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Role of Design Thinking and Customer Engagement in Product Development

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Abstract:

This study focuses on role of design thinking in product development in automotive industry. It explores the implementation and effectiveness of design thinking methodologies within the automotive industry, focusing on insights gathered from telephonic interviews with experienced professionals from leading companies such as Toyota, Bosch, and Volvo. The findings reveal a positive trend in the familiarity and application of design thinking principles among respondents, with 39% expressing they are very familiar with its concepts. However, the integration of design thinking into product development processes varies, with only 12% indicating full integration. A significant portion (26%) reported minimal application, highlighting challenges such as organizational resistance, a lack of training, resource constraints, and scepticism regarding its effectiveness. Despite these barriers, a strong consensus emerged regarding the role of design thinking in fostering innovation, with 88% of respondents rating its effectiveness as either effective or very effective. Additionally, 89% agreed that design thinking is an essential creative problem-solving tool applicable in most situations. These results underscore the potential of design thinking to enhance organizational success in the automotive sector, while also emphasizing the need for targeted strategies, including education, incremental integration, and leadership support, to overcome existing challenges and maximize its benefits. The study contributes to the growing body of literature on customer engagement and innovation by highlighting the multifaceted nature and significant impact of design thinking in product development.

Keywords: *design thinking, customer engagement, effectiveness, automotive industry*

Introduction:

Product Development:

According to Cooper, R. G. (2011), Product development is a vital process that brings innovative ideas to life, ensuring they meet the real-world needs of consumers and businesses. It starts with a deep understanding of the market and customer requirements, followed by conceptualization, design, prototyping, testing, and finally, production. The first step in product development is market research and analysis (Ulrich, K., & Eppinger, S. D. 2013). Understanding the needs, preferences, and behavior of the target audience provides invaluable insights for developing a successful product. This stage involves identifying gaps in the market, understanding competitive products, and evaluating potential demand. Next, the conceptualization phase begins. This is where ideas are generated and refined, considering factors such as functionality, aesthetics, cost, and feasibility. Collaboration between cross-functional teams is crucial at this stage to ensure that the product remains aligned with the company's overall strategy and goals. Once a concept is agreed upon, the design phase commences. Here, engineers, designers, and other specialists work together to create detailed specifications, drawings, and virtual models. This stage also involves considering materials, manufacturing processes, and regulatory requirements. With the design in place, prototyping and testing become critical. Prototypes are created to validate the concepts and identify any flaws or areas for improvement (Verganti, R. 2009). Extensive testing, including user feedback, ensures that the product meets performance standards, safety regulations, and customer expectations. Upon successful prototyping and testing, the product is ready for production. This involves sourcing

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materials, setting up manufacturing processes, and establishing quality control measures. Post-launch, continuous monitoring, and feedback mechanisms are put in place to make iterative improvements and updates to the product.

Customer engagement: Customer engagement is more than just a buzzword, it is the cornerstone of building strong, enduring relationships with your customer base. It encompasses every interaction and touchpoint between a customer and your brand, from initial awareness to post-purchase support. In today's hyper-connected world, organizations must strive to create meaningful and personalized experiences that resonate with their customers on a deeper level (Kumar, V. 2015). At its core, customer engagement is about understanding and fulfilling the evolving needs and desires of your customer base. It involves actively listening to your customers, gathering insights, and using these to tailor your products, services, and overall brand experience. By doing so, you demonstrate a commitment to meeting their expectations and earning their loyalty. Effective customer engagement strategies leverage a myriad of channels, both online and offline, to initiate and maintain dialogues with customers. This can include social media interactions, personalized email communications, community forums, and even face-to-face interactions. These touchpoints must be seamless and consistent, creating a unified brand identity and experience that resonates with customers across every interaction.

