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Design Thinking: Best way to supply chain's success?

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Abstract

Creativity is the key for successful businesses and supply chains to bring new ideas and solutions to the surface. Design thinking (DT) practitioners rely on creativity to achieve sustainable competitive advantages and the ability to innovate. How promising is this approach in practice? Could it lead to more success for companies and supply chains? Can it be recommended for any business, supply chain, or industry? Why should the application of design thinking be supported, and who should take responsibility for DT projects? These and other questions build the investigation for the actual question: whether DT is the best way for supply chain success. The analysis of the open-ended questionnaires involving experts and practitioners in the field of DT shows a diverse understanding of what DT is or who is responsible for it. However, everyone should agree that creativity, regardless of its corresponding approach, is always worthwhile.

Keywords: strategy for innovation, creativity for supply chains, problem-solving approach

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1. Introduction

The market is full of unwanted products and services, highlighting a discrepancy between what product creators think the market needs and what customers need (Vermeulen, 2019). Studies conducted in the USA and the Netherlands show that 70-80% and 39% of innovations fail in whole or in part respectively (Cozijnsen et al., 2000). In this context, complex systems are one of the main reasons for operational failures (Cook, 1998). Unfortunately, almost everything is complex in the organizational context nowadays: products, processes, projects, and groups. This explains why organizations and supply chain systems should reconsider all tools and systems they employ to avoid operational failures.

In this regard, Design Thinking (DT) emerges as one of the potential solutions to the problematic situation. DT practitioners particularly emphasize its capacity to enhance the understanding of stakeholders and their interests or break down complex issues into clear ones. Consequently, the DT market is experiencing strong growth and is expected to grow further in the upcoming years. It has increased its importance in various industries, including technology, healthcare, finance, and education (MarkWide Research, 2023).

This paper explores whether or not DT is a worthwhile approach for supply chains to deal with the possibilities that arise from its adoption in organizations and supply chains. DT experts and practitioners worldwide responded to open-ended questions about the purpose of DT, key DT tools, requirements for successful DT projects, or advantages that could result from its use in supply chains.

Despite the high diversity in research participants' responses, it is clear that they share a positive perspective on creative approaches. This paper is structured as follows: after a literature review in Chapter 2, Chapter 3 presents the research method, followed by a practical example of a concrete supply chain in Chapter 4. Chapter 5 presents three selected case summaries, while Chapter 6 outlines this study's summary and conclusions.

2. Literature Review

Design Thinking (DT) is a common approach as organizations and industries of all sizes have applied it. However, different understandings circulate about what DT is. DT definition ranges from toolbox, process, method(ology), or mindset. True to the motto "the sum is greater than the individual parts“, proponents of DT point out that DT's advantages will only emerge through the interaction of individual mindsets, principles, practices, and tools (Schmiedgen et al., 2015).

DT might help in **understanding** problems and designing superior solutions. Problems often arise from a stakeholder context. DT enables companies to empathize with users and buyers (Cankurtara et al., 2020). It is an empathetic approach that makes it possible to understand the actual context of a situation by identifying users' needs, desires, motivations, pain points, and

frustrations. In other words, the approach might help companies to understand their users' point of view (Groupe de recherche Littoral et vie, 2019).

DT facilitates new ideas and innovations to emerge, sometimes merely through simple questions such as, “What if the product had a different shape?” (Cankurtara et al., 2020). DT promotes success by implementing the trial-and-error principle, since “the secret of success is making mistakes faster than anybody else”. The secret here is to create early and frequent modeling and simulation to minimize each mistake's consequences while facilitating the organization's learning capacity. This approach is the opposite of traditional business thinking which focuses on avoiding mistakes at all costs (Lockwood, 2010). Design thinkers do not expect a perfect instant solution as they acknowledge that further reworking and improving the idea would bring them closer to an ideal customer solution, creating iterative loops. The user-centered approach processes customer feedback throughout the process. The openness to all possibilities accommodates ingenious ideas and solutions (Groupe de recherche Littoral et vie, 2019). Design thinkers should be involved early in the innovation process to promote the notion that DT facilitates innovations. That said, they should perform human-centered DT to reveal unexpected insights, make sure that design thinkers are available during the whole DT process from Inspiration, Ideation to Implementation, and adjust the budget to the pace of innovation (Brown, 2008).

