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PRACTICAL APPLICATIONS OF DESIGN THINKING IN THE CONTEXT OF A HIGHLY COMPETITIVE INDUSTRY: THE EXAMPLE OF ROAD CONSTRUCTION INDUSTRY

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ABSTRACT

Purpose: This paper aims to identify the application of design thinking in the road construction industry, particularly concerning private investors, by exploring current and prospective opportunities for its utilisation. With its strong emphasis on customer focus and fundamental link with marketing, design thinking is a valuable tool for players in the road construction market to understand clients' needs better.

Methodology: A qualitative approach was adopted to explore this emerging field, utilising semi-structured in-depth interviews based on a theoretical framework developed through a literature review. The qualitative methodology aims to uncover participants' subjective experiences, perceptions, beliefs, and attitudes towards implementing design thinking in road construction, allowing for detailed and rich data collection.

Results: The research findings demonstrate that design thinking principles are applied in road construction, enabling companies to enhance problem-solving, increase productivity, and improve client satisfaction. By embracing design thinking and developing related skills, companies can drive innovation, overcome internal barriers, and gain a competitive advantage.

Conclusion: Design thinking, as a customer-focused approach, has significant potential within the context of the road construction industry. Although design thinking principles may be perceived as intuitive and with certain marketing roots, the proper application requires training and education and solving the internal barriers.

Keywords: design thinking, user-centred, customer focus, road construction industry, B2B marketing

1. INTRODUCTION

In the recent post-COVID-19 era, we are seeing growing demand for design thinking (DT) and empathetic behaviours, as well as a higher level of emotional capabilities of employees on all levels. Exceptional circumstances and developments require even more empathy towards customers and their emerging needs. This paper aims to explore the potential applications of DT in the context of the highly competitive European road construction market as part of the overall construction industry. According to IBISWorld (2022), the European road and motorway construction market reached around EUR 136 billion, dominated by public clients. As the OECD Transport Statistics (2023) data suggests, public spending on transport infrastructure varies yearly, significantly influenced by the overall economic development and EU funding schemes. Therefore, big players in the EU road construction market have to offset adverse developments in the context of public investments with more intensified activities in the private market. In contrast, success in public procurement relies significantly or almost entirely on the bidding price. Therefore, private sector investors are prone to negotiate and consider other elements of an offer besides being entirely focused on the price.

Considering the highly competitive environment of the European road construction industry, this paper aims to investigate current practices of road construction industries in the context of private investors in order to detect current and potential applications of the DT approach. Since this study is explorative, it utilises qualitative research methodology. Through a series of in-depth interviews with business development managers from ten EU countries, common practices in the context of the private market are investigated.

2. CONCEPTUAL FRAMEWORK

A conceptual framework that outlines the potential application of design thinking in the context of the (road) construction industry will be elaborated below. Firstly, the main principles of DT will be presented to define this study's theoretical framework. Furthermore, studies focused on the specific application of DT in the broader context of the construction industry will be analysed.

2.1. THE FUNDAMENTALS OF DESIGN THINKING

Design thinking goes beyond being solely a tool for designers. As a problem-solving technique, it does not mandate creativity as a prerequisite for participants; instead, it actively fosters the development of creative thinking. Some DT principles overlap with marketing principles, such as understanding the consumer, testing the product, and iterating based on feedback (Knight, 2021). However, design thinking is not limited to design or marketing, but it is a broader approach to problem-solving and innovation that can be applied in various domains. Companies like IBM, Apple, and Google use a design thinking mindset to design user products and experiences (Fanguy, 2018). The roots of the design thinking approach can be traced to the concept of creative engineering, which emerged as a research topic in 1950 (Arnold, 2016). This concept inspired Simon (1969), who defined design broadly as the activity that changes existing situations and design as a complement to natural science: engineering, architecture, business, education, law and medicine. Nevertheless, he also pointed out how human problem-solving can be considered as a process of a methodical search of possibilities, limited by the individual's adaptive capabilities of information processing, thus leading to a selective search strategy (You & Hands, 2019). Furthermore, Simon (1969) conducted a comparative analysis between the data processing methods employed by computers and the human approach to information search and processing. He concluded that the theory of design serves as a comprehensive theory of search, highlighting the interplay between these two domains. From his perspective, everyone could be considered a designer as long as a person "devises courses of action aimed at changing existing situations into preferred ones" (Simon, 1969: 55). McKim (1979) further carried out the research and developed a need-based design theory covering the entire process, including physical concerns and a human's intellectual and emotional nature. Furthermore, McKim also defined the core concept of his need-based design theory: "Design is the unique capacity of the human species to manipulate materials and energy in a reasoned or a felt response to human physical, intellectual, and emotional needs—human needs which are partially formed and modified by the natural and cultural environment" (von Thienen et al., 2019: 200).

