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EDITORIAL

It is with great pleasure that we present the preface to the first issue of the third volume of the International Journal on Technology, Innovation, and Management (IJTIM) for the year 2023. Published by the Global Academic Forum of Technology, Innovation, and Management (GAFTIM), IJTIM continues to foster the dissemination of cutting-edge research and advancements in the field of technology, innovation, and management. As we embark on this new volume, we are excited to bring together a diverse range of research papers, and scholarly articles that explore the frontiers of technology, innovation, and management. This issue showcases the relentless pursuit of knowledge and the collective effort of researchers, academicians, and industry experts who contribute to the enrichment of our understanding and practice in these dynamic domains.

The papers included in this issue reflect the interdisciplinary nature of technology, innovation, and management. They delve into various subfields such as digital supply chain, digital marketing, artificial intelligence, business analytics, digital transformation, blockchain, sustainability innovation, and more. Through rigorous research and critical analysis, the authors shed light on emerging trends, challenges, and opportunities that shape our contemporary world. IJTIM serves as a platform for scholars and practitioners to share their insights, discoveries, and experiences. It fosters intellectual exchange, collaboration, and the advancement of knowledge. By bridging the gap between theory and practice, IJTIM aims to address real-world problems and offer innovative solutions that have the potential to transform industries, societies, and economies.

We extend our deepest gratitude to the authors who have contributed their exceptional research papers to this issue. Their dedication and commitment to advancing knowledge have made this volume a valuable resource for academics, professionals, and policymakers alike. We also express our appreciation to the esteemed reviewers whose expertise and constructive feedback ensure the quality and integrity of the published works. We would like to acknowledge the unwavering support of the editorial board, editorial staff, and the dedicated team at GAFTIM. Their meticulous efforts in managing the submission and review process, as well as the publication of the journal, have been instrumental in maintaining the high standards and reputation of IJTIM.

Lastly, we extend our sincere gratitude to the readers of IJTIM, whose continued interest and engagement drive the growth and impact of our journal. It is our collective commitment to knowledge dissemination, collaboration, and innovation that propels the field

of technology, innovation, and management forward. We invite you to delve into the insightful articles and research papers presented in this issue. We are confident that the diverse perspectives, thought-provoking ideas, and evidence-based findings shared within these pages will inspire further research, spark dialogue, and contribute to the advancement of technology, innovation, and management.

Editor-in-Chief

Prof. Haitham M. Alzoubi

IJTIM



Exploring the Impact of Artificial Intelligence language model ChatGPT on the User Experience

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ABSTRACT

This study investigates the integration of AI language model tools, specifically ChatGPT 3.5, in one of the well-known approaches to problem-solving that focuses on innovation and creation in user experience, namely Design Thinking. The study aims to evaluate the effect of using AI language model tools on product design. While previous research has primarily focused on Design Thinking, limited research has been conducted on the application of AI tools in the process. This study involved redesigning two previous projects with the help of ChatGPT AI tools in the Design Thinking process. We conducted interviews with five designers and analysed ten Product Manager reports to understand the impact of using AI tools. The findings indicate that integrating AI tools into the Design Thinking process, specifically in the Define and Ideate stages, can improve the efficiency and creativity of the UI. However, the successful implementation of AI tools requires a combination of technological expertise and creative design thinking. We emphasise the potential for AI tools to complement human creativity and expertise in the design process, rather than replace them. We believe this study will contribute to understanding the appropriate application of AI tools in design and innovation while underscoring the importance of keeping humans at the centre of the process.

1. INTRODUCTION

In today's dynamic and rapidly evolving technological landscape, organizations are actively pursuing innovative strategies to maintain a competitive edge. Design Thinking, an innovation approach, has emerged as a prominent methodology in this regard, and its impact on the development phase of innovation has been subject to extensive research (Ismail, 2022).

Innovation is a crucial aspect of modern business, yet a significant number of product and service innovations fail for various reasons related to the innovation process, organization, resource endowment, and commercialization strategies, among others. Design Thinking, a formal creative

problem-solving method based on the application of the mindsets and tools of designers to the business context, has been shown to enhance performance in the development phase of the technological innovation process.

The Fourth Industrial Revolution (Industry 4.0) has brought about significant changes in the way we live and work, with the integration of artificial intelligence (AI) being a key aspect of this transformation (Levy and Huli, 2019). In emerging economies, AI has the potential to impact poverty reduction, innovation, infrastructure development, and progress towards the Sustainable Development Goals (SDGs). AI can drive innovation

by enabling faster and more efficient development of new products and services. In emerging economies, AI can be used to identify and address specific challenges such as improving agricultural productivity or developing new renewable energy solutions.

The integration of AI tools, particularly ChatGPT, to support the Design Thinking process within the domain of product design has received limited research attention to date (Malefane Sekoboto and Mazanai, 2022). Despite the increasing importance of AI in enhancing innovation and design, the potential of using AI tools to augment the Design Thinking process remains an underexplored area of investigation. Specifically, the examination of how ChatGPT can be leveraged to improve the design phase of technological innovation in the context of distant markets, advanced technologies, and undefined user needs has been sparsely explored in academic literature. Therefore, exploring the potential of AI tools, such as ChatGPT, in combination with Design Thinking principles to enhance product design is a promising area for further research (Micheli et al., 2019).

Our study investigates the potential benefits and limitations of integrating AI language model tools, specifically ChatGPT 3.5, into the Design Thinking process for improving product design. We explore the use of ChatGPT in combination with Design Thinking principles to enhance the efficiency and creativity of the design phases of technological innovation. Our aim is to shed light on the impact of integrating AI tools into the design thinking process, and to offer insights into how organizations can best leverage these tools to enhance their innovation efforts.

In the upcoming sections, we will discuss the concept of Design Thinking for innovation, and its relevance in the current age of AI-powered innovation and design. Then, we will outline our research methodology and present our key findings, followed by a detailed discussion. Finally, we will conclude by highlighting the implications of our research and suggesting avenues for future exploration.

2. LITERATURE REVIEW

2.1. Design Thinking for Innovation

Design Thinking has emerged as a popular approach for creative problem-solving initiatives in recent years. At the heart of this approach is

experimentation, which is considered a fundamental trait of Design Thinking. Designers use experiments to generate knowledge about the unknowns underlying an innovative idea, including its desirability, feasibility, and viability. By creating and processing information through experimentation, designers can make accurate design decisions as projects unfold. This is because design thinking enables innovators to gain a deeper understanding of user needs and preferences, leading to the development of solutions that better meet those needs (Kim, 2023). Design Thinking is an innovation process that emphasizes the use of prototypes as incomplete and approximate representations of the innovation output during development (Sakirin and Ben Said, 2023). The process involves actively intervening in reality and manipulating it to produce the desired result (Verganti et al., 2020). found that testing prototypes with target users helps to create a realistic experience of what the innovation might be, allowing users to provide reliable feedback (Zhai, 2023). This feedback is crucial for innovators to make informed design decisions as projects progress. It is important to note that incorporating human feedback in all phases of Design Thinking is vital to ensure that the end product is user-centered and meets their needs. The involvement of users throughout the design process can lead to better design decisions and ultimately result in greater user satisfaction (Kalla et al., 2023). Design Thinking for innovation involves a structured approach to identifying, defining, and addressing problems or opportunities. It involves the use of empathy to understand the needs of users, collaboration among stakeholders to generate and evaluate ideas, and experimentation to test and refine solutions (Gao et al., 2023). The iterative nature of Design Thinking allows innovators to make adjustments based on feedback from users and other stakeholders, leading to more effective and efficient solutions (Xu, 2019). Innovation is critical for companies to remain competitive in today's fast-paced and ever-evolving technological landscape. The design phase of innovation, where research and development take place, is particularly important in ensuring the success of new products and services (Lund and Wang, 2023). Design Thinking has been shown to be effective in improving the design phase of innovation by helping innovators gain a deeper

understanding of user needs and preferences, leading to the development of solutions that better meet those needs.

Design Thinking is an approach that emphasizes experimentation as a fundamental trait to foster innovation. By designing and running experiments, designers can generate knowledge about unknowns underlying an innovative idea, making accurate design decisions as projects unfold. Designers should adopt a mindset of discovery and embrace an exploratory approach to experimentation, characterized by multiple, fast, and frugal prototypes that push the boundaries of what is possible. Through experimentation, designers can reduce cognitive biases, facilitate communication and coordination across team members, and ultimately.

