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Design Thinking: A Review Paper

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Abstract: *Design thinking is an analytic and creative process in which a person is encouraged to experiment, create and prototype models, gather feedback, and redesign. The literature has identified several characteristics (e.g., visualisation, creativity) that a good design thinker should have. Design and design thinking have been recognised as valuable contributions to business and management, and the number of higher education programmes teaching design thinking to business students, managers, and executives is increasing. Multiple definitions of design thinking, as well as a variety of perspectives, have led to some confusion about possible paths. Design, like problem solving, is a natural and widespread human activity. A design process begins with a need and discontent with the present situation, as well as a determination that something must be done to fix the problem. Many scientists, in this opinion, have been creating and behaving as designers throughout their careers, while not always being aware of or realising that they are doing so..*

Keywords: Design thinking.

I. INTRODUCTION

1.1 Frameworks Theoretical

Design entails intentional behaviour aimed at achieving certain objectives and the production of solutions. Design can be used to solve a problem that affects a single person or a group of people. Design is not seen as a privilege reserved for a select few in the field of design. On the contrary, "we all can, and do, design and that we can learn to design better" (Lawson, 2006, p. vii). Within the academic discipline of design, the notion of design thinking has been of central importance for more than thirty years.

Design thinking can be described as "a discipline that uses the designer's sensibility and methods to match people's needs with what is technologically feasible and what a viable business strategy can convert into customer value and market opportunity" (Brown, 2009, p. 86). Design thinking is generally referred to as "applying a designer's sensibility and methods to problem solving, no matter what the problem is a methodology for problem solving and enablement" (Lockwood,2010, p. xi). More recently, design thinking has moved from product and process design to a key factor in company strategy (Bucolo & Matthews, 2010; Carlopio 2009).

To a large extent, stories and case studies of work done by design firms such as IDEO, which have been working in new product development for decades, have popularised the concept of design and design thinking in the business literature (Brown, 2008, 2009; Hargadon & Sutton, 1997). In these cases, design thinking is widely understood as a human-centered approach to innovation that includes inspiration, ideation, and implementation in a cyclical and iterative manner that includes prototyping, building to think, using stories, and having an inspired and inspiring culture (Brown, 2008).

II. PROBLEM-SOLVING THROUGH DESIGN THINKING

Designers strive to create solutions that are appealing to consumers, practical for clients, and achievable given technological and design restrictions. The notion of wicked issues is used to apply design thinking to problem-solving settings, based on Rittel's first definition of social planning problems as indeterminate (Churchman, 1967; Rittel & Webber, 1973).

Because so many people are paid to design things and systems, Lawson (2006) argued that design challenges are the most essential category of problems to explore. It is commonly acknowledged within the idea of design thinking that there is more than one appropriate way to do things. Designing or bringing about alternatives, as opposed to making decisions, is what a design mentality entails.

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The goal here is to identify the optimum solution given the available skills, time, and resources. It is assumed that design will need the creation of new possibilities. A decision attitude, in contrast to a design attitude, stimulates new possibilities by the management as an idea producer. "A design mindset views each project as an opportunity for creativity that includes a questioning of underlying assumptions and a desire to leave the world a better place than we found it," according to Boland and Collopy (2004).

The benefits of design thinking in terms of issue formulation, techniques, solution processes, reasoning, and outcomes are highlighted in Glen et al(2014) .'s comparison of rational-analytical thinking and design thinking approaches. The generative aspect of design thinking in producing new solutions is not restricted to corporate contexts, and there is a large body of literature on the topic of social innovation. Brown and Wyatt (2010), for example, demonstrated how design thinking may generate hundreds of ideas and, eventually, real-world solutions that benefit organisations and the people they serve.

Integrative thinking is a term used to explain design thinking applied to company strategy and change (Cooper, Junginger, & Lockwood 2010; Martin, 2009). This method of design thinking focuses on innovation and business transformation, as well as the identification of unmet needs and possibilities, as well as the creation of new visions and scenarios. The capacity to collect fresh information is a key component of design thinking, however practitioners may use different techniques and tools (Bucolo & Matthews, 2010). The strategic usefulness of design thinking will, however, be determined by combining design tools with a thorough grasp of organisational innovation.

III. METHODOLOGY

The research was carried out using Internet search engines, business literature, and research papers.spanning a number of colleges, into educational programmes, courses, and units, as well as course content to look at how design and design thinking are taught to students in business schools all across the world. Some information was available in various formats on the internet. For instance, a unit is frequently A summary was published online to summarise briefly what learning goals were assessed and how they were assessed. However, in a few small situations, the scope of the programme and its week-by-week learning activities were disclosed online. Many searches necessitated making direct contact with the institution to learn more about the program's curriculum and activities. By examining programme content and concentrating on foreign business schools, The following outcomes were achieved using multidisciplinary units that included business.