Design thinking addresses 'wicked problems' in organisations and society (Buchanan, 1992). The term 'wicked problem' was initially described as the "class of social system problems which are ill-formulated, where the information is confusing, where there are many clients and decision makers with conflicting values, and where the ramifications in the whole system

are thoroughly confusing" (West Churchman, 1967: B-141). Wickedness refers to highly complex challenges that are difficult to define and solve. These problems often involve multiple interconnected factors, and stakeholders with varying perspectives, values, and priorities often struggle to understand each other (Buchanan, 1992). The wicked-problems approach considers almost all design problems fundamentally indeterminate, except for the most basic ones that have already been simplified to determinate or analytical problems by removing their 'wickedness' (Buchanan, 2010). In other words, 'wickedness' suggests complexity and indetermination, while clear-cut conditions and determinate issues are necessary for the linear design model.

Design thinking can be defined as "a human-centred approach to innovation that puts the observation and discovery of often highly nuanced, even tacit, human needs right at the forefront of the innovation process" (Gruber et al., 2015: 1). According to IDEO U (2023), design thinking is "a human-centred approach to innovation—anchored in understanding customer's needs, rapid prototyping, and generating creative ideas—that will transform how you develop products, services, processes, and organisations". Instead of relying on historical data or their instincts, design thinking advocates focus on what the customer wants (IDEO U, 2023).

The Stanford Life Design Lab (Stanford, 2023) suggests the non-linear five-step design thinking process as follows:

- Step 1 – Empathise: research your users' needs, problems and lifestyles;
- Step 2 – Define: state what issues you are going to try to solve;
- Step 3 – Ideate: challenge assumptions and create ideas;
- Step 4 – Prototype: start to create downscaled solutions and test them to minimise risk;
- Step 5 – Test: use the prototyping data to adjust your products or ideas.

These stages are not always sequential, and design teams often run them in parallel, out of order and iteratively repeat them (Balcaitis, 2019). Although empathy is explicitly included in the first step, it is vital to emphasise empathy as an inherent and inevitable component of the design thinking process and all five stages.

The designer's empathy represents the foundation of design thinking. As Köppen & Meinel (2015: 20) suggested, empathy is viable if "one's own perspective is rejected in favour of the observed user". Kouprie & Visser (2009) stressed the relevance of empathy in design by suggesting the four essential steps to be followed in the process:

- Discovery - enter and connect with the client's world, ask about difficulties, absorb what they are feeling, and gain insight; the goal is to enter the client's world and achieve willingness without judging;
- Immersion - wandering around in the client's world and taking the client's point of view;
- Connection – resonating with the client and achieving emotional resonance;
- Detachment – designer detaches from his emotional connection but keeps the client's perspective.

By emphasising creative solutions that are technically feasible, design thinking tackles complex problems with an ongoing concern for meeting fundamental human needs (Subramanian, 2023). Products developed by design thinkers are directly tailored towards the careful and intentional gratification of critical human needs. Design thinkers should learn to empathise with users before developing a suitable design solution. Therefore, designers should communicate with clients to understand their wants, thoughts, needs, motives, and emotions so that designers can learn to innovate for them and design solutions for the detected needs (Doorley et al., 2018).