2.2. Innovation and Design in the Age of AI

Innovation and design are crucial aspects of any organization's success, and the advent of AI has brought about a new paradigm in the way we approach these processes (Arif et al., 2023). AI is increasingly being used in product design, testing and simulation, optimization, and generating ideas, providing a range of benefits such as improved scalability, adaptability, and broader scope. This shift in focus calls for new theories and brings design closer to leadership, which is inherently an activity of sensemaking (Shaji George et al., 2023). Recent research has highlighted the potential impact of AI on innovation and design processes. For instance, a study by (Chubb et al., 2022) examined the role of AI in the product design process, particularly in ideation and iteration phases (Haleem et al., 2022). The authors found that AI can facilitate the generation of novel ideas and enhance the creativity of the design process. Furthermore, AI can improve product development by enabling real-time feedback and continuous improvement.

AI can reinforce the principles of design thinking, particularly in its ability to generate user-centered solutions and its iterative approach to problem-solving (Enholm et al., 2022). However, the use of AI in design and innovation is not without its challenges. One key issue is the potential for bias in AI algorithms, which can have significant implications for product design and user experience (Lo, 2023).

ChatGPT is a cutting-edge AI language model tool

developed by OpenAI and launched in November 2022. Since its launch, this widely-used chatbot has become extremely popular due to its remarkable ability to process prompts and generate essays, articles, poems, and more in a "human-like" fashion (Verma, 2023). The use of ChatGPT in innovation and design is an area of great interest and potential impact. With its advanced natural language processing capabilities, ChatGPT has been trained on a vast amount of text data, enabling it to generate responses that closely resemble those of human beings (Chasanidou et al., 2015). This technology has the potential to revolutionize the way humans interact with machines and could have significant implications for innovation and design processes.

The use of AI in innovation and design processes has the potential to transform the way we approach problem-solving, product development, and user experience. While it brings significant benefits, such as improved scalability and adaptability, it also presents challenges that need to be addressed (Kim, 2023). As such, organizations must carefully consider the implications of AI and develop ethical frameworks to ensure its responsible and effective use in design and innovation.

3. METHODOLOGY

In this section, we will outline the research methodology used in the study. This includes the type of data sources analysed, the time period of the study, and the specific questions asked in the interviews with UX designers, as well as some details of manager reports. The study involved a team of five user experience (UX) designers, each with at least 5 years of experience in the field. The designers were of various ages, ranging from late-twenties to mid-forties, and were at different job levels, including mid-level and senior UX designers. The study was conducted by New Zealand Quality Innovation and Research (NZQRI), a private company specializing in providing consultation in design, innovation, and research, and utilizing the Design Thinking approach since early 2010. The researchers and participants involved in the redesign and testing of the two mobile apps were all affiliated with NZQRI.

The study focused on redesigning and testing two of the organization's previous mobile applications: a disaster management system and a mental health

assistance app. The application aimed to provide critical information and assistance to communities in the event of a natural disaster or emergency situation. The second project focused on designing a mental health support app that provides mental health resources and assistance to the people of New Zealand, such as guided meditations, daily mood trackers, a directory of local mental health professionals, and an anonymous forum for users to connect and share their experiences.

The interviews conducted with the UX designers aimed to gather their perspectives and experiences with using AI tools, specifically ChatGPT, in the design process. The interviews were conducted from December 2022 to February 2023, and each interview lasted for one hour, as shown in Table 1. During the interviews, the UX designers were asked semi-structured questions about their experiences with using ChatGPT in the redesign process. The questions focused on how ChatGPT was integrated into the design process, what types of tasks it was used for, and how it affected the overall project timeline. The UX designers were also asked about the challenges they encountered while using ChatGPT, such as issues with accuracy, relevance, or suitability for the specific project.

The manager reports were generated by project managers within one New Zealand company and covered a range of projects and initiatives, not just the two mobile applications redesigned as part of this study. The reports were produced between

January 2021 and February 2022, and each provided an overview of the project's goals, timeline, budget, and key performance indicators (KPIs).

The first data source was team interviews, which took place from December 2022 to February 2023 and involved five user experience (UX) designers with at least 5 years of experience in the field. The table lists examples of the types of questions asked during the interviews, which focused on the designers' experiences with using ChatGPT in the design process, including any benefits or challenges encountered, and their thoughts on the role of AI tools in the future of UX design.

The second data source was product manager reports, which covered a period from January 2021 to February 2022 and included eight reports produced by project product managers within one New Zealand company. Table 1 provides examples of the information contained in these reports, which provided an overview of the goals, timeline, budget, and key performance indicators (KPIs) of a range of projects and initiatives within the organization, including the two mobile applications redesigned in the study. The reports also included some commentary on the design process, although the level of detail varied depending on the specific project.

Table 1: Data Source

Type of data source	Time	Evidence analysed	Examples
Team interviews	01/12 2022 – 01/02 /2023	5 interviews, 10 hr (two interviews one hour each)	How did you find the experience of working with ChatGPT? In what ways did ChatGPT assist in the design process? Did using ChatGPT speed up the project process? If so, how? Were there any challenges or limitations you encountered when using ChatGPT? How do you see the role of AI tools like ChatGPT evolving in the field of UX design in the future?
Product Manager reports	01/12/2022 - 06/02/2023	8 Reports	The eight reports analysed in the study were all produced by project Product Managers within one New Zealand company. The reports covered a range of projects and initiatives within the organization, not just the two mobile applications redesigned as part of the study. The reports were generated between January 2021 and Feb 2022. Each report provided an overview of the project's goals,

		timeline, budget, and key performance indicators (KPIs). The reports also included some commentary on the design process, although this varied depending on the specific project.
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4. FINDING AND DISCUSSION

Based on the interviews and Product Manager reports, our study found that integrating AI tools such as ChatGPT into the product design process can lead to significant improvements in efficiency,

creativity, and user satisfaction. However, it is important to note that the successful implementation of these tools requires a combination of technological expertise and creative design thinking.

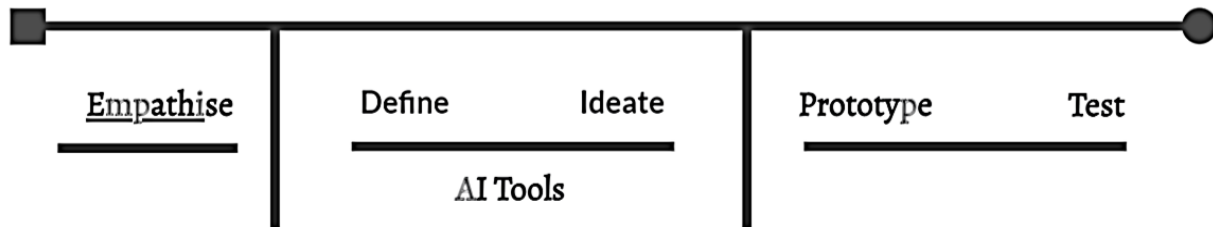


Figure 1: AI tools in Design Thinking

4.1. Interview finding

The interviews were aimed at exploring the role of ChatGPT in the different phases of the Design Thinking process, as well as its impact on product design outcomes and user satisfaction. In this section, we present the findings of our interviews and discuss their implications for the use of AI tools in Design Thinking. To achieve our goal, we conducted a series of semi-structured interviews with designers and product managers who had experience with Design Thinking and had used ChatGPT in their work.

One major finding was that ChatGPT was particularly useful in the ideation phase of product design. By generating new ideas and expanding upon existing ones, ChatGPT provided designers with a wider range of options to consider, leading to more creative and innovative product designs. As one designer stated, "It [ChatGPT] helped us think outside the box and come up with ideas which was very useful."

The experimental prototype redesigns also showed the potential for ChatGPT to improve user satisfaction. By incorporating user feedback into the design process and using ChatGPT to generate and refine design features, the redesigned prototypes were more user-friendly and intuitive. This was reflected in feedback from users, who reported greater ease of use and satisfaction with the new designs.

The team began by using the design thinking

process to solve the pain points that could be addressed through a single app built with their capabilities. They used the "How Might We" technique to solve the pain points and grouped their ideas using an "Affinity Diagram". They then prioritized the features by discussing which feature had the most user value and least effort.

This highlights the initial steps taken by the team to solve the pain points of their target audience through the design thinking process. They used various techniques such as "How Might We" and "Affinity Diagram" to generate ideas and prioritize them based on user value and effort. However, they faced challenges in implementing a cohesive and user-friendly design.