Over the course of four weeks, two types of searches were undertaken to gather information on design and business and management courses. Degrees and courses in innovation and entrepreneurship, as well as general management and education programmes, were investigated at foreign and Australian institutions. Professionals in the field were also contacted to confirm the nature and correctness of our results.

The following are some of the design categories:

Human-Centered Design (HCD) is a term that refers to the Human-Centered Design is described as a design approach that prioritises people or consumers and their requirements over specific technological constraints. Innovation happens when business, technology, and people collide, resulting in dramatic, new experience innovation. The user is the one who decides whether or not a product or service should exist. This approach is backed up by design firms like IDEO and the Stanford D-school, who define design thinking as a specialised way for non-designers to evaluate and use design processes.

Integrative Decision-Making

The capacity to actively confront the contradictions between conflicting models and, rather than choosing one at the expense of the other, to provide a creative resolution of the tension in the shape of a new model that incorporates components from both but outperforms them both.

Management of Design

A paradigm for design as a differentiator, integrator, and transformer, as well as excellent business, was developed based on research on design-oriented European small and medium companies (SMEs).

Design as a Plan

This area is still evolving and has a lot of room for improvement. It combines human-centered design ideas and processes with strategy components such as Porter's activity maps (Armistead & Clark, 1993) to provide a whole-of-organization approach to design as a strategic and operational process with the goal of achieving long-term competitive advantage.

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Design thinking is a problem-solving method based on a set of abilities. The method has been around for decades, but it only gained popularity outside of the design industry until Tim Brown, CEO and president of design firm IDEO, published a Harvard Business Review essay titled "Design Thinking" in 2008.

Since then, the design thinking method has been used to create new goods and services, as well as to solve a variety of challenges, ranging from designing a business strategy for selling solar panels in Africa to running Airbnb.At a high level, the processes in the design thinking process are straightforward: first, fully comprehend the problem; second, investigate a wide variety of potential solutions; third, iterate widely through prototyping and testing; and finally, implement using standard deployment techniques.

The abilities connected with these processes enable people to use creativity to address real-world challenges more successfully than they would otherwise. They are simple to learn, but they need work. Setting aside your own prejudices, for example, is critical when attempting to grasp a subject, but it's difficult.

For creating alternative answers, creative brainstorming is vital, yet many individuals don't do it very effectively. It is also vital to engage in modelling, analysis, prototyping, and testing throughout the process, as well as to truly learn from these numerous iterations.

The capacity of practitioners to accept new understanding that skills and equipment may vary is an essential aspect of design thinking. The strategic value of design thinking, on the other hand, is defined by a combination of the application of design tools and a thorough grasp of organisational innovation.The difficulties of innovation To be successful, the innovation process must deliver three things: superior solutions, reduced risk and change costs, and employee buy-in.Therefore, through time, businesspeople have evolved the ability to make fully informed decisions in order to attain those goals. However, when attempting to implement it, businesses typically face additional challenges and trade-offs. What is the distinction between problem-based and solution-based thinking? Solution-based thinking, as the name implies, focuses on finding solutions; coming up with something constructive to successfully address an issue. Problem-based thinking, on the other hand, is prone to fixating on roadblocks and restrictions.

IV. Design Thinking's Four Principles

The human rule is as follows: Any design effort, regardless of context, is social in nature, and any social innovation will return us to the "human-centric point of view."

The ambiguity rule is as follows: Ambiguity is unavoidable, and it cannot be eliminated or simplified too much. Experimenting at the frontier of your knowledge and skills is essential for seeing things in new ways.

4.1 What is the difference between problem-based and solution-based thinking?

Solution-based thinking, as the name implies, is concerned with finding solutions; that is, coming up with something useful to address a specific issue. Problem-based thinking, on the other hand, tends to focus on roadblocks and restrictions.

4.2 Design Thinking: The Four Principles

The rule of thumb for humans: Any design effort, regardless of context, is social in nature, and any social innovation will lead us back to the "human-centric point of view."

The Rule of Uncertainty: Ambiguity is unavoidable, and it can't be eliminated or simplified too much. Experimenting at the boundaries of your knowledge and competence is essential for seeing things in new ways.