As an advanced customer-centric approach, the design thinking practice is implemented in organisations of every size and within all industry sectors (Schmiedgen et al., 2015). Design thinking presents business and public sector organisations with a method to create novel products and services that cater to unexpressed needs. This approach is recognised as a potential source of a competitive edge as it enables innovation and facilitates the management of organisational transformations in the midst of swift shifts in consumer preferences, supply chains, and intense competition (Dunne, 2018).

Implementation of design thinking requires resources and willingness to change. The process of integrating design thinking requires an organisation to undergo multidimensional changes, have management support, strong leadership, skilled staff, and a culture of innovation, as well as the capacity to adapt and evolve (Ward et al., 2009). Despite potential benefits, studies demonstrate that, as an exploratory process, design thinking may need help surviving within organisations prioritising efficiency (Dunne, 2018). In other words, its creative and emphatic nature and customer focus are somewhat challenging to quantify and translate into units that can be easily measured. For design thinking to have a long-term impact, it necessitates the involvement of multiple individuals, as the transient nature of most

design thinking engagements may cause individuals to overlook the bigger picture, and organisations must be mindful of creating conditions that support design integration beyond individual successful engagements or interventions (Wrigley et al., 2020).

2.2. CUSTOMER FOCUS AND DESIGN THINKING APPLICATION IN THE CONSTRUCTION INDUSTRY

In the construction industry, the activities usually start with the client's brief describing requirements and project design, while commissioning and handover occur in the later stages. During the project's life cycle stages, a group of stakeholders with different views on the entire project influence the decision-making process and its impact on the project itself (Padala & Maheswari, 2017). However, they all share the need to finish the project most efficiently. Poor design and inadequate project planning can result in delays and financial losses during the execution phase of the construction project (Nikolić & Cerić, 2022). Traditionally, good collaboration between a client and a construction company can improve the overall quality of the project outcome (Latham, 1994).

As an essential driver of better relationships with clients, studies suggest applying specialised software tools, such as building information modelling, which provides better control over the whole lifecycle of a construction project (Pham et al., 2021). On the other hand, construction project failures are commonly attributed to the human factor, especially in project management (Ewin et al., 2017). While project managers in the construction industry are commonly civil engineers, their formal education usually lacks soft skills that are imperative in creating and nurturing a relationship with the client and adequately addressing the client's needs (Pant & Baroudi, 2008). Consequently, projects would usually fail due to a lack of communication with the client, the inability to comprehend business objectives, and the inability to manage client expectations (Lahiri et al., 2021). Unfortunately, there is usually too much focus on the business needs. However, to improve the understanding of the client's needs, some recent studies suggest a design thinking approach (Ewin et al., 2017, Lahiri et al., 2021). Specifically, user-centredness and holistic view are considered the most relevant design thinking competencies (Lahiri et al., 2021). In this context, user-centeredness considers the capability to observe things from multiple perspectives and recognise other person's needs and values (Carlgren et al., 2016; Howard & Davis, 2011). Similarly, a holistic view refers to a complete, 360-degree perspective on the overall problem, with the

view of customer needs, technical feasibility, organisational constraints, regulatory implications, competitive forces, resource availability, strategic implications, as well as the costs and benefits of different solutions (Holloway, 2009, Schweitzer et al., 2016, Dosi et al., 2018). In other words, this implicated the need to thoroughly define customer problems, while maintaining the DT mindset (Schweitzer et al., 2016).

Although there is a rationale for using the DT approach in the construction industry, especially in the context of project management, it is a topic that would require more attention from researchers. There is still little or very little empirical evidence suggesting the benefits of design thinking in the construction industry context (Dijksterhuis & Silvius, 2017), and adaptation of this approach would require a more explicit measure of its actual value (Rauth et al., 2014). Additionally, studies primarily focus on customer-centrism and empathy while giving less attention to other individual steps of the DT process (Lahiri et al., 2021). Furthermore, studies suggest a significant absence of customer focus in the construction industry and project management in the real-life context (Ewin et al., 2017).

