating meaning in things. There are also many different ways of saying it.

Definitions of design thinking are actually very vague and often misunderstood and misused. In recent years, there have been several attempts to reach a consensus on one

or more modes of design thinking. (Baker III & Moukhliiss, 2020, p7) Yet to this day it still has no universally accepted definition, and even the word itself has some controversy among its proponents. The word first appeared in an article posted by Peter Rowe, a professor of architecture at Harvard University. However, a review of the content of that publication shows that the term was used primarily for architectural design and does not reflect the meaning of the term as it is currently widely used in a variety of fields. In terms of how design thinking is currently used, the actual promoter of the term can be said to be the design consultancy IDEO and its leadership. IDEO's own strategy reflects the evolution of the concept: while they initially focused on product development, they have now expanded their business to include the design of services, strategy, and even education and other social systems. (Liedtka, 2018)

Practitioners and practitioners of design thinking are not in a position to provide a detailed definition of design thinking; they only vaguely state that design thinking is



Figure 1 Brown's 2009 presentation on Design Thinking

"what designers do" or "the application of designers' principles, approaches, methods, and tools to problem solving." In particular, Brown emphasizes that design thinking is a human-centered activity: "Design thinking is a methodology that uses a designer's sensibilities and problem-solving methods to meet people's needs in a technically feasible and commercially viable way. In other words, design thinking is human-centered innovation." (Figure 1) Designers are seen as being competent enough to understand and interpret the problems faced by users and their needs. Brown believes that in participating in the design process, they may develop a higher level of buy-in to new solutions. (Brown & Katz, 2009, p18)

All in all, there are so many different opinions on the definition of design thinking that it is difficult to find a single point of view. Instead of defining it, it may be more meaningful to study the characteristics and working methods it possesses. Through the collection and analysis of literature and website content, the characteristics and ways of working that Design Thinking should have can be summarized as follows:

Conditional creativity, i.e. what is produced must not only be creative, but also confirm that it is within a framework that is not divorced from society and reality. Human-centeredness, i.e., design is customer-oriented, and design thinking must constantly consider how what is created will meet the needs of the customer. Environment-centered, where today's design thinking requires that environmental interests be placed on an equal footing with human interests as a major constraint on the design process. (Owen, 2007, p24) Adaptable, i.e., adapting to the unique needs of the user in the production process; adapting to the changing needs of the user in the use process. Diversified, for creativity, to be inspired to create you need a wealth of knowledge. These points are crucial to the work of design thinking, but design thinking is not limited to this, according to the changes in the work scene, design thinking may also produce richer and more specific characteristics.

Consistency and uniqueness in design thinking

While there is no universally accepted definition of design thinking, what about the practical ways about it? Before we can discuss whether design thinking is useful or not, we need to know if there is a standardized process about how it actually works.

Information about the practicalities of design thinking is well documented on the web, with many design firms extensively describing their views on the process on their websites, and some educational institutions' descriptions of design thinking courses explaining in great detail how it works. There is also a large body of literature that organizes the *modus operandi* in more detail. Through the collection and browsing of these materials, it can be found that, despite some differences in terminology and descriptions, they have a relatively consistent view of how design thinking actually works. That is, the first stage is data collection, followed by defining the problem and thinking through the solution, the fourth stage is prototyping, and then testing. After completing a full process return to one of the previous phases to begin work again. The process emphasizes an iterative design cycle that develops a deeper understanding of requirements through ongoing user research, then develops new ideas through ideation, and then experiments with them through prototyping and testing. (Liedtka, 2018, p11)

In summary, in the literature and websites reviewed, both design theory and business practice seem to have reached a unified perception of the operational process of design thinking and the purpose of the work, makes a compelling case for the internal consistency and coherence of the design thinking process.

Having established conceptual coherence, we now move on to divergent validity testing and question the uniqueness of design thinking as an approach. That is, is design thinking irreplaceable?