"With ChatGPT's involvement, the team was able to significantly improve the user interface design and reduce project time. Here's how ChatGPT made a difference:"

This emphasizes the impact of ChatGPT's involvement in improving the user interface design and reducing project time. The following points elaborate on how ChatGPT made a difference:

"Streamlined Design Thinking Process: ChatGPT helped streamline the design thinking process, allowing the team to move from idea generation to design implementation more efficiently. By providing suggestions and feedback on the team's design ideas, ChatGPT helped the team stay focused on creating a user-friendly interface."

Furthermore, throughout the study, ChatGPT was

utilized to generate new design ideas and support the ideation process. For example, we provided details and ideas to ChatGPT, and then asked

ChatGPT to generate new design ideas. Table 2 shows the response from ChatGPT

Table 1: ChatGPT 3.5 generate new design ideas

Disaster Management System:

- *Integrate real-time weather and emergency alerts to keep users informed of potential disasters in their area.*
- *Use ChatGPT to provide personalized emergency preparedness plans based on the user's location and needs.*
- *Implement a feature that allows users to report and track their safety status during a disaster, which can help emergency responders prioritize their efforts.*
- *Add a feature that allows users to connect with their neighbors or local community groups to coordinate disaster response efforts.*
- *Utilize augmented reality to show users where the nearest evacuation routes, emergency shelters, and other important locations are during a disaster.*

Mental Health Assistance App:

- *Use ChatGPT to personalize mental health resources and support based on the user's individual needs and goals.*
- *Implement a mood tracking feature that uses ChatGPT to suggest self-care activities or coping strategies based on the user's current mood.*
- *Add a feature that connects users with mental health professionals for online counseling or therapy sessions.*
- *Incorporate gamification elements to make using the app feel more engaging and rewarding.*
- *Utilize machine learning algorithms to detect changes in the user's mood or behavior and provide targeted support or intervention.*

These are just a few ideas to get started with, but the possibilities are endless when combining AI and design thinking to support innovation.

This explains how ChatGPT streamlined the design thinking process, making it more efficient for the team to move from idea generation to design implementation. By providing suggestions and feedback, ChatGPT helped the team stay focused on creating a user-friendly interface.

Improved Design Elements: ChatGPT recommended the use of modern design elements and helped the team choose the right colour schemes and typography to make the app visually appealing and engaging. This led to a more cohesive and effective design that met the needs of the target audience."

This highlights how ChatGPT improved the design elements of the app. They recommended modern design elements and helped the team choose the right colour schemes and typography to make the app visually appealing and engaging. This resulted in a more cohesive and effective design that met the needs of the target audience.

Faster Implementation: With ChatGPT's

assistance, the team was able to implement the design more quickly, reducing project times and allowing the app to be launched more quickly."

This highlights how ChatGPT's involvement led to faster implementation of the design, resulting in reduced project times and a quicker launch of the app.

4.2. Manger reports

The Product Manager reports highlighted the significant value of AI tools such as ChatGPT in the Define and Ideate stages of the design thinking process. While empathy is critical in understanding the needs and wants of users, ChatGPT was found to be a useful asset in synthesizing data and analysing observations to identify the core problem.

Product Managers reported that ChatGPT enabled teams to analyse customer feedback and synthesize that information into a clear and concise problem statement quickly and accurately. By

using ChatGPT for data analysis, teams were able to move forward into the Ideation phase with a solid foundation for their design thinking process. One Product Manager reported, "Using ChatGPT to analyse customer feedback allowed us to identify the most common pain points and concerns, giving us a clear problem statement to work from in the Ideation phase."

Moreover, Product Managers reported that ChatGPT was particularly useful in the Ideation phase of product design, where it helped designers to generate and refine design ideas. By using machine learning algorithms to identify potential product features and designs, ChatGPT provided designers with a wider range of options to consider, leading to more creative and innovative product designs. One Product Manager stated, "ChatGPT was invaluable in the Ideation phase. It helped us to generate ideas we never would have thought of on our own and to refine those ideas based on user feedback."

The reports also indicated that AI tools such as ChatGPT can help teams to work more efficiently by streamlining the design thinking process. By providing a reliable and accurate analysis of customer feedback, ChatGPT helped teams to save time and resources in the Define stage of the design thinking process. Additionally, by generating and refining design ideas, ChatGPT helped teams to move more quickly through the Ideation phase. As one Product Manager noted, "Using ChatGPT in the design thinking process helped us to work more efficiently and effectively. It allowed us to move more quickly through the initial stages of product design, giving us more time to focus on the details in the later stages."

The Product Manager reports provided additional support for the positive impact of integrating AI tools such as ChatGPT into the product design process. However, they also highlighted the importance of a collaborative approach that combines technological expertise with creative design thinking.

While ChatGPT was found to be most useful in the Define and Ideate stages of design thinking, Product Managers emphasized the crucial role of empathy in the overall process. Empathy allows designers to gain real insight into users and their needs, and to set aside their own assumptions about the world. Therefore, some Product Managers were hesitant to rely too heavily on AI

tools in the empathy stage, as they felt it could undermine the human-centered approach as shown in figure 1.

However, when used in conjunction with human expertise, ChatGPT was seen as an asset for analysing customer feedback, synthesizing information, and identifying core problems. This allowed designers to move forward into the Ideation phase with a solid foundation for the design thinking process, as one Product Manager noted. Furthermore, the experimental prototype redesigns showed that ChatGPT could help designers generate and refine design features based on user feedback, ultimately leading to greater user satisfaction.

Despite the benefits of AI tools, Product Managers acknowledged the importance of human creativity and expertise in product design. As one Product Manager stated, "AI tools like ChatGPT can be powerful assets, but they are only as good as the human behind them." Designers must leverage their own creativity and expertise to ensure that the use of AI tools enhances the overall product design process.

In particular, the Prototype and Testing stages were noted as important areas where human expertise is critical. Product Managers stressed the importance of human decision-making in testing and iterating on designs, as AI tools may not always be able to account for the nuances of user experience. As one Product Manager stated, "We need to balance the use of AI tools with human judgement to ensure that our designs are not only efficient, but also intuitive and user-friendly."

5. CONCLUSION

The study reveals that applying Design Thinking to the R&D phase can lead to a more structured and creative approach to early research, which in turn improves the likelihood of successful innovation. By examining this case, the article highlights the potential of AI and Design Thinking to support innovation, even in the face of advanced technologies, distant markets, and unidentified user needs. Overall, this study provides valuable insights into the application of AI and Design Thinking principles to the research phase of innovation within the New Zealand context.

One limitation of this study is the small sample size of interviewees and Product Manager reports. While the findings were consistent across

participants, a larger sample size would provide more robust data and potentially uncover additional insights.

Another limitation is the limited scope of the experimental prototype redesigns. The study only focused on one product and one set of design features, and the impact of ChatGPT on other products and design features may differ.

Additionally, the study did not explore the ethical considerations of integrating AI tools into the design process, such as data privacy and bias. Future research should address these ethical concerns to ensure the responsible and ethical use of AI in product design.

Finally, while the study focused on the use of ChatGPT specifically, there are many other AI tools available that could potentially provide different benefits and limitations. Further research could explore the use of other AI tools in the design thinking process and compare their effectiveness to ChatGPT.

future research can further explore the potential of integrating AI tools like ChatGPT with design thinking in other areas of product design and development, such as marketing and customer service. Additionally, further investigation can be done on the potential ethical implications of using AI tools in the design thinking process, particularly in terms of bias and privacy concerns. Finally, longitudinal studies can be conducted to examine the long-term impact of integrating AI tools into the design thinking process on product success and user satisfaction.

In conclusion, while integrating AI tools such as ChatGPT into the product design process can lead to significant improvements in efficiency, creativity, and user satisfaction, it is important to approach their use with a balanced perspective. Combining technological expertise with creative design thinking, empathy, and human decision-making is critical for successful implementation. As one Product Manager put it, "AI is a tool, not a solution."

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Improving Marketing Performance: How Business Analytics contribute to Digital Marketing

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ABSTRACT

This research is aimed to assess the business analytics impact on marketing performance with mediating role of digital marketing. In order to evaluate the variables, the data was empirically collected from e-commerce industry UAE. 116 responses were included for statistical analysis. The quantitative nature of research enabled to measure the data using SmartPLS 4.0. PLS-SEM applied to assess the research model and validity of the proposed model. The findings revealed a significant association between business analytics and marketing performance whereas, the indirect link between business analytics has significant relevance using digital marketing (mobile Marketing, Social Media Marketing). As a result, business analytics has become an essential tool for companies to improve their marketing performance. By analyzing customer data and market trends, businesses can gain insights into consumer behavior and preferences, allowing them to make informed decisions and target their marketing efforts more effectively. Digital marketing has also emerged as a key component of modern marketing strategies, with its ability to reach and engage with customers through various online channels.