Another field where design thinking could become beneficial is innovation diffusion. In the road construction industry context, innovations are sometimes expensive but would lower the overall cost in the long term by increasing durability and reducing maintenance costs (Gee, 2021). Nevertheless, the successful implementation of an innovation tremendously depends on the client's engagement, which could sometimes be quite unpredictable, and overall preparedness for innovations can be questionable (Widén et al., 2014). In other words, clients (i.e., investors) are sometimes unaware of the potential benefits a technology innovation can provide them. Therefore, the construction company must communicate all the benefits properly and manage the innovation diffusion process. In this intention, design thinking can act as a catalyst since it has been considered an approach to innovation (van Reine, 2017). Specifically, design thinking can be used to improve the quality and efficiency of road construction projects while understanding the needs of investors and road users and designing roads that meet their needs. Additionally, design thinking can assist construction companies in improving the sustainability of road construction projects by considering the environmental impact of road construction materials and techniques (Jaber, 2020).

3. RESEARCH DESIGN

3.1. RESEARCH PROPOSITIONS

As the literature review suggests, there is a potential for design thinking in the context of the construction industry, especially in the context of private projects. A better understanding of the client's requirements is the main driver for hassle-free project execution (Carlgren et al., 2016, Howard & Davis, 2011). However, there is also the presence of uncertainties when it comes to the perception of the benefits of the design thinking approach in the construction industry context (Dijksterhuis & Silvius, 2017). Furthermore, there is minimal evidence of the design thinking application advantage in the specific case of road construction as a part of the construction industry. Therefore, we suggest the following research proposition:

P1: Implementation of the design thinking methods and approach has potential benefits for the road construction industry.

Various studies (e.g., Holloway, 2009, Schweitzer et al., 2016, Dosi et al., 2018) recognised the need for a customer-centric approach to improve the company's competitiveness and nurture long-term relationships with clients; however, there seems to be a lack of customer focus in the road construction industry (Ewin et al., 2017), which can be partially attributed to the lack of soft skills among civil engineers managing construction projects (Pant & Baroudi, 2008). Implementation of design thinking in the construction industry context can be problematic due to various factors, so the following research proposition is developed:

P2: Implementation of customer–centric approach in the context of the road construction industry is hindered by various barriers.

As the literature suggests, design thinking has the potential to aid in innovation diffusion in the road construction industry. However, successful implementation depends heavily on client engagement, which can be unpredictable, and overall preparedness for innovation can be questionable (Widén et al., 2014). Design thinking relates to thinking processes connected with empathy and better understanding among customers and clients (Stanford, 2023). Therefore, better communication with customers can be expected if the company relies more upon the design thinking approach, resulting in better mutual understanding. Potentially, road construction companies can improve overall relationships with clients and manage the diffusion process to meet the needs of investors by applying design thinking principles. Therefore, we suggest the following research proposition:

P3: The application of design thinking can improve the customer acceptance rate of product innovation in the context of road construction projects.

3.2.RESEARCH METHODOLOGY

As the analysed literature reveals, the application of design thinking in the context of the broader construction industry and narrower road construction industry has received limited attention among scholars. Nevertheless, it is a developing field in the broader body of design thinking research. Therefore, this research study adopted a qualitative approach using semi-structured in-depth interviews based on the theoretical framework developed through a literature review. The qualitative research approach aims to generate knowledge and insights into the participants' subjective experiences, perceptions, beliefs, and attitudes (Tenny et al., 2022) towards the application of design thinking in road construction. Semi-structured interviews are used because they allow the researcher to probe deeper into the participant's responses, thus obtaining more detailed and rich data. Due to the specifics of the research goal, this study intends to shed some light on the current practices and potential for applying the design thinking approach when dealing with private investors. Although the usage of qualitative methodology can cause a certain level of subjectivity and difficulty in data interpretation, it is commonly considered an appropriate approach in the field of management and marketing (Gummesson, 2000, Drew et al., 2007).