DT promotes the potential for a sustainable business model innovation as it invites previously unnoticed stakeholders to the value proposition (e.g. mapping and understanding the stakeholders and identifying their needs and interests, harmonizing the often-conflicting stakeholder interests) (Kurek et al., 2023). INDEX, for example, uses DT to save the environment by inventing a system to remove plastic waste from the oceans: the Ocean Cleanup (Groupe de recherche Littoral et vie, 2019). There is a trend that organizations are increasingly using as they seek to emphasize sustainability, address environmental and social challenges, and design sustainable solutions. Key areas such an application include circular economy initiatives, sustainable product design, and social impact projects (MarkWide Research, 2023).

The SWOT analysis shown in figure 1 also adds strengths, weaknesses, and threats to the opportunities (MarkWide Research, 2023).

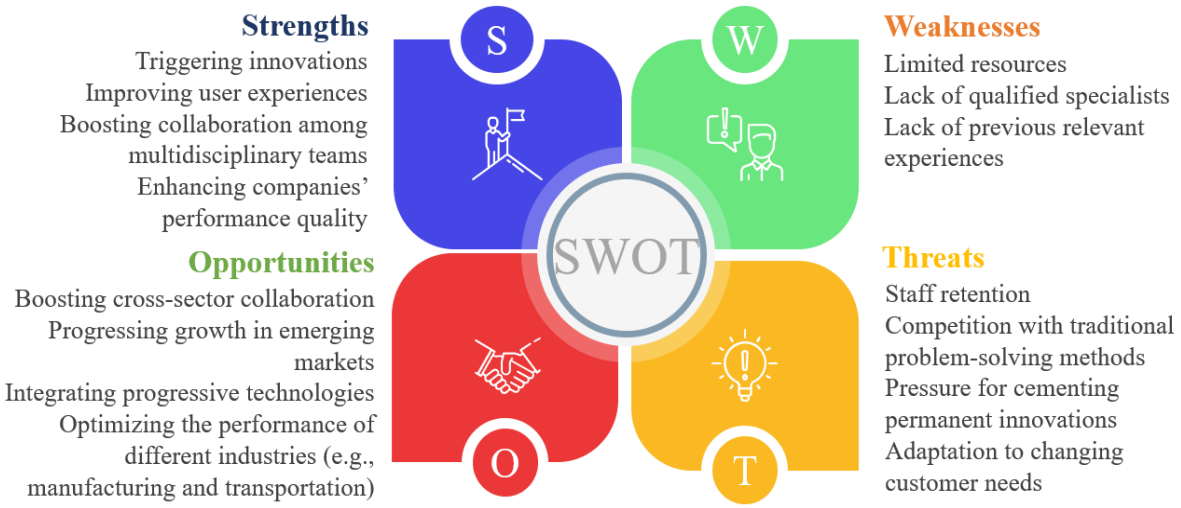


Figure 1: SWOT-Analysis DT-Market

Source: own representation following MarkWide Research, 2023; slide template from Slidesgo and Freepik

DT can best be explained as a system of spaces: **Inspiration** (e.g. starting with an opportunity or problem), **Ideation** (generating, developing, and testing ideas to obtain solutions), and **Implementation** (e.g. putting solutions into practice). These spaces construct the continuum of innovation (Brown, 2008). The following section presents a few DT tools in more detail (Liedtka et al., 2017; Yayici, 2016). Simple **brainstorming** (see figure 2) is just as much a part of the DT approach as journey mapping or rapid prototyping.