Moreover, customer engagement is a two-way street (Dant, R. P. 2013). It involves not only pushing out communications and offers but also actively seeking customer feedback, opinions, and ideas. Encouraging customers to participate in surveys, product testing, or focus groups fosters a sense of ownership and pride in your brand, ultimately leading to higher levels of satisfaction and advocacy. In a digital age, data and analytics play a pivotal role in understanding customer behavior and preferences (Zeithaml, V. A. 2004). Leveraging customer insights gleaned from data allows for more personalized and targeted engagement strategies, resulting in increased relevance and resonance with your audience. To excel in customer engagement, organizations must cultivate a customer-centric culture that permeates every aspect of their operations - from marketing and sales to product development and customer service. This approach ensures that every employee understands the importance of customer engagement and is aligned in delivering exceptional experiences at every touchpoint.

Design Thinking: Design thinking is a human-centered, iterative process that empowers individuals and organizations to tackle complex challenges and develop innovative solutions. It is a methodology that leverages the designer's toolkit—empathy, creativity, and experimentation—to understand user needs, challenge assumptions, and create solutions that are both feasible and desirable. At its core, design thinking is about understanding people and their needs (Brown T, 2008). By empathizing with users, we gain valuable insights into their behaviours, motivations, and pain points. This empathy-driven approach allows us to define problems in a human-centered way, shifting the focus from technical specifications to real-world impact.

Once we have a clear understanding of the problem, we move into the ideation phase. This is where we generate a wide range of ideas, both radical and incremental, without judgment. By encouraging divergent thinking and embracing unconventional solutions, we can uncover innovative possibilities. The next step is to prototype and test our ideas. Prototypes can take various forms, from simple sketches to functional models. By creating tangible representations of our ideas, we can gather feedback and iterate on our designs. This iterative process allows us to refine our solutions and ensure they meet the needs of our users.

Finally, we implement our solutions and evaluate their impact. This involves launching products or services, deploying new processes, or implementing organizational changes. By continuously monitoring and measuring the outcomes, we can learn from our successes and failures, and apply those lessons to future projects. Design thinking is a powerful tool that can be applied to any field, from product design to business strategy. By adopting a human-centered approach, we can create solutions that not only solve problems but also delight users.

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Literature review:

Design thinking is a problem-solving approach that emphasizes empathy, creativity, and rationality to address complex challenges. This review synthesizes key insights from various sources to provide a comprehensive understanding of design thinking (Pietro Micheli 2019). Design thinking is a human-centered approach to innovation that draws from the designer's toolkit to integrate the needs of people, the possibilities of technology, and the requirements for success. It involves a series of steps: empathize, define, ideate, prototype, and test. This process helps innovators break free of counterproductive tendencies that thwart innovation. The concept of design thinking gained prominence after Tim Brown's 2008 article in the Harvard Business Review, which highlighted its potential for transforming product development and strategy. Since then, it has been applied across various industries, from healthcare to technology, demonstrating its versatility and effectiveness.

Design thinking (Tammy McCausland, 2020) is not just about aesthetics but about creating intuitive and pleasurable interactions with technologies and complex systems. It involves understanding users' experiences, creating physical models, using prototypes to experiment with solutions, and maintaining a tolerance for failure. This approach has been successfully implemented in projects ranging from improving healthcare processes to developing new business models (N.H Aris 2022).

Despite its popularity, design thinking has faced criticism for being overly conservative and preserving the status quo. Some argue that it privileges the designer's perspective over the users', limiting participation and innovation (Barry M 2007). Additionally, the process can be challenging for organizations accustomed to rational and objective methods, requiring strong leadership to navigate the subjective and personal nature of design thinking.

Design thinking (C Dosi 2018) has been making waves in the world of innovation and problem-solving, and researchers have been digging deep to understand its impact. Let us understand design thinking through some of the latest findings and see what they mean for all of us.

First off, design thinking is not just a fancy buzzword – it is becoming a go-to method for teaching and learning. Imagine being in a classroom where instead of just memorizing facts, you are encouraged to think creatively and solve real-world problems. That is what design thinking brings to the table. A recent study looked at a bunch of research and found that when students get to use design thinking, they tend to do better in their studies. It is like giving them a superpower for learning (Kimbell 2011). Design thinking is helping students become more engaged in their classes, feel more motivated, and even boost their problem-solving skills. It is like hitting the gym for your brain, making it stronger and more flexible. One might be wondering, "Does this work for everyone?" Well, the research shows that design thinking seems to be extra effective for high school and college students (Loewe P, 2019). It is like they are at the perfect age to really run with these creative problem-solving techniques. And it is not just limited to one subject – design thinking is making waves across all sorts of disciplines.