3.3. RESPONDENTS AND RESEARCH PROCEDURE

The primary research comprises 15 in-depth interviews with industry professionals proficient in road construction. They all had more than ten years of working experience in related industry. The respondents are sales and business development managers from ten European countries. Regarding their background, nine of them are civil engineers, while six have an educational business background. Their employer is one of the most prominent players in the industry.

The researchers followed a research agenda and asked open-ended questions allowing participants to express their views on applying design thinking in road construction. Nine interviews were conducted in person and six via video conference and recorded, transcribed, and analysed, using a thematic analysis approach. Thematic analysis is a method of analysing

qualitative data that involves identifying patterns, themes, or categories within the data, in order to identify the meaning and significance of the data and to provide a rich and detailed understanding of the phenomenon under investigation (Nowell et al., 2017, Braun and Clarke, 2006).

4. RESEARCH FINDINGS

Application of design thinking in the context of the (road) construction industry can have positive outcomes and improve relationships with customers. Regarding the formal knowledge of the DT methods among respondents, there is undoubtedly a huge potential for improvement since only three respondents stated their familiarity with the technique. However, once they were acquainted with the basic principles of design techniques, they recognised it as a customer-centric marketing approach they commonly apply in their day-to-day activities and interactions with clients:

I am familiar with the concept since what we do here is focused on our clients. [...] Our task is to provide them with the best possible solution in asphalt. (Respondent 4)

Interaction with our clients is based on mutual understanding and respect. [...] Clients would describe their specific needs, and it would be our job to provide them with the best solution. (Respondent 6)

In most cases, clients approach us with a request for a specific type of works or type of asphalt. However, we usually suggest alternative solutions after inspecting the request and getting more information about specific requirements. [...] clients are sometimes not familiar with the range of products and technologies we can offer. [...] Our job is to listen carefully to our clients to reveal problems they are trying to solve. Only this way can we develop a customised solution for them. (Respondent 9)

As an essential building brick of design thinking, the importance of empathy is recognised among respondents. Most of them stressed the need to identify all the relevant aspects of a project correctly. This way, a proper technical solution can be proposed to solve the client's problem. Nevertheless, a deeper understanding of customer's needs can result in higher levels of customisation and more meaningful proposals for solving customer's problems:

We must demonstrate empathy towards our clients. Only this way can we build our relationships to become long-lasting. [...] If we properly assess our client's needs and issues, we can propose customised solutions, like some special

types of asphalt. [...] One should also not underestimate the importance of a personal relationship with the client. When you develop a sincere relationship with your client, he or she will always look for you once the need for specific road construction works arises. (Respondent 12)

I consider empathy as looking at things from my customer's perspective. We do not necessarily share our clients' views, but showing respect and understanding is the key to business success. [...] If we ignore the specific requirements, we cannot propose the best possible solution. (Respondent 13)

Respondents were also directly asked to assess the potential benefits of design thinking for their companies. Considering the main principles of design thinking, respondents expressed their firm belief in customer-centred strategies and the need to understand and address clients' needs properly. Furthermore, most of the respondents recognised design thinking as a potential differentiator for a company, contributing to the company's competitiveness:

A systematic application of design thinking would definitely help our company to gain a better understanding of customers and their needs. [...] Design thinking can improve our competitiveness. (Respondent 1)

Many of our competitors are struggling to maintain good relationships with their clients. I see a huge potential for design thinking in our company. It will give us an advantage over our competitors. (Respondent 3)

Sometimes, our management should be more customer-oriented. I understand their focus on financial indicators and overall business development. However, I see a huge potential for design thinking here. If the whole organisation adopts customer-centric principles, we will profit from it. Our relationships with clients will be stronger and more profound. (Respondent 11)