1. INTRODUCTION

In the e-commerce sector, digital analytics is a potent instrument that aids firms in measuring, analyzing, and comprehending the behavior of their online customers. Data from several sources, including website traffic, social media engagement, email marketing, and more, must be gathered and analyzed. With the use of digital analytics, e-commerce companies can learn more about the preferences, purchasing patterns, and website usage of their clients. This information can be used to optimize their online presence, boost customer engagement, and boost sales. E-commerce companies can get a competitive edge in the congested online market by utilizing the power of

digital analytics (Conboy et al., 2020).

Whereas, the way that organizations connect with and interact with their target audiences has been changed by digital marketing. It includes a wide variety of strategies, including search engine optimization (SEO), pay-per-click (PPC) marketing, social media marketing, email marketing, content marketing, and others. Businesses may develop focused, quantifiable, and affordable marketing programs that can reach a larger audience, provide more leads, and ultimately drive more sales by utilizing these digital channels (Yasa et al., 2020). Moreover, digital marketing provides businesses with a wealth of data that can be used to measure

and optimize marketing performance. With digital analytics tools, businesses can track and analyze their marketing campaigns' effectiveness in real-time, identifying what's working and what's not. This allows businesses to adjust their strategies and tactics quickly, optimizing their marketing efforts for maximum impact (Bala and Verma, 2018). Overall, digital marketing has transformed marketing performance by enabling businesses to reach their target audience more efficiently and effectively, while also providing the data needed to continually improve and refine their marketing strategies.

1.1. Problem Statement

Despite the growing importance of business analytics and digital marketing in modern marketing strategies, there is still a lack of understanding regarding the precise impact of these tools on marketing performance. While it is clear that businesses can leverage analytics to gain insights into customer behavior and preferences, and that digital marketing can be an effective way to reach and engage with customers, the extent to which these tools can improve marketing performance remains unclear. Moreover, the mediating role of digital marketing in amplifying the impact of business analytics on marketing performance is not yet fully understood. As such, there is a need for further research to explore the relationship between business analytics, digital marketing, and marketing performance, and to identify the key factors that contribute to their success.

2. THEORETICAL FRAMEWORK

2.1. Business Analytics

In the subject of digital analytics, digital data is measured, analyzed, and interpreted to support business decisions. Its foundations are in the broader discipline of data analytics, which include methods for gathering, processing, and analyzing data in order to gain knowledge about a variety of phenomena (Liu et al., 2019). Data is gathered from a variety of digital sources in the context of digital analytics, including websites, social media platforms, email campaigns, and mobile apps. Then, in order to find patterns and trends that can help with business choices, this data is evaluated using a range of approaches, including data mining, statistical analysis, and machine learning (Tong-On et al., 2021). Digital analytics has its roots in web

analytics, which was initially focused on analyzing website traffic and user behaviour (Mikalef et al., 2020). However, as digital channels have proliferated, digital analytics has expanded to encompass a broader range of data sources and analysis techniques.

2.2. Digital Marketing

In the realm of digital marketing, a target audience is reached by using digital media to promote goods or services. It includes a variety of strategies, including social media marketing, email marketing, content marketing, pay-per-click (PPC) advertising, and more. The expansion of the internet and the rise in the usage of digital devices for information access and purchasing decisions are largely responsible for the rise of digital marketing. Businesses have had to modify their marketing methods as customers have switched to digital media (Bhosale et al., 2020).

As comparison to traditional marketing channels, digital marketing has a number of advantages, including the capacity to reach a larger audience, target particular demographics, and more precisely gauge results. Also, it enables companies to give their clients more unique and interesting experiences, which boosts client loyalty and retention (Tariq et al., 2022). Because of changes in consumer behavior and technological advancements, the field of digital marketing is continually evolving. Businesses must continually change their marketing tactics to stay competitive as new digital channels appear and customers continue to migrate towards them.

2.3. Marketing Performance

The monitoring and analysis of a company's marketing efforts are referred to as marketing performance. It entails establishing precise marketing objectives, monitoring progress toward those objectives, and using data to guide subsequent marketing choices. Depending on the precise objectives of the marketing effort, there are many different approaches to evaluate marketing performance (Hendiarto et al., 2021). Examples of measures that can be used to evaluate marketing effectiveness include website traffic, social media engagement, email open rates, and sales income. To determine what is and is not working in marketing, as well as to create data-driven decisions that will increase the efficiency of

upcoming marketing campaigns. Marketing performance is influenced by a variety of factors, including the quality of the marketing strategy, the relevance of the marketing message to the target audience, and the effectiveness of the marketing channels used (Daud et al., 2022). By continually monitoring and optimizing marketing performance, businesses can improve their marketing ROI and drive business growth.

2.4. Industry description

By 2023, the United Arab Emirates will surpass Belgium as the 28th-largest market for e-Commerce, with anticipated sales of US\$11,782.3 million. The predicted market volume by 2027 is US\$16,373.4 million, with revenue expected to rise at a compound annual growth rate (CAGR 2023–2027) of 8.6%. The UAE e-Commerce market contributed to the global growth rate of 17.0% in 2023 with an anticipated increase of 10.6%. Global e-Commerce sales are anticipated to rise over the coming years, just like they did in the United Arab Emirates.

Within the UAE e-Commerce market, e-commerce DB takes into account five markets. The main market and source of 38.7% of UAE e-Commerce sales is fashion. It is followed by Furniture & Appliances with 12.4%, Toys, Hobby & DIY with 15.4%, Food & Personal Care with 13.6%, Electronics & Media with 19.9%, and Toys, Hobby & DIY with 15.4%.

3. LITERATURE REVIEW

3.1 Business analytics impact on Digital Marketing

There is a growing body of literature that examines the impact of digital analytics on digital marketing. Several studies have found that digital analytics tools can significantly improve the effectiveness of digital marketing campaigns by providing businesses with a more comprehensive understanding of their customers' behavior and preferences.

For example, a study by (Adaileh et al., 2022) found that companies that use digital analytics to inform their marketing strategies are more likely to achieve their marketing goals. The study also found that companies that invest in digital analytics are more likely to see a positive return on their marketing investment. Similarly, discovered (Marcelo and López, 2022) that businesses are better able to determine which channels and

approaches are most effective at generating traffic and conversions when they use digital analytics to measure the success of their marketing initiatives. As a result, firms are able to maximize the impact of their marketing initiatives.

Several studies have studied the precise ways in which digital analytics tools can be used to improve digital marketing performance (Tariq et al., 2022). According to a study by (Bala and Verma, 2018), for instance, businesses may determine which pages and content are most appealing to their target audiences by studying website visitor behavior, which enables them to improve both the look and the functionality of their websites (Orzan et al., 2020).

3.2 Business Analytics impact on Marketing Performance

According to (Afriyie et al., 2019), digital marketing means promoting goods and services on social media platforms digitally. There are several online marketing campaigns that are conducted where the advertisers are paid by companies to promote their goods or services online. This actually helped customers to reach the brand much faster. As suggested by (Amado et al., 2018), these marketing techniques are usually focused on driving actions, and as per the analysis, each asset's ROI is done. If the social media campaigns are focused and there are good strategies for online marketing, then the products are sold easily to the customers, and the customers also get in touch with the brand through the platforms (Wright et al., 2019). Digital analytics provides businesses with the data and insights they need to continuously improve their marketing strategies. By tracking the performance of each marketing channel and tactic, businesses can identify areas for improvement and adjust their strategies accordingly. This can lead to a more efficient use of marketing resources and a better overall marketing performance.

3.3 Digital Marketing impact on Marketing Performance

Digital marketing has revolutionized the way businesses reach and engage with their target audiences. With the proliferation of internet and social media, digital marketing has become an essential component of any comprehensive marketing strategy (Orzan et al., 2020). Numerous studies have been conducted to understand the

impact of digital marketing on marketing performance (Nuseir and Aljumah, 2020). Digital marketing has the potential to improve customer engagement by providing personalized experiences to customers. According to a study by (Daud et al., 2022), personalized content can increase engagement rates by up to 80%. Furthermore, digital channels such as social media and email can enable businesses to communicate with their customers in real-time, providing them with relevant information and offers.