Considering the multiple processes of design thinking it is not surprising that elements

related to design thinking can be found in much of the literature. Whether it's human-centered thinking in design (i.e., empathy); brainstorming, which is widely used in ideation; or testing prototypes in business practices, these important processes or tools in design thinking are well known in isolation. So they can be found in much of the literature unrelated to design thinking. However, if the elements of design thinking are connected and viewed as a systematic process for solving problems, it is clear that design thinking is indeed distinctly unique. The concept of design thinking provides an integrative framework that combines modes of creative reasoning with a specific set of processes. It has a distinctive set of practices and processes and a consistent set of ways of thinking: treating the problem, rather than just its solution, as a postulate that will lead ultimately to more creative and value-added solutions; The risk of design failure is minimized by using the information-gathering phase of empathy to gain insights into the user's emotions and their practical problems, and translating them into design requirements thus generating new ideas. Thus, research to elicit better ideas rather than just testing ideas will lead to better results. (Liedtka, 2018, p23) There is also an assumption that experimentation is more stable than analysis as a method of decision-making in an environment full of uncertainty, and that continuous learning and iteration of hypotheses will gradually reduce their risk and increase the likelihood of success in the innovation process. In addition, the use of low-cost materials, early iteration and rapid construction of concrete prototypes, used in conjunction with small-scale market experiments, can involve customers in the design, provide an earlier understanding of the solution in the design process, and improve the accuracy of feedback from potential customers. By working conceptually, it was also possible to justify design thinking.

The Five Stages of Design Thinking

After the study of design thinking coherence above, it can be known that its operational process can be summarized into five consecutive stages, each of which is indispensable and should be carried out in subsequent stages without discarding some of them. (Wolniak, 2017, p13)

The first stage is Empathize, where issues of the product user population are understood through detailed surveys and data collection. In that case, detailed information about the product users and their needs can be found. Design thinking begins with a thorough analysis of the needs of the product's primary and potential users and their expectations, as well as an understanding of the technology used to make the product and the competitive conditions in the marketplace.

The second stage is Define, in which the team needs to clarify user needs. The interdisciplinary team should synthesize the information gathered during the empathy phase to define the nature of the problem. The design brief should present the client's requirements for the work. These requirements can be superficial or in-depth, ordinary or innovative. The design summary shall include specific objectives to be achieved by the design. Standard thinking frameworks and habits need to be discarded during the analysis process in order to design solutions that are both creative and client-oriented.

The third stage is "ideation", which involves coming up with ideas that are as rich and varied as possible, using tools such as brainstorming. Coming up with good ideas requires not only technical knowledge about the subject matter, but also the courage and creativity to come up with bold ideas. To facilitate this process, excessive restrictions on the team's ideas should be avoided. This stage should be accomplished by choosing the most appropriate ideas in conjunction with the user's sensibilities and then creating a prototype of the solution based on them. The design team may also choose to utilize one of the many art and design movements as an aid during this phase. As the progression of the ideation phase continues, it can be easily spotted whether the definition phase has produced any misunderstandings about the user and whether the user's feelings have been adequately taken into account.

The fourth stage is Prototype, in which it is necessary to build a solution or solutions in order to produce a prototype and test it. During the build phase, the prototype is a

substantial representation of the problem solution. The basic function of a prototype is to provide users with a tangible and visible reference for the solution, and to get quick feedback from users for improvement. In this way, it is possible to check whether the project meets the requirements set out by the client or whether the concept needs to be changed. Prototypes give the design team and the client the ability to more intuitively understand the actual situation and elements of its look, feel, and touch.

The last stage is testing, where a prototype that is the final solution should be shown to users and used to get their feedback on the phased product. In this way, the usefulness of the product can be tested. At this stage, the aim is to understand how well the product works when used in a real environment and to confirm the completion of the solution based on the data. The necessary parameters need to be recorded so that the test results can be clearly identified. As many people as possible should be involved in the testing process during this step. If this step is neglected in the design, it may result in the proposed solution not fully meeting the assumptions and expectations of the customer. (Wolniak, 2017)

Practical Examples of Design Thinking Success

There are so many success stories that can be found about design thinking, and it has played a key role in fields of all sizes, from personal design to large organizations. I will list two success stories about design thinking below.

The Oral B brand wanted to increase the functionality of its main product, the electric toothbrush, and enlisted the help of two professional designers. Oral B wanted to be able to appeal to users of its electric toothbrushes by adding features such as tracking the frequency of brushing, observing gum sensitivity, and playing sounds. However, the designers, on hearing these requests, pointed out that brushing is a slightly redundant behaviour for many people. Users won't want extra features when brushing itself isn't that popular, and in many cases redundancy leads to more stress. Rather than

these features, they recommended solutions that would improve the user experience without causing excess stress.