Although design thinking is widely accepted among all respondents as an approach with huge commercial potential that could positively impact the company's overall market success, some organisational functions have different focuses than the commercial part of an organisation. As most respondents reported, the role of sales managers and business developers is sometimes underestimated. On the one hand, most turnover is generated through public tenders. However, it is vital for companies to maintain a blend of private and public clients:

Our construction department prefers working on big projects. Commonly, these big projects belong to the public segment. Hence this is why sometimes other departments need more understanding of the private projects. (Respondent 1)

Some of my colleagues from other departments need to become more familiar with the scope of our activities. Sometimes, this lack of understanding of the sales role within an organisation can harm inter-department relationships. [...] However, our CEO would usually support us by restating the importance of our department. (Respondent 10)

The majority of turnover in our business unit comes from public projects. However, our strategy is to develop the business with private investors further. Unfortunately, sometimes I feel I need more support from other departments. (Respondent 14)

The road construction industry is traditional, where civil engineers commonly play the most critical role in establishing and nurturing client relationships. Therefore, significant players in the industry recognised the need for dedicated staff with better soft skills to improve the overall relationships with clients. Overall, communication between clients and project managers can sometimes become quite dramatic:

Communication at the construction site is usually quite dynamic. Sometimes, people are also yelling at each other. [...] communication can sometimes be an issue, together with a lack of understanding for other party's issues and problems. (Respondent 2)

Conflicts are common in our business, especially on the construction site. Sometimes, conflicts may occur in meetings with clients and supervising engineers. [...] situation can escalate quickly because both sides usually have opposing goals. (Respondent 5)

While sales managers and business developers sometimes act as client ambassadors and propagators of the design thinking principles, they are also aware of difficulties and barriers while trying to integrate these principles within the organisation. It seems that one of the main barriers is the short-term focus of decision-makers:

There is considerable pressure on immediate results. Design thinking, which I consider to be an approach rooted in marketing philosophy, has some short-term effects, but the majority will come from a mid and long-term perspective. This is sometimes challenging to explain within the company. (Respondent 15)

We must deliver results. That is imperative in an organisation. [...] If the tool or technique does not provide visible results in the short term, it could raise major concerns among the management. (Respondent 7)

The short-term focus of some decision-makers within our organisation looks like the biggest barrier to design thinking implementation. [...] Management is also sometimes quite suspicious towards tools that emphasise soft skills. (Respondent 12)

When it comes to design thinking, the focus is on understanding the customer and the customer's needs, wants and emotions. Therefore, if a business organisation endorses design thinking as a customer-focused strategy aimed at solving 'wicked problems', customers should be aware of it or at least perceive certain benefits. On the other hand, sales managers and business developers see an opportunity for design thinking in providing and implementing new technical solutions:

Our clients are only sometimes welcoming deviations from their initial designs and BOQ [Bill of Quantity]. They are only sometimes prepared to discuss potential changes in technology and materials. However, we can suggest new technologies to clients with whom we have a more extended relationship based on mutual understanding and respect. [...] We would also develop a prototype and conduct extensive testing to improve the innovation acceptance rate. (Respondent 2)

We can easily suggest an alternative technology if we carefully listen to clients' requests and identify their problems. (Respondent 8)

With a relationship based on mutual understanding, proposing new technology to the client is relatively easy. [...] Clients that trust us are usually open-minded. Especially when we have an excellent joint project behind us where we proved ourselves being good listeners and experts in road construction. (Respondent 15)

We would fail every time we try to 'sell' new technology to a client without caring about what they are looking for. However, if we listen to the client's needs and wants and try to figure out what brings value to the client, we will be successful. (Respondent 13)

5. DISCUSSION

Our research study confirmed that building interpersonal relationships and skills is very important in the context of a customer-centric approach. Furthermore, an empathic approach towards customer needs and wants would result in satisfaction and loyalty. When dealing with new situations and challenging problems, breaking out of established routines is required. By using DT to guide the way how an activity is conducted, one can practice

out-of-the-box thinking and excel in any problem-solving scenario (Choi & Kim, 2017)