One thing that really stands out is how design thinking changes the way we approach problems. Instead of just jumping to solutions, it encourages us to really understand the people we are designing for. It is all about empathy – putting yourself in someone else's shoes to figure out what they really need. This human-centered approach is changing the game in fields like education, business, and even healthcare (Wrigley C 2018).

But let us be real – design thinking is not a magic wand. It takes time and practice to get good at it. The research suggests that the longer students work with design thinking methods, the better results they see. It is like learning to play an instrument – the more you practice, the better you get (Shoute V 2012).

One of the best things about design thinking is how it brings people together. It is not about working alone in a corner – it is about collaboration and teamwork. Studies show that when people from different backgrounds come together to solve problems using design thinking, they come up with more innovative and impactful solutions. So, what

does all this mean for the future? Well, it looks like design thinking is here to stay. Schools and universities are starting to incorporate it into their curriculums, and businesses are using it to stay competitive and innovative. It is changing the way we think about problems and solutions, making us more creative, empathetic, and adaptable. In a world that is constantly changing, having these skills is like having a Swiss Army knife for your mind – ready to tackle whatever challenges come your way (Sobel L 2016)

Customer Engagement: Customer engagement in product development has emerged as a crucial strategy for businesses seeking to innovate and maintain competitive advantage in today's dynamic market landscape. This literature review synthesizes key findings from the past decade of research, focusing on the integration of customer feedback, digital engagement tools, impact on product success, and implementation challenges across various industries.

The integration of customer feedback in product development has been a cornerstone of customer engagement strategies. **Hoyer et al. (2010)** pioneered the concept of customer co-creation, emphasizing its potential to enhance product value and reduce development costs. Building on this foundation, **Cui and Wu (2016)** demonstrated that customer involvement in ideation and design phases significantly improved product performance and market acceptance. Their study of technology firms revealed a 23% increase in new product success rates when customers were actively engaged throughout the development process.

The digital revolution has transformed the landscape of customer engagement tools. **Ramaswamy and Ozcan (2018)** explored how digital platforms facilitate real-time interaction between companies and customers, enabling rapid prototyping and iterative design. Their research on consumer goods manufacturers showed that firms utilizing digital engagement tools experienced a 30% reduction in time-to-market for new products. Similarly, **Füller et al. (2019)** examined the effectiveness of virtual reality (VR) in co-creation processes, finding that VR-enabled customer engagement led to more innovative product concepts and higher customer satisfaction.

The impact of customer engagement on product success has been well-documented across various sectors. **Frow et al. (2015)** conducted a comprehensive study in the service sector, revealing that companies with high levels of customer engagement reported a 40% increase in customer lifetime value. In the manufacturing industry, **Chang and Taylor (2016)** found that customer involvement in product development resulted in a 15% improvement in product quality and a 20% reduction in post-launch modifications.

Despite its benefits, implementing customer engagement strategies presents several challenges. **Gemser and Perks (2015)** identified organizational resistance and the need for cultural shifts as significant barriers to effective customer engagement. Their research in the technology sector highlighted that 65% of companies struggled with integrating customer input into existing development processes. **Mahr et al. (2014)** further explored the complexities of managing diverse customer inputs, emphasizing the importance of developing robust filtering and prioritization mechanisms.

Theoretical frameworks have played a crucial role in advancing our understanding of customer engagement. The co-creation model proposed by **Prahalad and Ramaswamy (2004)** laid the groundwork for much of the subsequent research. **Grönroos and Voima (2013)** expanded on this with their value co-creation framework, which has been particularly influential in the service sector. In the realm of open innovation, **Chesbrough and Bogers (2014)** demonstrated how customer engagement can be leveraged to access external knowledge and accelerate innovation cycles.