3.4 Digital Analytics impact on Marketing performance with mediating role of Digital Marketing

As stated by (Alwan and Alshurideh, 2022), digital marketing can also improve lead generation and conversion rates. According to a study by Hubspot, inbound marketing, which includes digital marketing tactics such as content marketing, SEO, and social media marketing, can result in 54% more leads than traditional outbound marketing methods. Furthermore, a study by McKinsey & Company found that companies that use digital

marketing to engage with their customers can increase their conversion rates by up to 50% (Edelman and Heller, 2015). Moreover, digital marketing provides businesses with valuable insights and analytics that can help them optimize their marketing strategies. By using tools such as Google Analytics, businesses can track the performance of their campaigns and identify areas for improvement. Furthermore, digital marketing can enable businesses to gather valuable customer data that can be used to inform future marketing campaigns.

Furthermore, Digital analytics can provide businesses with a wealth of customer insights that can be used to inform their marketing strategies. A research by (Rikhardsson and Yigitbasioglu, 2018) identified, tracking customer behavior across various digital channels, businesses can gain a better understanding of their customers' preferences and needs. This can help businesses tailor their marketing messages and offers to better meet the needs of their target audience.

3.5. Research Model

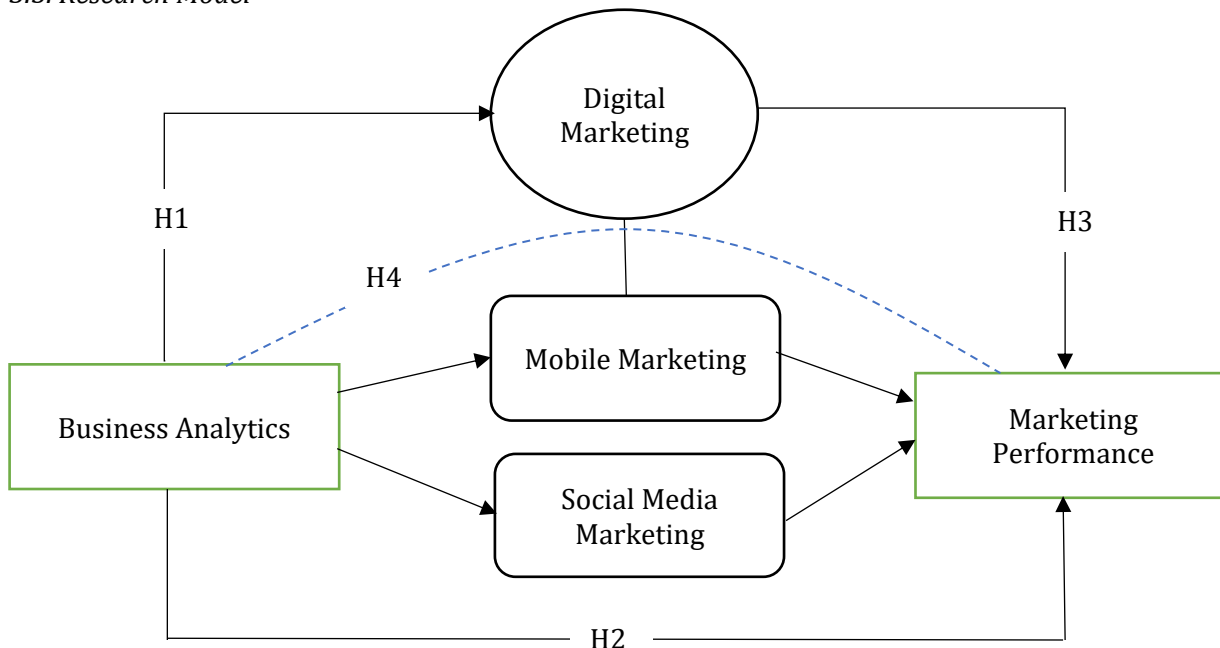


Figure 1: Conceptual Research Model

3.6 Hypothesis Development

Ho1: There is no statistically impact of Business Analytics on Digital marketing in e-commerce industry UAE.

Ho2: There is no statistically impact of Business Analytics on Marketing Performance in e-commerce Industry UAE.

Ho3: There is no statistically impact of Digital Marketing on Marketing Performance in e-commerce industry UAE.

Ho4: There is no statistically impact on Business Analytics on Marketing Performance with mediating role of Digital Marketing in e-commerce industry UAE.

4. METHODOLOGY & RESEARCH DESIGN

With the help of business and e-commerce industry experts, a survey instrument was first constructed. By completing a pilot study, expert opinions from e-commerce industry practitioners were incorporated into the survey instrument. The survey's material was divided into two categories, the first of which focuses on the respondents' profiles. The information relevant to the degree of business analytics applied in marketing processes to gauge the marketing performance with mediating effect of digital marketing. Further, the instrument was developed on the basis of five point likert scale. The data were collected from e-commerce industry UAE. And the respondents were accessed through email. Due to quantitative nature of research an empirical analysis was performed using SmartPLS 4.0 software. A PLS-SEM model was applied to measure the hypothesis path coefficients. The model assessed with convergent validity, variance inflation factor and hypothesis testing.

5. EMPIRICAL ANALYSIS

5.1. Structured Model Assessment

Structured model assessment is a process of evaluating the quality of a predictive model using a predefined set of criteria. This assessment typically involves comparing the predicted outcomes of the model to actual outcomes, in order to determine the accuracy and effectiveness of the model. The following justifications led to the usage of PLS-SEM in this investigation. First off, this strategy works best when the goal of the study is to forecast and examine the dependent variables in order to

understand the more precise amount of variance. Second, PLS-SEM is the most suitable prediction-oriented approach. Moreover, it can manage both structural models and measurement tasks simultaneously. Also, it is a suitable method for evaluating intricate path models. Finally, the PLS-SEM can still produce trustworthy results when utilised with small sample sizes. As a consequence, PLS-SEM seems to be the most acceptable method for this investigation.

5.1.1. Convergent Validity

We used the variance-based Partial Least Squares Structural Equation Modeling (PLS-SEM) approach to analyse the data. This method of multivariate data analysis allows for the simultaneous examination of numerous relationships between a wide range of variables, including latent variables. In this analysis, methods like Average Variance Extracted (AVE), (CR), and Cronbach's Alpha are typically employed to calculate the values of the indicators. However, using this methodology enables the study to provide information on several vital processes that must be handled and scrutinised in order to establish the reliability of these indicators. Moreover, dependability is connected to critical aspects of the study model's validity evaluation, also known as internal consistency.

It was also assessed whether the variance inflation factor (VIF) values in this study suggested collinearity problems with the model before carrying out the hypothesis tests. When the inner VIF values are less than 5, collinearity issues are not present in the data. The results of the current investigation show that the inner VIF construct values are substantially below the required level (0.5). The absence of collinearity in the data utilised for this study demonstrates the robustness of the model. Table 1 displays these results. The outcomes additionally demonstrated that the convergent validity had acceptable values of >0.50 and >0.60 . The outcomes of the measuring method used in this study demonstrated that the constructs were valid and consistent, and they largely supported all of the hypotheses

5.1.2. Hypothesis Testing and Mediating Analysis

The final step of the analysis was to conduct the mediation analysis, which involves testing the

significance of the indirect effect of the independent variable on the dependent variable through the mediator. This is done by calculating

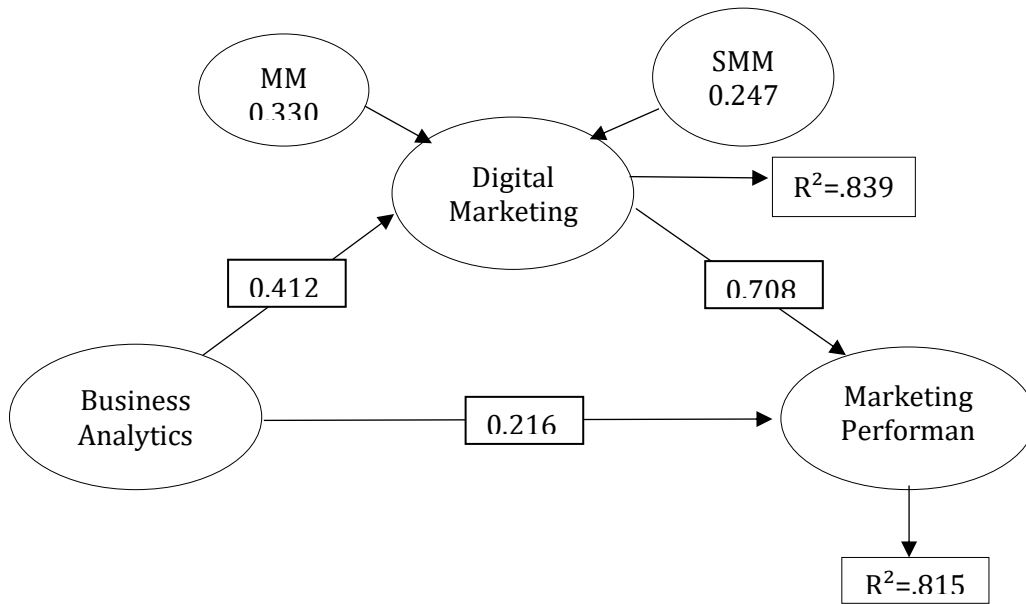
the product of coefficients approach or bootstrapping approach. Table 2 displayed the overall findings.