The rule of redesign is that everything needs to be redone. Although technology and societal situations change and evolve, essential human needs do not. We essentially redesign the means by which these needs are met or desired outcomes are achieved. The tangibility rule states that making ideas tangible in the form of prototypes allows designers to better communicate them.

V. Five Process of Design Thinking

Empathize mode is a setting that allows you to empath A human-centered design methodology revolves around empathy. Within the context of your design problem, the Empathize mode is the effort you perform to understand people. It's yours.

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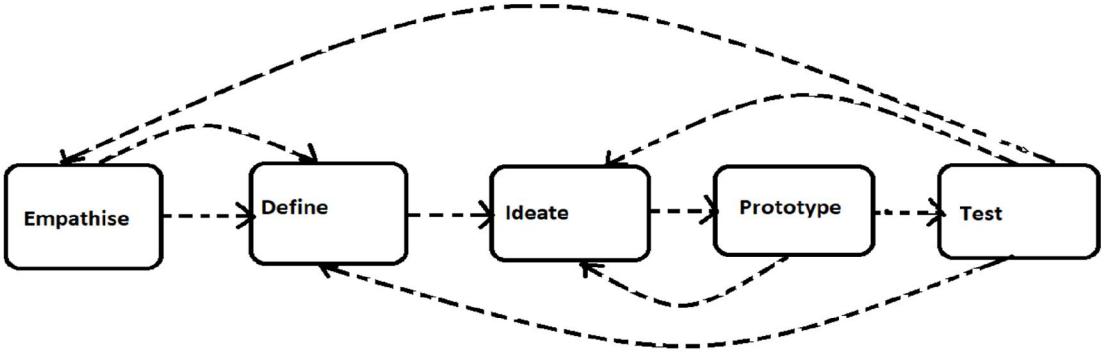
effort to comprehend how and why they do things, their bodily and emotional needs, and how they communicate They consider the world and what is important to them.



5.1 Why Should You Empathize?

The challenges you're trying to tackle as a design thinker are almost always those of others. a certain set of individuals; in order to design for them, you must first understand who they are, and what matters to them. Observing what individuals do and how they interact with their surroundings can provide insight into their thoughts and feelings. It also assists you in determining what they require. By observing others, You may record the physical expressions of their emotions, including what they do and say. This will be beneficial. enables you to deduce the intangible significance of such encounters in order to get insights These insights point you in the right path for developing creative solutions. The most effective answers emerge.one of the most insightful studies of human behaviour Learning to recognise those ideas, on the other hand, is more difficult. than you may believe. Why? Because our brains automatically filter out a lot of data without our recognising it. We must learn to see things "through new eyes," and empathising provides us with those new eyes.

Direct interaction with individuals reveals a lot about how they think and what values they have. These views and ideals aren't always clear to those who have them, and a successful dialogue might surprise both the designer and the topic with unexpected revelations. People's tales and what they claim they do, even if they differ from what they really do, are powerful markers of their firmly held views about how the world works.A thorough knowledge of these ideas and values is the foundation of good design.

5.2 Set the Mode

It's all about bringing clarity and emphasis to the design area in the Define phase of the design process. As a design thinker, you have the opportunity and obligation to identify the problem you're tackling based on what you've learned about your user and the context. This stage is about making sense of the vast knowledge you've acquired after becoming an instant expert on the subject and earning essential empathy for the individual you're creating for.The Define mode's purpose is to provide a relevant and actionable problem description.This is referred to as a point-of-view. This should be a guiding statement that focuses on a certain user's or composite character's insights and requirements. Insights don't always fall into your lap.Rather, they develop through a process of synthesising data to find connections and patterns. In a nutshell, the Define mode is all about creating meaning.

5.3 WHY is it Necessary to Define?

The Define mode is important to the design process because it produces your point-of-view (POV), which is an explicit articulation of the problem you're trying to solve. More crucially, based on your new knowledge of people and the issue area, your POV determines the RIGHT challenge to solve. When it comes to producing ideas, it may seem paradoxical, yet drafting a more narrowly focused issue statement tends to offer both more quantity and higher quality answers.

The Define mode is also an attempt to bring your disparate discoveries together into strong conclusions. This integration of your empathy work provides you an edge that no one else has. INSIGHT is something no one else has: discoveries that you can use to solve the design problem. Ideate is a design process mode in which you focus solely on idea creation.

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In terms of thoughts and consequences, it symbolises a mental process of "going broad." Ideation is both the raw material and the fuel for prototyping and bringing creative ideas into the hands of your people.