The first suggestion is to allow the toothbrush to be charged wirelessly or with a cable, especially when the user is on the go, without the need to connect a special dock. The other proposal was to make it easier for users to order a replacement brush head by having the toothbrush connect to their mobile phone and send reminder notifications. Both of these options were very popular with users because they correctly defined their needs in the second part of design thinking, rather than the product the company wanted to launch. (Figure 2)

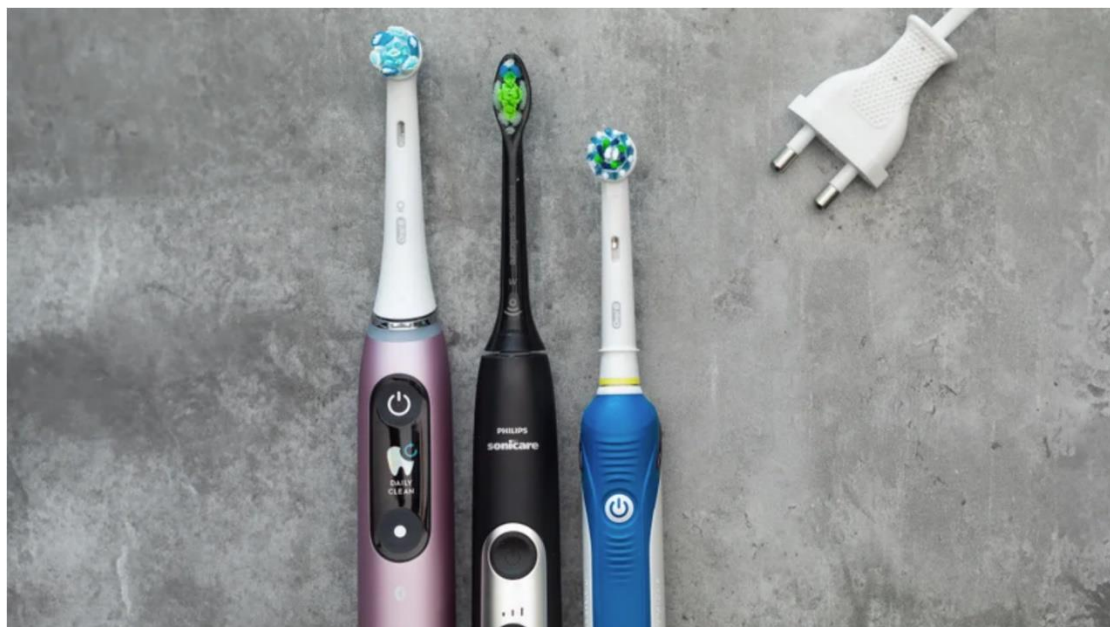


Figure 2 Oral-B's product iterations

Airbnb is based on the concept of connecting travelers with homeowners whose homes have empty rooms for rent, a service-based website. The idea was great and the need existed on both sides, but in the first 6 months, the site was generating less than \$200 a month in revenue. To solve this problem, Airbnb's founders utilized a design thinking approach to improve the site. The first step was to understand what difficulties tenants and homeowners actually face when operating, and to experience the rental process firsthand as a tenant to fully utilize empathy. Then organize the problems experienced

and define the requirements. After a round of brainstorming start to generalize the useful solutions. Then started prototyping, improving the website design, focusing on the customer experience, and then testing and feedback. Eventually, the company



Figure 3 Promotional page for Airbnb

succeeded in improving its operations and today has total assets of more than \$16 billion. (Figure 4)

By these two examples, it can be effectively proved that design thinking can indeed play a positive role.

Specific issues designers face in design thinking

By summarizing the five stages of design thinking, we understand that the role of the designer in the design thinking process is multifaceted and critical. Designers are not only problem solvers, but also bridges between user needs and solutions. They use creativity, user-centered thinking, and a systems perspective to transform abstract concepts into practical products or services. The role of designers is not limited to forming initial design concepts; they are also involved in every stage of design, including prototyping, testing, and iterative improvement. Designers' core skills, such as creativity, visualization, systems thinking, and teamwork, are the cornerstones of

practicing design thinking. As the most important participants in the design thinking process, designers often face problems as well.

Aspects related to the empathy stage, motivation and emotion can have an impact on a designer's work in design thinking. Although design thinking is a cognitive process, actual behavior is determined by cognitive, motivational, and affective processes. Emotions, as part of the designer's thinking process, if influenced in a specific way, the designer's cognition will change, behavior will be affected, and so will the outcome of the design. In addition, other elements in the affective domain, such as preferences or attitudes, are also possible to have an impact on the design thinking process. (Badke-Schaub, Roozenburg & Cardoso, 2010, p21) Since the process of empathy can be influenced by emotions as well as other factors, the definition phase can also face uncertainties that may ultimately lead to misinterpretation of the actual needs of the users. In addition, during the design thinking process, designers' over-emphasis on the needs of a particular user group may lead to the neglect of other key factors such as cost-effectiveness, technical feasibility, and the needs and preferences of other important user groups. For example, when developing a fitness application, focusing too much on younger users may overlook the needs of older users.