Figure 2: Brainstorming

Source: ulrichw, pixabay.com

On the one hand, there is visualization that addresses other parts of the brain and does not just use words or language. In **mind mapping**, users can elaborate sub-themes and topics around a central idea, or a keyword put in the map's center, and test possible connections that these elements have with each other. **Personas**, which are fictional characters that help to imagine the target groups, should be described using a photo, name, and demographic information such as age, gender, and occupation. **"How-might-we" questions** support the DT team to make the design challenge more concrete. For example, the question, "How might we improve customer satisfaction in our restaurant at the lunch buffet?" helps design thinkers map customers' current experiences and any gap between those and idealized experiences. In this context, **journey mapping** is about observing the customer's experiences at different touch points as he or she interacts with the organization, to find out what the customer needs to improve the customer experience. **Value chain analysis** focuses on analyzing the interactions between companies and their value chain partners to optimize their collaboration's value by working backward from supplier to company to distribution to customer. **(Rapid) Prototyping** is about making abstract new ideas and tangible concepts tangible for potential users to ignite user involvement and receive early user feedback. It enables the DT team to learn quickly from failures (Liedtka et al., 2017; Yayici, 2016).

3. Research method

After a comprehensive literature research was carried out, which shows both possible advantages and criticism of Design Thinking (DT), a DT example of a concrete supply chain is shown. The example shows the steps that are run through in the DT process as well as possible DT tools that can be used. Above all, however, it allows a first critical examination of the DT approach using a concrete example. An **open-ended questionnaire**, which contains 17 questions, provides the basis for the so-called case summaries - i.e. brief summaries of, in this case, 3 selected questionnaires, which, together with the entire portfolio of answers in the background, form an excellent basis for discussion and allow initial answers to be given, whether DT is advisable for companies and supply chains, and if so, under what conditions.

4. Practical example: supply chain in concrete construction

The supply chains of construction projects are enormously complex (Deutscher Beton- und Bautechnik-Verein E.V., n.d.). Such projects require a wide variety of construction materials. Consequently, construction companies must deal with numerous bills of delivery from different projects as they collaborate with different suppliers, creating potential supply chain chaos. That situation supports the notion that these companies should digitize and standardize

their supply chain systems using the example of ready-mixed concrete. Figure 3 shows a schematic representation of a **concrete supply chain**. In this context, the construction company orders concrete from the manufacturer while communicating the desired requirements. When the concrete is delivered, the supplier gives the contractor a delivery note (often a mere analog paper).

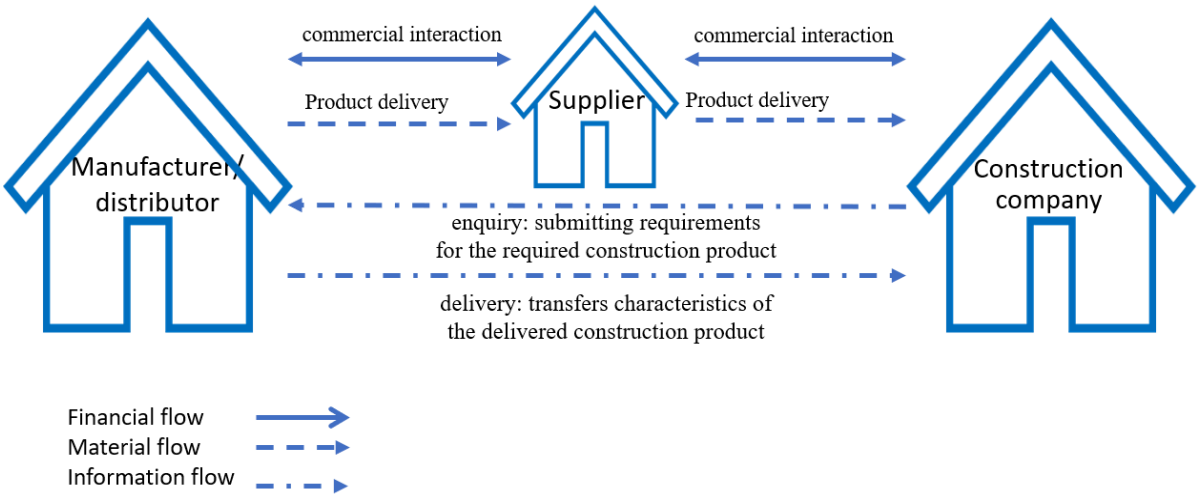


Figure 2: schematic representation of a concrete supply chain

Source: own representation following Deutscher Beton- und Bautechnik-Verein E.V. (n.d.)