Table 1: Convergent Validity, AVE, CA, CR, VIF, FL

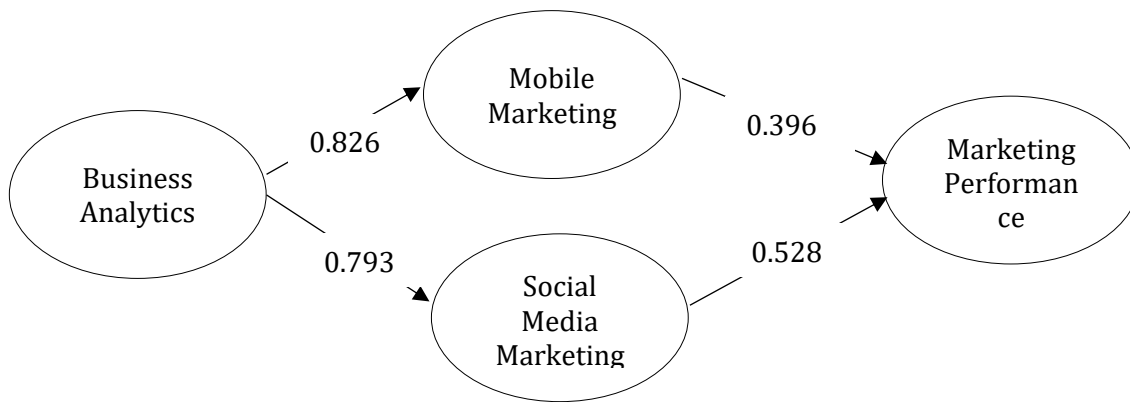
Construct	Items	VIF	Loadings	Cronbach's Alpha	CR (rho c)	AVE
Business Analytics	BA1	1.789	0.823	0.842	0.891	0.527
	BA2	2.896	0.877			
	BA3	1.239	0.812			
	BA4	1.863	0.789			
	BA5	1.224	0.833			
Digital Marketing	DM 1	1.766	0.765	0.734	0.878	0.518
	DM 2	1.876	0.921			
	DM 3	1.934	0.814			
	DM 4	1.883	0.902			
Mobile Marketing	MM1	1.821	0.872	0.824	0.844	0.622
	MM2	1.058	0.826			
Social Media Marketing	SMM1	1.008	0.826	0.891	0.845	0.627
	SMM2	1.255	0.749			
	SMM3	2.122	0.932			
Marketing Performance	MP1	1.786	0.982	0.822	0.854	592
	MP2	1.865	0.821			
	MP3	1.872	0.889			
	MP4	1.445	0.724			
	MP5	1.943	0.831			
	MP6	1.554	0.870			
	MP7	1.032	0.731			

CA=Cronbach's Alpha, CR=Composite Reliability, AVE=Average Variance Extracted, VIF=Variance Inflation Factor, FL=Factor Loadings

5.1.3. Structured Equation Modelling



(a) Figure 1: Structural Model Assessment



(Digital marketing dimensions)

(a) Figure 3: The Mediating Effect Model

The PLS method was used to produce the path coefficients, and the PLS bootstrapping method with a resampling of 5000 was used to assess the importance of the path coefficients at level (0.05). The R-square was initially computed to verify the explanatory power of exogenous impacts on endogenous variables. The model explained 83.9% of the variance in the business analytics and 85% of the marketing performance. thus, our study's first hypothesis explains the impact of business analytics on influences digital marketing ($\beta=0.412$, $p=0.001$) at level of 0.05 that indicate a H1 is supported in this study. The relationship of business analytics is measured with marketing performance as ($\beta=0.216$, $p=0.005$) predicted as Table 2: Hypothesis Testing

acceptance level of H2 of the research model. The data findings show a significant impact of digital marketing on marketing performance ($\beta=0.708$, $p=0.000$) at total significance level of <0.05 . hence the H3 of the model is supported. The mediating effect of digital marketing is also measured with its dimensions (Mobile Marketing and Social Media Marketing). The findings show ($\beta=0.508$, $p=0.006$) has the significant direct effect of business analytics on marketing performance whereas, an indirect effect using a mediator also shows a significant effect as ($\beta=0.292$, $p=0.005$). The H4 of the study is also supported. The overall findings are demonstrated in Table 2 above.

Hypothesis	Paths	Direct Effect				Indirect Effect					
		β	R ²	t-value	p-value	β	t-value	p-value	Percentile bootstrap 97.5% confidence interval	Decision	
H1	BA→DM	0.412	0.839	3.27	0.001				Lower 2.5%	Upper 97.5%	Supported
H2	BA→MP	0.216	0.850	2.17	0.005						Supported
H3	DM→MP	0.708		7.49	0.000						Supported
H4	BA→DM→M P	0.508		5.21	0.006	0.292	2.82	0.005	0.087	0.495	Partial Med

BA=Business Analytics, DM=Digital Marketing, MP=Marketing Performance, level of significance at $p<0.05$.

6. DISCUSSION

The research discusses the role played by business analytics on marketing performance with the mediating role of digital marketing. The business analytics process helps an organization use technologies, systems, and skills to gain an understanding and conduct a thorough investigation into the company's past performance. Gaining information on past performance helps an organization ensure the task of future business planning, and the company can avoid significant business risks. Business analytics make sure the company learns thoroughly about the organization's past performance, and data analysis and statistic models of information advantage can be gained through the process.

As discussed in the above findings, digital analytics can help in the process of marketing performance with the help of the applied understanding of the business. Business analytics takes the help of gaining knowledge of the previous performance of

the company through data analysis to lay out performance indicators for the company. The current demands and requirements of the consumers can be focused on while conducting data analysis of the company's previous performance, ultimately allowing the company to sustain the marketing performance for future activities and tasks in terms of the company's growth and development. Marketing performance indicators can favor the business analytics conducted by the company.

The marketing performance of an organization is not completely dependent on the business analytics a company conducts but is also largely contributed o by the performance of the employees, channels of selling the products and services, and so on. The satisfaction of customers from the products and services offered by the company, the product and service being delivered to the company, and so on are some factors contributing to the company's marketing

performance. As soon as the consumer demands are fulfilled, customer satisfaction and the company's marketing performance are enhanced. Understanding the needs and requirements of the market can contribute to marketing performance enhancement.

Additionally, the mediating role of digital marketing refers to promoting products and services and the company itself using internet-related marketing tools. One of the most frequently used internet tools for marketing is the social media platforms to help organizations in digital marketing procedures. Online or digital marketing tools and campaigns act as the mediating variable in laying down the impact of digital analytics on the company's marketing performance. Digital marketing tools may help an organization gather data to enhance the company's marketing performance.

As analyzed the digital marketing process helps organizations with an easy checkout process, thus increasing the easy-to-use nature of digital marketing. The strategies and methods of digital marketing being easy to use help the company enhance the efficiency of marketing performance of the digital strategies. Products being promoted through digital marketing have also been able to create reliability within the customers for the company's website and create reliability for the products being sold by the company, as can be gathered from the seventh question of the analysis process.

The processes and systems of business analytics and digital marketing are extremely integrated and rely on each other to complete the activities successfully. Business analytics or digital analytics process can only be conducted under a system as digital marketing help in gathering the customers for the company and helps in ensuring the company's successful growth. The process of digital marketing helps an organization in the collection of data, and the business analytics process and system ensure data is analyzed, used for future growth, and so on. Business analytics also allows organizations to explore business strategies to ensure the company completes its operations successfully. The business growth strategies can involve digital marketing strategies to ensure the mediating role of the same in enhancing marketing performance.

7. CONCLUSION

The research focuses on the impact of business analytics strategies on the marketing performance of an organization, with the mediating role of digital marketing and digital marketing strategies. The mediating role of digital marketing has further amplified the impact of business analytics on marketing performance. Through digital marketing, businesses can leverage the insights gained from business analytics to create targeted campaigns and personalized messaging that resonates with their audience. Additionally, digital marketing allows for real-time monitoring and optimization of campaigns, enabling companies to make data-driven adjustments to their marketing strategies. Overall, the integration of business analytics and digital marketing has proven to be a powerful combination in improving marketing performance. By leveraging these tools together, companies can gain a deeper understanding of their customers, create more effective marketing campaigns, and ultimately drive business growth.