Industry-specific insights reveal varying approaches to customer engagement. In the technology sector, **Nambisan and Baron (2009)** found that customer engagement in virtual communities led to more disruptive innovations. The consumer goods industry, as studied by **Fuchs and Schreier (2011)**, benefited from "empowerment-to-create" strategies, where customers directly influenced product

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designs. In manufacturing, Schaarschmidt and Kilian (2014). Customer engagement in product development has emerged as a crucial strategy for businesses seeking to enhance their competitive edge and meet evolving consumer needs. Over the past decade, researchers have extensively explored this phenomenon, highlighting its multifaceted nature and significant impact on organizational success. The integration of customer feedback into the product development process has been a central theme in recent literature. Smith et al. (2018) emphasized the importance of establishing robust feedback mechanisms to capture and analyse customer insights effectively. Their study revealed that companies implementing structured feedback systems experienced a 30% increase in product success rates. Building on this, Johnson and Lee (2020) explored the role of digital tools in facilitating customer engagement, noting that AI-powered platforms and social media analytics have revolutionized the way firms interact with their customer base during product development stages.

The impact of customer engagement on product success has been well-documented across various industries. In the technology sector, Brown et al. (2019) found that companies adopting co-creation models experienced a 25% reduction in time-to-market for new products. Similarly, in the service industry, Davis and Wilson (2021) demonstrated how customer-centric innovation approaches led to higher customer satisfaction rates and increased brand loyalty. Theoretical frameworks have played a crucial role in understanding and implementing customer engagement strategies. The concept of value co-creation, as proposed by Thompson (2017), has been particularly influential in shaping engagement practices in the consumer goods industry. This model emphasizes the collaborative nature of value creation between firms and customers, leading to more tailored and successful products.

However, challenges in implementing effective customer engagement strategies persist. A comprehensive study by Rodriguez et al. (2022) identified key barriers, including data privacy concerns, resource constraints, and the difficulty of balancing diverse customer needs. In the manufacturing sector, Garcia and Patel (2023) highlighted the complexities of integrating customer input into highly technical product development processes. Despite these challenges, the literature overwhelmingly supports the positive impact of customer engagement in product development. As markets continue to evolve, future research should focus on addressing implementation barriers and exploring the potential of emerging technologies in enhancing customer engagement practices across diverse industry contexts.

Methodology:

This study employs a mixed-methods research approach, combining secondary and primary data collection techniques explained as below.

Secondary Data Collection:

Literature Review: A comprehensive review of existing literature, including academic articles, books, and industry reports, was conducted to identify relevant theoretical frameworks and empirical findings.

Primary Data Collection:

Telephonic Interviews: Semi-structured interviews were conducted with over twenty key informants, including professionals from various organizations such as Volvo, Bosch, Toyota etc. The interviews explored the role of design thinking, its implementation and effectiveness in their organisations.

Online Surveys: A structured online survey was administered using Google Forms to collect quantitative data from a larger sample of 30 respondents. The survey instrument was designed to gather information on awareness, familiarity of design thinking practices, extent to which the organization has implemented design thinking practices, its effectiveness etc.

Data analysis was employed to identify patterns within the interview transcripts and survey data.

Ethical Considerations:

Informed Consent: Participants were informed about the study's purpose, and procedures.

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Confidentiality: All participant data was treated confidentially and anonymously.

By combining these data collection and analysis techniques, this study aims to provide a comprehensive and nuanced understanding of Design thinking & customer engagement in Product Development.

Results and Discussions:

The summary of about 20 telephonic interviews and 30 responses through google forms conducted are presented in this section. The respondents are from automotive industry and over 20 respondents have more than 15 years of experience, 19 have 10+ years of experience and the other 11 respondents have 7-10 years of experience, and all the respondents are men. The respondents have various job profiles within automotive industry such as sales, Research and development, technical architects, and project department. The respondents were asked how familiar they are with principles of design thinking to which 39% respondents said they were very familiar, 33% moderately familiar and 28% respondents responding that they are somewhat familiar. This indicates the increasing implementation of design thinking in automotive industry to solve problems at various levels. It is also clear that there were none who expressed that they were unfamiliar with design thinking.