As our respondents indicated, developing design thinking skills and having an empathetic and open-minded approach to clients and co-workers could lead to better problem-solving and increase productivity and work-related satisfaction. It is crucial to understand the client and their preferences. It is essential to develop design thinking skills in the road construction industry and implement this approach to improve client satisfaction and the company's competitiveness. In other words, design thinking is recognised as an approach or even a business strategy that can positively impact companies operating in the context of the road construction industry. Therefore, the research findings provided support for P1.

In the road construction industry context, the role of sales managers and business developers is sometimes underestimated. Consequently, there needs to be more understanding of customer focus and design thinking approach. In the design thinking approach, it is vital to have all employees included in the process of decision-making or client-related behaviour. People and their attitudes constitute a vital barrier to change in routines and behaviours (Cummings & Worley, 2013, Judson, 1991). Many people dislike change since it involves moving from the security of something well-known into unfamiliar territory (Okumus & Hemmington, 1998).

Furthermore, a high focus on public tenders, where the company's competitiveness is predominantly expressed with the ability to offer the lowest project price, does not contribute to recognising design thinking as a valuable technique. Furthermore, as the literature suggests, a lack of soft skills among engineers can also hinder the broader acceptance of design thinking among decision-makers. Although design thinking is recognised as a valuable approach in the context of private projects and creating and nurturing long-term relationships with investors, internal barriers are noted, together with the need to better understand the importance of soft skills and empathy. Therefore, it can be concluded that the implementation of design thinking in the context of the road construction industry faces significant barriers, which supports P2.

The way that innovations spread in a market is described by the innovation diffusion theory (Rogers, 1995). According to the theory, innovation aims to bring something novel with potential benefits or advantages compared to existing alternatives (Robinson, 2009). From the marketing perspective, customers demand new products and technologies. However, new technology suppliers could also influence the customer's

implementation decision process (Hall, 2004). According to our research findings, the design thinking approach could help improve the rate of innovation acceptance by customers in road construction projects. It is essential to listen to and understand the client in order to provide them with meaningful innovation. Ultimately, the client should be willing to accept the innovation. Therefore, road construction companies should improve communication with clients and manage the innovation diffusion process to meet the needs of investors by applying design thinking principles. Thus, P3 is also supported.

6. CONCLUSION

The implications and conclusions of this paper are based on the literature review, research propositions, and findings of the in-depth interviews. Due to the qualitative nature of this study, specific hypotheses were neither formulated nor tested at this point. However, this paper can be used as a starting point for further research where specific hypotheses can be tested.

Despite limited insights from existing literature, our findings indicate that implementing design thinking can be successful in this industry, as it has demonstrated success in other industries. Respondents believed that design thinking could help them address the challenges encountered on construction sites and when dealing with private investors. However, additional training and education are necessary to facilitate its effective implementation.

Design thinking plays a fundamental role in the process of customer experience management. It fosters employee engagement by providing an opportunity to develop solutions that meet customer expectations from the design phase through project implementation and construction.

As design thinking garners increasing attention, our study contributes to the limited research on its application in the construction industry, highlighting avenues for further exploration. Future research should focus on refining the design thinking model, examining its applicability to road construction project management, and enhancing customer satisfaction.

Regarding the limitations of this paper, our findings stem from a small sample size, and caution should be exercised when making international generalisations due to cultural and social differences. Additionally, although interviews offer flexibility and provide in-depth information, the research design has limitations in terms of generalisability. Further studies with larger sample sizes, quantitative methodology and diverse cultural contexts, need to be conducted.

In conclusion, this study represents one of the few efforts to address design thinking in the road construction industry, leaving ample room for further exploration. The development of tools for evaluating solutions and ideas generated by design thinking should be investigated, as well as determining the specific types of problems in which design thinking is most successful in road construction management.

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