It is challenging for construction companies to check delivery notes manually to ensure that they receive the desired amount of materials with the desired quality. That said, digitizing this process would involve transforming manual data into digital format to eliminate possible human errors since the digital system will recognize every information contained in each note automatically, saving much time and energy. Some steps are necessary for initiating such transformation, with the DT approach having the potential to be exercised (Deutscher Beton- und Bautechnik-Verein E.V., n.d.).

- problem definition based on specific user needs
  - determining the current status of the solution
  - carrying out a market analysis
  - working out challenges
- determination of requirements
  - developing personas to understand who the users are
  - adjusting the personas using expert interviews and on-site observations

    - forming hypotheses about the personas (e.g. users are afraid of change or to learn something new)
    - repeatedly checking hypotheses until reality is represented as best as possible
    - the established hypotheses by means of the expert interviews either falsified or confirmed and the problem definition can be adapted again if necessary
    - the **focus is on customer** and user feedback
- idea generation
    - using methods such as Mind-Mapping, 6-3-5 method or SCAMPER-method (Substitute – Combine – Adapt – Magnify – Put – Eliminate –Rearrange/Reverse)
    - ideas are collected and compiled (not evaluated)
    - evaluation of ideas (e.g. based on profitability or feasibility)
    - idea prioritization
- prototype development of a digital application
    - development of the necessary structure, steps, functionalities
    - as well as the design of the prototype developed
    - development of a mock-up or a demonstration model
    - the level of detail and the design of the application will be increased step by step according to the received user feedback
    - development of a working model of the application
- testing phase
    - creation of a test plan (description of the test scenario, how many people should be tested ..)
    - using the Thinking-Aloud method to test applications where the users express their thoughts and actions aloud while testing and using the application, so that the developers can get even more understanding
    - using the Heatmap or Clickmap to visualize how often, how long and on which areas in the prototype the test person stays with the mouse pointer
    - testing with users to collect feedback and get answers as to whether the concept works
    - testing the prototypes for a set period of time under real conditions by users and document the experiences

Sample analysis with critical assessment

It is expected that the "supply chain in concrete construction" example provides insight into how one could imagine DT in a supply chain. Since DT promotes **critical thinking**, this study conducted a brief critical assessment. The starting point of the example is a concrete problem,

such as the chaos with the numerous different paper delivery notes. A question may emerge from the situation; What if an idea is the starting point that initiates the DT process?

The example does not specifically show who is responsible for DT or who initiates the process, leading to two probabilities. On the one hand, it suggests that the idea generation can happen anywhere. All it takes is an individual who believes the world could be better in some aspects, creating the trigger for creativity. Therefore, the initiator of the DT process may be anyone involved in any activity anywhere on the supply chain at any level. This condition may serve as an ideal encouragement for local factory workers with no authority to communicate their creative ideas to higher authorities. This condition outlined two things that DT practitioners need to initiate the process: a brilliant idea and how to communicate the idea (D. Sherwood, telephone conversation, August 28th, 2023).

The example also gives the impression that DT begins with a problem that needs to be solved. Problem statement is a feature of DT because problems draw solutions. However, creativity may transcend the problem-solution relationship since it represents the aspiration to improve existing procedures. In this context, disruptive innovations may be problematic to those who are unable to catch up and those who have waited for such innovations for too long, suggesting that the problem statement of a DT approach should be comprehensive enough to entail any opportunity for improvement to existing conditions (D. Sherwood, telephone conversation, August 28th, 2023).

5. Case Summaries

Case summaries are individual, case-by-case summaries of interviews or questionnaires. These summaries offer an excellent basis for further discussions as they present cases briefly and concisely. A short title that represents each interviewee's background and characteristics is given to each person interviewed (Rädiker & Stefer 2007). Three cases were randomly selected. They highlighted diverse opinions and standpoints on the subject of DT. There were 11 completed, highly extensive open-ended questionnaires with 17 questions, which already provide an adequate basis for discussion. It should be noted that these are interim results and that the research should, if not must be, continued.

Case summary of person 1

The experienced programmer who thinks that "design is everything."