During the idea stage, designers may subconsciously rely on traditional or previously successful solutions and not move forward in one of the many possible directions with uncertainty. This is due to factors such as cognitive bias and mental comfort zones. Humans are naturally inclined to avoid risk and uncertainty, and the human brain tends to take the path of least cognitive effort. In the field of design, exploring new solutions requires a higher level of cognitive investment and creativity, and can mean higher levels of uncertainty and risk. People tend to seek, interpret and remember information that is consistent with their existing beliefs and knowledge. Designers therefore subconsciously look for evidence that supports the solutions they already have and ignore information that contradicts it.

Additionally when making design idea choices, designers will have to face the issue of balancing design elements, with the core criteria for design decisions often being technology-centric, organization-centric, or human-centric. For example, decisions that overemphasize technology in pursuit of getting clean data for prediction may sacrifice privacy, security, or ethics. An overemphasis on organizational decisions to prevent potential litigation may create excessive bureaucratic procedures or mechanisms that become meaningless and waste employee time. An overemphasis on human decision-making may create rules and environments that are too lax, thus, it affects production and efficiency. These elements are connected to each other, and changes in one of them can have an impact on the others. Striking a smart balance between these elements is the most important place to be. When decision-making overly prioritizes one of the three, the resulting imbalances in the system pose many challenges. (Baker III & Moukhliiss, 2020, p27)

Designers also face problems during the prototyping and testing stages. You can never be sure if the final product will be successful until testing is complete; after all, there are often surprises and oversights in the product design process. Instead, designers need to determine whether all potential solutions need to be prototyped, and what elements the prototype will test. Once testing is complete, the iterative process of product and design thinking can lead to excessive consumption of time and resources, especially in a rapidly changing market environment. Redundant prototyping and design can lead to decreased efficiency and increased costs in the product development process. Designers need to make appropriate trade-offs between prototyping and testing to prevent inefficiencies.

Finally, design has a huge impact, both intentional and unintentional, and sometimes unintentional factors can lead to negative social, environmental, and economic impacts of design, such as cultural insensitivities and stereotypes; technological dependencies and social disconnections; increased production and maintenance costs; and other types of problems. If this possibility is not adequately scrutinized at some point in design

thinking, the probability of accidents increases. So out of responsibility for their designs, designers also need to reflect and learn from the constant iteration of design thinking, relying on artistry, intuition, critical thinking and ethical reasoning skills to solve tough problems in the process. (Baker III & Moukhliiss, 2020, p31)

Conclusion

In summary, it can be concluded from the research and analysis of design thinking that there is actually no uniform definition of design thinking, and many designers have different views on its definition. Practitioners in other industries also have completely different definitions of design thinking according to the needs of their own industries. However, in terms of how it is practiced, it is certain that there is a unified view of Design Thinking across all fields. At the same time, it is unique in that it provides a framework that combines a creative reasoning model with a specific process to form an irreplaceable workflow. This process usually consists of five stages, 1. Empathize, 2. Define, 3. Ideate, 4. Prototype and 5. Test.

Furthermore, in applying design thinking, designers will undoubtedly encounter problems. As a problem solver and a bridge between user needs and solutions, designers face problems at every stage. These include the impact of emotions and environment on the design process; the impact of instinctively seeking past successes on innovation; the impact of highlighting a single design element on the balance of the design; and the impact of the trade-offs between prototyping and testing on the final result of the product.

Finally, the creation of a design often also means big changes and the possibility of surprises. In order to avoid such surprises as much as possible, designers need to eliminate any negative factors in their design thinking and continue to reflect and learn through iterations. Any immature designer will grow through this process and eventually become a better designer while becoming more proficient in the design

process and learning to solve problems in design that could lead to surprises. This is why we need design thinking.

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Figure 2

Oral-B, (2023).<https://www.expertreviews.co.uk/health-and-grooming/1405326/best-electric-toothbrush>

Figure 3

Airbnb,(2020).<https://jayvas.com/wp-content/uploads/2020/11/airbnb-real-estate-company.jpg>