5.4 Why Generate Ideas

You brainstorm ideas to help you move from recognising problems to developing solutions for your users.
Ideation is your opportunity to combine your knowledge of the issue area and the people you're creating for with your creativity to come up with solution possibilities. Ideation is about striving for the greatest possible range of ideas from which to choose, especially early in a design process, rather than merely choosing a single, best option. The optimum option will be identified later, as a result of user testing and feedback.
Various types of ideation are used to: - Expand your solution set's innovation potential by going beyond obvious options.

- Leverage your team's collective viewpoints and abilities.
- Discover new areas of interest to explore.
- Make your innovation possibilities more fluent (volume) and flexible (variety).
- Get the obvious answers out of your brain and motivate your staff to think beyond the box. Prototype

VI. Mode of Prototyping

The Prototype mode is used to create artefacts in an iterative fashion to answer questions that help you get closer to your ultimate solution. That question may be wide in the early phases of a project, such as "do my users like cooking in a competitive manner?" Create low-resolution prototypes that are quick and cheap to make (think minutes and cents) but can elicit useful feedback from users and colleagues in the early stages. Both your prototype and inquiry may become more sophisticated as time goes on. For instance, you may make a later stage prototype for the culinary project to see if "my consumers love cooking with voice orders or visual commands."

A prototype may be anything a user can interact with, such as a wall of post-it notes, a device you built, a role-playing game, or simply a storyboard. You should aim for something that a user can interact with. It's one thing to walk someone through a scenario with a storyboard, but having them role-play in a physical scene you've constructed will likely elicit more emotions and responses.

6.1 WHY make a prototype?

To come up with new ideas and solve problems. Build with the intention of thinking.
In order to communicate. A prototype is worth a thousand images if a picture is worth a thousand words.
To initiate a discussion. When you concentrate your interactions with people around a conversation element, they tend to be richer. A prototype allows you to conduct a second, more focused discussion with a user.
To fail rapidly and at a little cost. Investing as little time and money in each idea as possible saves time and money in the long run.
To see what's possible. Staying low-res allows you to experiment with a variety of concepts without committing to one too early.
To oversee the process of developing a solution. Identifying a variable also motivates you to experiment with new ideas. Breaking down a huge problem into smaller, testable sections.

VII. Mode of Experimentation

When you're in Test mode, you're looking for feedback on the prototypes you've developed.
You'll have another chance to empathise with your users and build empathy for the individuals you're creating for.Testing is another way to learn more about your user, however unlike your first empathy mode, testing is more objective.
You've probably spent more time defining the problem and developing prototypes to test. Both of these things tend to highlight user engagement, but don't limit your "testing" job to just that.
Whether or if people enjoy your solution is a good question to ask. Instead, keep asking "Why?" and concentrating on the answer. what you can find out about the individual and the situation, as well as your possible remedies In an ideal world, you'd be able to test in the context of the user's daily life. People should be asked about a physical thing. to take it with them

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and incorporate it into their daily lives Create a scenario in a place that captures the true circumstances for an experience. If in-person testing isn't an option, create a more realistic scenario by having people assume a role or task while approaching your prototype. Always prototype as if you're sure you're right, but test as if you're sure you're wrong—testing is your chance to fine-tune and improve your ideas.

7.1 Why Do You Need to Test?

Prototypes and solutions will be fine-tuned. Prototype iterations are improved via testing. This may need going back to the drawing board. To gain a better understanding of your user. Testing is another another way to develop empathy via observation and interaction, and it frequently offers surprising results. To improve your point of view. Testing might demonstrate that you not only didn't get the answer right, but you also didn't pose the problem effectively.

What are the advantages of Design Thinking in the workplace?

As a designer, you have a significant influence on the goods and experiences that your firm brings to market. Integrating Design Thinking into your process may provide significant commercial benefits, ensuring that the goods you create are not only appealing to clients, but also feasible in terms of money and resources.

Reduces time-to-market by a significant amount: Design Thinking, with its emphasis on problem-solving and feasible solutions, may drastically minimise the amount of time spent on design and development, especially when used in conjunction with lean and agile methodologies.

Cost savings and a high return on investment: Getting successful goods to market sooner saves the company money in the long run.

Improves consumer loyalty and retention: Design Thinking provides a user-centric approach, which increases user engagement and retention over time.

Encourages all stakeholders to think beyond the box: Design Thinking is all about questioning assumptions and established beliefs. This generates an innovative culture that reaches well beyond the design team.

Can be used throughout the company: The beauty of Design Thinking is that it isn't limited to designers. It facilitates cross-team collaboration by using collective thinking. Furthermore, it may be used by almost any team in any business.