8. MANAGERIAL IMPLICATIONS

The e-commerce industry needs to focus on expanding its employee performance to increase marketing efficiency. Digital marketing or business analytics are not the only factors essential for the success of the marketing performance process. Other factors, such as the performance of employees, are also essential in the successful generation of marketing performance. The company can focus on enhancing employee performance, thus giving the company enhancement strategies for marketing performance and digital marketing. Enhancing the employee performance will offer the company strategies for successfully enhancing all the areas of operations because the employees are a pillar of the organization, and the employee performance enhancement will lead to larger successful implications.

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Revolutionizing Supply Chains: Unveiling the Power of Blockchain Technology for Enhanced Transparency and Performance

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ABSTRACT

In recent years, the significance and prevalence of distributed ledger technology have grown. However, there is a lack of empirical studies examining the managerial and technological aspects essential for implementing it in the distribution network. The objective of this research is to develop a comprehensive framework for the adoption of blockchain technology in the entire distribution chain. This will be achieved by identifying the factors that facilitate adoption and experimentally evaluating their interdependencies and effects on adoption through empirical evidence collection. A quantitative approach was used to assess the model's main objective. The study focused on the medicine manufacturing industry to gather responses regarding the intention to use blockchain technology and its impact on supply chain performance. The findings revealed a significant positive relationship in the hypothetical model. Additionally, secondary data analysis, which considered previous research and online surveys, was conducted to assess the impact of blockchain technology on supply chain performance and the mediating role of supply chain transparency.

1. INTRODUCTION

The utilization of emerging technologies has opened opportunities to enhance various aspects of the supply chain process, and one such technology is blockchain. Its implementation in the supply chain has proven to be beneficial by increasing transparency and significantly reducing administrative costs (Alabi and Telukdarie, 2021). The adoption of blockchain in the supply chain method enhances the management of participants, including factors such as pricing, location, quality, and certification (Korpela et al., 2017). This improvement in supply chain performance, coupled with the mediation of supply chain transparency, has particularly benefited the supply chain industry in the UAE. It has facilitated better traceability of materials and mitigated losses

resulting from counterfeit products or involvement in the gray market.

Additionally, there has been a growing adoption of blockchain technology across various industries, aiming to enhance transparency, security, and efficiency in supply chain management. Specifically, the pharmaceutical industry has recognized the potential advantages of integrating blockchain technology into its intricate and heavily regulated supply chain. By implementing blockchain-based solutions, pharmaceutical companies can enhance visibility and traceability of products throughout the entire supply chain, mitigate counterfeiting and fraudulent activities, and enhance overall supply chain efficiency (Arden et al., 2021). This transformative potential of

blockchain technology holds the promise of revolutionizing the pharmaceutical business, spanning from production to distribution, ultimately leading to improved patient outcomes (Khubrani, 2021). Thus, this research was undertaken to investigate the adoption of blockchain technology and its impact on supply chain performance, while also examining the mediating role of supply chain transparency.

1.1 Medicine Manufacturing Industry in The United Arab Emirates (UAE)

The medicine manufacturing industry in the United Arab Emirates (UAE) is experiencing rapid growth, thanks to several factors such as the strategic location of the country, advanced infrastructure, and favorable business environment. The UAE has successfully positioned itself as a prominent hub for pharmaceutical manufacturing and exports, attracting substantial investments from both local and international companies. To ensure the production of safe and effective drugs, the country has implemented stringent regulatory frameworks and quality standards. Given the rising demand for pharmaceuticals locally and globally, the UAE is poised for further expansion and development of its medicine manufacturing industry in the foreseeable future.

1.2 Research Problem

In recent years, the utilization of blockchain technology in supply chains has garnered significant attention for its potential to improve various aspects of operations. This includes enhancing transparency, enabling traceability, combating fraud, and counterfeiting, and increasing overall efficiency. However, there is still much to be understood about the specific impact of blockchain technology on supply chain performance, particularly in relation to the role of supply chain transparency as a mediator.

While blockchain technology offers a secure and decentralized platform for recording and sharing supply chain data, its benefits may not be fully realized without sufficient transparency throughout the supply chain. Transparency plays a vital role in allowing stakeholders to track the origin and movement of goods, ensure compliance with regulations and standards, and make informed decisions. Therefore, it is crucial to investigate the extent to which blockchain

technology can enhance supply chain transparency and how this enhanced transparency can subsequently influence overall supply chain performance.

To address these issues, the research aims to achieve the following objectives:

- Assessing the statistical impact of information integrity on supply chain transparency.
- Identifying the key factors that make risk management essential for maintaining supply chain transparency.
- Examining the interplay between blockchain technology implementation, networking, and risk management as mediators in achieving transparency within the supply network. By investigating these objectives, the research aims to shed light on the relationship between blockchain technology, supply chain transparency, and overall supply chain performance. This understanding will contribute to the effective adoption and utilization of blockchain in supply chains and pave the way for improved operational efficiency and performance.

1.3 Operational Definitions

1.3.1 Blockchain technology:

Blockchain technology refers to a public and tamper-proof ledger that governs the recording of transactions and tracks assets within a secure business network. Its key components include distributed ledger technology, immutable records, and smart contracts.

1.3.2 Supply chain performance

The evaluation of supply chain performance is essential in assessing the effectiveness of the overall supply chain system. It encompasses both qualitative and quantitative measures to gauge the system's efficiency and effectiveness.

1.3.3 Supply chain transparency

Supply chain transparency is a process wherein organizations strive to gain visibility into upstream activities within the supply chain and facilitate the transfer of information both internally and externally within the organization (Frederico et al., 2021).

By incorporating blockchain technology, organizations can enhance the transparency and

security of their supply chain operations. This technology provides a decentralized and tamper-proof system for recording transactions and tracking assets. It improves trust and accountability within the supply chain network (Marinagi et al., 2015). Evaluating supply chain performance allows organizations to identify areas of improvement and optimize their operations for better efficiency. Furthermore, fostering supply chain transparency enables organizations to gain insights into upstream activities, facilitating informed decision-making and enabling collaboration throughout the supply chain network.

2. LITERATURE REVIEW

2.1 Blockchain Technology

Blockchain technology utilizes a distributed ledger system to record transactions securely and transparently. It operates in a decentralized manner, employing encryption to safeguard data stored within the network, verify, and secure transactions, and ensure their validity (Lu, 2018). While blockchain's association with cryptocurrencies is widely recognized, its potential extends beyond that, encompassing various applications like voting processes, supply chain management, and identity verification (Othman et al., 2020). The immutability of blockchain, which safeguards transactions from alterations or removal once recorded, stands as a significant feature of this technology. As a result, it serves as a crucial tool in ensuring accountability and transparency across diverse industries (Kramer et al., 2021).

2.2 Supply Chain Performance

In logistics development, the supply chain plays a vital role, and its evaluation involves various metrics. These metrics include order planning (i.e., access method direction, order lead time, customer order route), supply link assessment, dealings and production-level key performance indicators (KPIs), calculation of delivery connections (i.e., performance actions for delivery, overall supply cost), measurement of client facility and fulfillment (i.e., flexibility, customer inquiry response time, post-transaction procedures for customer service), supply chain and logistics costs (i.e., price related to assets and return on investment (ROI), and data dispensation rate). These metrics collectively form

a comprehensive framework for assessing and improving the efficiency of the supply chain within logistics operations.

2.3 Supply Chain Transparency

Supply chain transparency is a multi-step process that extends beyond mere visibility within the supply chain. It involves an organization's response to insights gained through broader visibility to mitigate risks more effectively. The framework for achieving supply chain transparency comprises the following four steps. The first step is identification and prioritization of risks. It is to understand the potential risks inherent in the industry is crucial to address them in accordance with their level of severity. Step two is visualization of the risks. Once the risks are identified, the immediate next step is to assess them and determine the necessary measures to prevent their occurrence in the future. Step three is utilization of transparency levers to bridge information gaps. After prioritizing the areas of risk, the subsequent step involves employing transparency levers to close any existing information gaps. The last step is managing and monitoring. Closing an existing gap through transparency lays the foundation for a sustainable transparency program that not only supports the organization but also gathers insights from up-to-date information. Once the new system is established, the subsequent step is to effectively manage and monitor the resulting information. By following this comprehensive four-step process, organizations can enhance their supply chain transparency, thereby mitigating risks and improving overall performance.