- Top programmer - with 35 years of experience in the design of aerospace parts and consumer products
- For him/her DT helps ensure that the design satisfies the need of the initial requirements.
- Has been dealing with DT for 35 years.
- Thinks that the key skills a DT specialist should have is experience and manufacturing.
- Believes that the purpose of DT is practically only for thoughtful design.
- Mentions use of research, usability, testing, interviews, prototypes as the key DT tools.
- Has never been involved in failing DT projects.
- Thinks that leadership is one of the requirements for successful DT projects.
- In his/her opinion Happy employees is how How the success of DT in organizational operations can be measured.
- Failed products is how the success of DT in supply chains can be measured.
- Thinks that everyone is responsible for running DT projects in organizational operations.
- Does not know who is responsible for running DT projects in supply chains.
- Does not think that DT can be an appropriate approach for each organization/industry/supply chain.
- Does not know what advantages could result from the use of DT in supply chains.
- Supports the application of DT in businesses because "Design is everything".
- Does not Support the application of DT in supply chains.
- Has the following advices: "Hire people with experience", "hire people with curiosity", "challenge your people to think differently", and "come with new fresh ideas".

Case summary of person 2

The professor who believes in the "starting small" principle of success

- Consultant and in-house Design Executive for Brazilians and global companies in several industries and professor with over 7 years of experience in undergraduate and post-grad courses in Brazil and abroad.
- For him/her, DT is a "way to see the world". DT will be "map to non-designers use this lenses."
- He/she has been dealing with DT for more than 20 years.
- Thinks that the key skills a design thinker needs to have are as follows: Lucidity: to perceive and read the zeitgest, the users and all the kind of signs; Envisioning: to transform those signs into insights; Action: to make those insight concrete; Resilience: to pursue the result/impact; Resilience; Accountability and faith.

- Amplifies the individual (or group of individuals) perspective over a problem, issue and/or opportunity is the purpose of DT for him/her.
- Mentions Empathy map, CSD matrix, prototyping, problem framing, storytelling, collaboration, MESCRAI as some key DT tools.
- Thinks that expending too much time on problem framing and workshops and less time in building the solution and measuring the impact could lead to failuers in DT projects.
- Believes that Execution and management are the requirements for successful DT projects.
- The success of DT in organizational operations can be measured by line time reduction, CSAT increasing, funnel improvement and several other experience and/or operational metrics. He/she thinks that this is why de DT process should go till the creation, production and delivery.
- The success of DT in supply chains can be measured by focusing on operational metrics such as leading time, waiting time, number of processes/tasks to a JTBD among others.
- Holds the opinion that operation, business and design teams together are responsible for running DT projects in organizational operations.
- Thinks that operation, business, logistics and design teams together are responsible for running DT projects in supply chains.
- Totally thinks that DT can be an appropriate approach for each organization/industry/supply chain. Thinks that it needs to be moulded according each context and need.
- Mentions that new processes, new solutions in terms of last mile tracking, new solutions for the lines, etc. as advantages of the use of DT in supply chains.
- Supports the application of DT in businesses because "All businesses started (or should) focusing on some human need. We should reconnect business with those needs"
- Supports the application of DT in businesses because "All the business started (or should) focusing on some human need. We should reconnect business with those needs".
- Supports the application of DT in supply chains because "In order to innovate and scale the business, we need to use "non process" based approaches. Here is where DT will make the difference".
- Has the following tips or advices for managers or decision-makers who want to implement DT in their organization/supply chain: "Start small, take the issue is more important for the business and build on that. After you start to be more confident, look for bigger problems. Don't try to embrace the world from the day one."

Case summary of person 3

An expert who rejects purely number-oriented approaches without creativity

- Began his/her design education at the National Institute of Fashion Technology (NIFT) before completing a faculty development program at the renowned National Institute of Design (NID) in Ahmedabad; he/she contributed to the NID for a decade.
- For him/her, DT is a human-centered approach focusing on empathy, problem-solving, and innovation as it provides a structured procedure for mastering complex challenges by putting special emphasis on end users' needs and experiences. Thinks that DT provides a valuable foundation for a strategic framework that guides through the entire design process.
- Has been dealing with DT for three decades.
- Believes that a DT should have the following skills: balance of mind (holistic thinking), logical thinking, creative and disruptive attitude, ability to absorb, understand and articulate, presentation skills, knowledge of semiotics, semantics and perceptual ergonomics, empathy

& user-centric focus, collaboration & teamwork, iterative mindset, systems thinking, adaptability & open-mindedness, problem formulation & definition, research skills.