7.2 Business Applications

Designers have traditionally been involved solely in the last stages of new product development, focusing on the aesthetics and functioning of the final product.

Many businesses and other organisations today recognise the value of incorporating design as a productive asset into their policies and practises, and design thinking has been utilised to assist a variety of corporations and social organisations in becoming more constructive and inventive. In the 2000s, there was a huge increase in interest in design thinking as a catalyst for creating a competitive edge in company, but there were also reservations about design thinking as a cure for success. Designers bring their approaches into business by either participating in the early stages of product and service development processes directly, or by teaching people how to utilise design methods and create innovative thinking capacities inside organisations. In terms of education, Design thinking can be presumed to be developed in students via all types of professional design education, even if just implicitly, but design thinking is now expressly taught in general and professional education, across all sectors of education. In the United Kingdom, design as a topic was introduced into secondary school curricula in the 1970s, progressively replacing and/or developing from certain conventional art and craft courses, and becoming more integrated with technology studies. As a result of this evolution, relevant research investigations in both education and design have been conducted.

At the university level, new design thinking courses have been created, particularly when tied to business and innovation studies. In 2003, Stanford University's Hasso Plattner Institute of Design, also known as the d.school, launched a famous early course of this sort. Design thinking is utilised in K-12 education to improve learning and foster creative thinking, teamwork, and student responsibility for their own learning. Throughout education, a design-based approach to teaching and learning has become more widespread. Design thinking is currently taught at IB schools all around the world, as well as in Maker Education organisations. For more than 40 years, design thinking has been at the heart of user-centered design

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and human-centered design, the two most common approaches to creating human-computer interfaces. Design thinking is also at the heart of newer approaches to software development in general.

VIII. CONCLUSION

This appears to be a characteristic of design thinking that develops through time as a result of education and experience in the field. Building experience in a certain domain, for example, helps designers to rapidly recognise a problem and provide a solution. Design talent is typically characterised as generating, synthesising, and assessing a solution. According to certain studies, creative and productive design behaviour is linked to frequent switching between forms of cognitive activity. Designers should be able to swiftly analyse the circumstances of a particular situation and change their activities in accordance with the current set of requirements.

Students who are taught to think like designers may be better prepared to deal with tough situations and solve complicated challenges in school, in their jobs, and in life. Current educational methods, on the other hand, are often based on out-of-date learning and pedagogy ideas, as indicated by a so-called content obsession.

Researchers interested in assessing and promoting design thinking have a wide selection of experimental research to choose from, all of which can yield valuable results. Researchers may, for example, look at the impact of the design thinking process on various learning outcomes.

They can also look at the impact of various activities and their complexity on improving design thinking abilities, which are thought to improve students' learning outcomes.

It would also be fascinating to see if design thinking abilities may help students study more effectively. In other words, design thinking ability may act as a mediator, clarifying the nature of the link between an independent variable (e.g., problem-solving ability) and a dependent variable (e.g., problem-solving ability) (e.g., math test scores). Rather of assuming a direct causal association between problem-solving ability and math test results, we may speculate that problem-solving ability improves design thinking ability, which leads to higher math scores.

There is considerable empirical work to be done to establish a full understanding of design thinking. In today's economy, employers want people who can learn over time and solve complex problems (Belkin, 2015). Business schools have been criticized for not adequately preparing students for the complex, rapidly changing businesses environment they will face (Glen, Suciu, & Baughn, 2014). Recently, Dunne and Martin (2006), Glen et al. (2014), and others (Kurtmollaiev, Pedersen, Fjuk, & Kvale, 2018; Razzouk & Shute, 2012) have argued that design thinking offers business schools a means of addressing their perceived deficits (e.g., too lecture and case focused, inadequate opportunities to learn by doing, over reliance on rational analysis). Design thinking, which emphasizes the user need, delays search for the solution until the user need is understood, encourages learning through iterative prototyping and feedback, and embraces a bias towards action, offers a complementary approach to the rational/analytical problem-solving methods typically emphasized in business schools. Today design thinking is recognized and embraced as a successful problem-solving method, a method which melds an end-user focus with multidisciplinary collaboration and iterative experimentation to achieve desirable, user-friendly, and economically viable solutions or innovations (Brown, 2008; Dunne & Martin, 2006; Meinel & Leifer, 2012). Thus, the integration of design thinking into business school curricula, whether in a single course or across the curriculum, may help students develop the creative and critical thinking skills needed to solve complex problems (Dodd, 2014; Kurtmollaiev et al., 2018; Razzouk & Shute, 2012).

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