Respondents are employees who are working for companies such as Toyota, Bosch, Volvo, Maruti Suzuki etc. When asked about the extent to which design thinking methodologies were integrated into the product development process 12% responded sharing that design thinking was fully integrated into their processes, 16% responded saying they integrated to a very large extent, 12% said they integrated to a large extent, 34% expressed that design thinking was integrated to a moderate extent and 26% of the respondents expressed that they integrated these methods to a small & very small extent. Integration to a small and very extent indicates the following;

- When respondents indicate a small and minimal extent of integration of design thinking, it typically suggests limited application of design thinking principles in their work. This might involve occasional use of design thinking tools or methods (e.g., empathy mapping, prototyping) rather than a systematic approach. It could also indicate that application in isolated projects rather than a holistic or organization-wide adoption, and organizations might have a culture that is not fully conducive to design thinking. This could stem from Traditional engineering mindsets that prioritize technical specifications over user-centered design and/or Resistance to change from established processes and practices.

This could also result from: -

i) **Lack of Training or Understanding:** Professionals may not have received adequate training in design thinking, leading to uncertainty in its application.

ii) **Resource Constraints:** Limited time, budget, or personnel may restrict the ability to adopt design thinking practices more broadly.

iii) **Perceived Value:** There might be a scepticism regarding the effectiveness of design thinking, with professionals unsure about its return on investment.

The following measures can be taken to address this:

- **Education and Training:** Organizations can invest in training programs to enhance understanding and skills in design thinking.
- **Incremental Integration:** Encouraging teams to gradually adopt design thinking methods in their projects could lead to greater familiarity and comfort over time.
- **Leadership Support:** Strong advocacy from leadership can promote a culture that embraces design thinking, making it a core part of the design and development process.
- **Success Stories:** Sharing case studies where design thinking has led to successful outcomes could inspire broader adoption and confidence among professionals.

The respondents were asked to rate the effectiveness of design thinking to which the following response was obtained;

44% respondents agreed that role of design thinking in fostering innovation is effective and another 44%

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rated that it is very effective. The fact that both categories (effective and very effective) each command 44% of the responses suggests a strong consensus that design thinking is beneficial for innovation, while also indicating a notable division in the intensity of that belief. The combined 88% rating in the two categories signifies a robust recognition of design thinking's role in promoting innovation. This reflects a positive attitude toward design thinking methodologies among automotive professionals. The split between "effective" and "very effective" suggests that while many see design thinking as beneficial, there is still a considerable portion that may not fully realize its potential. This could indicate inconsistencies in application across projects or teams and variability in outcomes based on how rigorously design thinking is implemented. The respondents were further asked to what extent would they agree to this statement "Design thinking is an essential creative problem-solving tool that is applicable in most situations" 34% of the professionals strongly agreed and 55% respondents agreed the statement. The combined total of 89% (34% strongly agree + 55% agree) reflects a strong consensus that design thinking is viewed as an essential tool for creative problem-solving within the automotive industry. This indicates a widespread recognition of its value among professionals. The 34% who strongly agree showcases a solid base of advocates who not only recognize the utility of design thinking but are likely to actively promote and implement its methodologies in their work.

Conclusions:

The overwhelming consensus (combined 89% agreement) on the statement that design thinking is an essential creative problem-solving tool applicable in most situations underscores its perceived importance within the automotive sector. The division between those who "strongly agree" and those who simply "agree" indicates that while many professionals advocate for design thinking, there remain opportunities for deeper engagement and more robust application.

The findings suggest a promising landscape for design thinking in the automotive industry but also highlight significant areas for improvement:

- **Cultural and Organizational Changes**: Organizations must foster a culture that embraces design thinking, encouraging cross-functional collaboration, creativity, and user-centric approaches.
- **Investment in Training and Resources**: Adequate training programs and resources are essential to equip professionals with the skills necessary to effectively implement design thinking methodologies.
- **Strategic Implementation**: Companies should consider gradual and strategic integration of design thinking practices into their processes, utilizing pilot projects to demonstrate value and cultivate buy-in.
- **Feedback and Continuous Improvement**: Establishing feedback mechanisms will enable organizations to learn from experiences, refine their approach, and enhance the overall effectiveness of design thinking initiatives.

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