- Thinks that the purpose of DT is to "provide a structured and human-centered approach to problem-solving and innovation that goes beyond traditional problem-solving methods by emphasizing empathy, creativity, and collaboration to create solutions that truly resonate with users and address their needs." In his/her opinion, empathetic understanding, holistic problem-solving, innovation and creativity, collaboration, iterative development, user-centered solutions, practical application as well as sustainability and ethics could be achieved with DT.
- When asked about DT tools and concepts, he/she named the following: imagination and visualization, empathy and interaction, brainstorming, group discussions and collaboration, research and user observation, modeling and prototyping, Balanced thinking (right and left brain), critical evaluation, summary and synthesis, visual tools (charts, maps), presentations, execution and implementation, technology tools, user-centered design, iterative process, divergent and convergent thinking, continuous learning mindset. These tools and concepts can, according to his/her opinion, promote creativity, collaboration, and the ability to find creative solutions.
- Has no personal experience of failed DT projects, but based on his/her knowledge of the industry, he/she mentioned lack of empathy, insufficient collaboration, rushed solutions, resistance to change, misinterpretation of insights, lack of iteration, insufficient resources, ignoring complexity design, insufficient acceptance, overthinking and analysis paralysis, no definition of clear goals, no consideration of technical feasibility and ignoring the cultural context as common reasons for failure.
- The requirements for successful DT are to understand that "god is in the details" and that one's own understanding, one's own worldview, can become a barrier. He /she has contributed to many successful DT for weavers in Kashmir. They faced the problem of "lack of demand" and then brought back a technique that got extinct 70-years back, resulting that the same fabric now could sell at much higher prices, resulting in increasing. The gratifying result was that more and more weavers started to join the group and find sustainable livelihood.
- When measuring the success of DT in organizational operations, both qualitative and quantitative assessments should be included; everything starts with a clear definition of goals before the DT project begins. It is also important to set these goals as part of DT with the organization's overall mission and the specific problem being addressed.
- When asked how the success of DT in supply chains can be measured, he/she noted that supply chain is not the right term if it is used in the same breath as DT. Instead, the word value chain should be used here, where each step of SCM builds value or adds value to the so-called 4P´s (product, process, people and planet). Based on the alignment with the 4P´s, it can be measured to what extent DT has led to the development of products that meet customer needs (product value), - to what extent DT has led to streamlined processes, reduced waste, and improved resource utilization (process value), - the extent to which employee satisfaction, engagement, and stakeholder relationships have changed for the better (people value), - the extent to which DT has contributed to more sustainable practices, a smaller ecological footprint and greater social responsibility (planet value). It is also important to measure the potential for sustainable value creation, i.e. whether the improvements achieved by DT still bring added value when circumstances change.

- Holds the opinion that there needs to be a special person like Chief Design Officer (but no CEO, CTO, CFO and others) that is responsible for running DT projects in organizational operations.
- Thinks that a person who has been trained in Left and Right Brain (e.g. design management graduates) could be responsible for running DT projects in supply chains. He/she thinks that DT can be an appropriate approach for each organization/industry/supply chain since most of the industry is linear (linear means focusing mainly on profit and ignoring everything else) and not circular (circular in the sense of holistic with consideration of all stakeholders).
- Advantages that could arise from the use of DT in supply chains are: Mechanical to Organic, Waste to Sustainable, AI to Humane and much more, the whole approach would change, the process would not be mind driven, but would have a heart inside, which means compassion and empathy that could create better quality of life.
- Supports the use of DT in businesses because he/she thinks it is important to look a world beyond number games and that could only be achieved through DT as it is more holistic and organic. He/she rejects the conventional approach devoid of creativity and compassion.
- Supports the application of DT in supply chains because he/she wants "a shift from conventional SCM to Value Chains and only DT is the tool to achieve it."
- When asked for tips or advice for managers or decision-makers who want to implement DT in their organization/supply chain, he/she recommended Prof Henry Mintzberg 'Crafting Strategy' in Harvard Business review as a great example, and also gives the link to an article called "Crafting Strategy: The Harvard approach" (https://craftvillageblog.wordpress.com/2016/03/17/crafting-strategy-the-harvard-approach/)

6. Summary and conclusions

The present research aims to make statements about whether Design Thinking (DT) could be a suitable approach for supply chains and whether this could lead to more success. To answer this question, the researcher conducted a literature review, presented and critically examined a practical application of a concrete supply chain, and distributed a questionnaire study consisting of 17 open-ended questions to DT experts and practitioners. In addition, the researcher contacted a person who was directly involved in applying "deliberate creativity" and "wide evaluation" to capture a more differentiated perspective on the topic.

In the present research, the researcher did not attempt to clarify what DT is in the literature, although diverse definitions and opinions regarding the concept were present during the process. Some referred to it as a toolbox or a process, while others referred to a method(ology) or mindset.

One research participant pointed out that DT is a clever marketing idea and is heavily marketed by consultants to market more services. Another participant did not mention the marketing idea, but it was clear from the statements that he or she had been using this concept for a long time although he or she was not aware of the DT concept before the practice

became more prevalent. This response suggests that people have been considering creativity as a means to find effective solutions to complex problems for ages.

There were 11 completed, highly extensive open-ended questionnaires with 17 questions (see attachment for sample questionnaire), which already provide an adequate basis for discussion. It should be noted that these are interim results and that the research should, if not must be, continued.

Many participants supported the use or application of DT in businesses and supply chains because **"design is everything"**. They believed that creativity projects can make the world a better place. DT might clarify biases and explore better solutions because it may trigger a change in business direction. It offers a framework for creative problem-solving and the chance to clarify their vision, reorganize their operations, and enhance the efficiency of supply chains. It is important to use "non-process"-based approaches to innovate and scale the business as it keeps the customer and the product at the top of the priority list. It is a good step towards innovation since it offers the opportunity to **out-think competitors** and **overcome the take-make-waste approach in supply chains**.

One participant suggested that since DT processes would depend on the goal or problem that they address, they may not work the same way for different organizations. However, another participant believed that the approach is applicable in any situation because people can become creative anywhere and at any time. One other participant added that DT is suitable across different organizations because the process of identifying problems, empathy, active listening, and goal mapping is consistent across organizations, industries, and supply chains. One participant was also of the opinion that DT can be used anywhere, but the approach needs to be molded according to each context and need. Since "it is always about the product and the customer".

This study's interim results show that there is a great deal of diversity as to who can be responsible for running DT projects in organization operations or supply chains. While one thinks that it should be those who have the strongest interest in "making the world a better place", another suggests collaborating with a consultant or academic is the most effective way. In the supply chain context, one answered the question by saying that there should be a mixed DT team consisting of supply chain managers and those responsible for maintaining supply chain efficiency.

These responses show that there is no clear consensus about what DT is, who is responsible for the DT process, what skills design thinkers should have, what purpose DT has, how to measure its successes, and what the essential requirements for successful DT projects are. Therefore, this study cannot provide clear answers yet as to whether DT is now a recommended path for supply chain success. However, this study concluded that a combination of **creative and number-based approaches** is highly likely to produce innovative ideas. However, creative ideas alone are not enough; they always need someone who listens to and approves them.

Therefore, this study has outlined the following recommendations for managers and decision-makers based on participants' responses:

- involve end users throughout the process
- be aware of how to resource big ideas
- hire people with experience and curiosity
- challenge people to think differently
- be clear on the terms and flow
- lead from the back, observe more and react less
- implement testing and team empowerment
- get familiar with DT practices and loop in stakeholders early
- start small and, after being more confident, look for bigger problems
- always have a product-first and customer-first mindset
- understand what comes after DT

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Abbreviations

DT	Design Thinking
CEO	Chief Executive Officer
CFO	Chief Financial Officer
CSAT	Customer Satisfaction
CSD matrix	Certainties-Suppositions-Doubts matrix
CTO	Chief Technology Officer
JTBD	Jobs-to-be-done
MESCRAI	Modifique, Elimine, Substitua, Combine, Rearranje, Adapte, Inverta
SCM	Supply Chain Management

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