2.4 Impact of Blockchain Technology on Supply Chain Performance

A distribution system typically consists of multiple independent companies that actively engage in the movement of goods, services, money, and/or information from the source to the end consumer. To effectively operate such a distribution chain, participants must collaborate and share data. Distributed ledger technology holds significant potential in enhancing supply chain operations and achieving supply chain management goals. It provides a framework for direct communication among supply chain participants, enabling the exchange of reliable and tamper-proof information.

One of the key advantages of this technology is its ability to ensure complete product traceability and enhance visibility throughout different phases of the supply chain. For example, a UK-based blockchain technology company has developed systems that enable product monitoring and the collection of specific product data to verify authenticity, provenance, and consistency. Start-up Everledger is another example, utilizing blockchain to generate and maintain unique identifying information for individual units of items across various industries. These technologies offer quality assurance, help the jewelry industry comply with gem industry regulations, and are also employed in monitoring and certifying liquor bottles. Through blockchain technology, supply chain members can share data regarding demand, inventory, and capacity, facilitating improved coordination and efficiency within the supply chain.

2.5 Impact of Blockchain Technology on Supply Chain Transparency

The logistics sector is highly vulnerable to cyber-attacks due to its interconnected nature and reliance on data and software for tracking the movement of goods (Farouk and Darwish, 2020). Understanding the intricate processes involved in logistics can be challenging. Effective planning for optimal efficiency requires careful selection of suppliers, establishing distribution networks, managing inventory, and scheduling workers. Logistic chain management plays a crucial role in ensuring the smooth functioning of these elements (Khai Loon et al., 2018). Given the potential to enhance supply chain operations, the advanced features of blockchain technology and the factors influencing its adoption in a distribution network environment have garnered significant interest (Sillanpää, 2010). A recent study highlighted the challenges faced in implementing distributed ledger technology in international supply chains, particularly related to interoperability among different blockchain platforms and the complexity of contractual regulations across national borders (Chowdhury et al., 2022). A notable example of utilizing distributed ledger technology is its application in tracing the authenticity of fish from the source, such as a fisherman in Indonesia, and providing robust verification of compliance with international standards throughout the network, using smart labeling (Chowdhury et al., 2022). This

demonstrates the potential of distributed ledger technology to enhance transparency and traceability in supply chains.

2.6 Impact of Supply Chain Transparency on Blockchain Technology

Blockchain enables end-to-end tracking of distribution networks, offering enhanced openness and precision. By digitizing physical assets, businesses can monitor their journey from production to distribution or end-user use, creating an immutable and distributed record of all interactions. This secure method of data storage makes it difficult to alter or manipulate the network, ensuring transparency in all activities (Arden et al., 2021). Supply chain management plays a crucial role in building trust among businesses, suppliers, and customers, as it signals a company's commitment to transparency and integrity in its operations. With blockchain, businesses can conduct transactions directly, improving the efficiency of global value chains without the need for intermediaries (Meidute-Kavaliauskiene et al., 2021). Furthermore, blockchain facilitates the integration of financial and logistical services, enhancing the sharing of information among stakeholders. By leveraging blockchain technology, companies can enhance trust, streamline operations, and foster collaboration in the supply chain ecosystem.

2.7 Impact of Blockchain Technology on Supply Chain Performance with The Mediating Role of Supply Chain Transparency

According to a study conducted by (Erceg and Sekuloska, 2019) blockchain technology has the potential to enhance transparency and traceability in the supply chain, thereby improving production quality (Min, 2019). The study highlights that real-time tracking of goods through blockchain can aid in early detection of quality issues and enable quicker resolution (Alazab et al., 2021). Furthermore, blockchain can contribute to better coordination among supply chain stakeholders by providing a shared ledger accessible to all, reducing the chances of miscommunication and errors. Similarly, another study by (Sobb et al., 2020) emphasizes the role of blockchain in improving time efficiency within the supply chain. By streamlining processes and minimizing delays, blockchain's real-time tracking capability can

reduce lead times and facilitate faster delivery. The study also suggests that blockchain can automate manual tasks like documentation, saving time and effort.

As explained by (Mondol, 2021), blockchain technology has the potential to significantly enhance supply chains in several ways. It can enable faster and more cost-effective product delivery, strengthen coordination among partners, ensure product provenance, and provide easier access to funding. By facilitating seamless and integrated communications across complex

distribution networks, blockchain enhances confidence, speed, and safety. Additionally, it can be utilized to create online platforms where logistics service providers advertise available space on vehicles or containers in real-time (Wu et al., 2006). This further improves efficiency, safety, and confidence in supply chain operations. Overall, blockchain technology holds promise for transforming supply chains by enhancing various aspects of operations and promoting collaboration among stakeholders.

2.8 Conceptual Framework

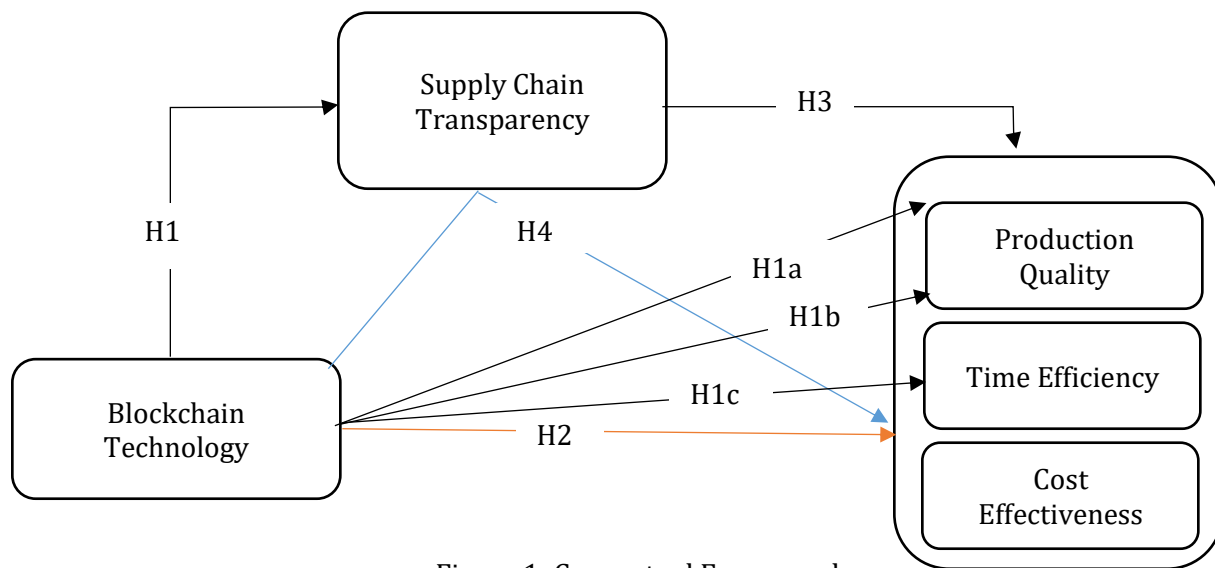


Figure 1: Conceptual Framework

2.9 Research Hypotheses

H1: Block Chain technology has positive impact on Supply Chain Performance.

H1a: Blockchain Technology has positive impact on Quality Production.

H1b: Blockchain Technology has positive impact on Time Efficiency.

H1c: Blockchain Technology has positive impact on Cost Effectiveness.

H2: Blockchain Technology has positive impact on Supply Chain Performance.

H3: Supply Chain Transparency has positive impact on Supply Chain Performance.

H4: Blockchain Technology has positive impact on Supply Chain Performance with the mediation of Supply Chain Transparency.

3. METHODOLOGY

A quantitative research methodology was employed to gather data from participants involved in the pharmaceutical sector. Although 17 pharmaceutical manufacturers were contacted via email, obtaining confidential responses proved to be challenging. However, managers, operations managers, supply chain managers, and logistics officers received a set of 300 questions each via email. After screening, a total of 156 responses were deemed eligible for data analysis. A simple random sample was selected for this study. The questionnaire, consisting of 22 items, was developed by the author. It covered various aspects, including the implementation of blockchain technology (6 questions), supply chain transparency (5 questions), and supply chain

performance (4 questions). Additionally, there were 7 items relating to the cost, time efficiency, and quality output of supply chain performance. The collected data were analyzed using SmartPLS 4.0 software, employing the structured equation modeling technique for hypothesis testing.

4. DATA ANALYSIS

4.1. Demographic Analysis

To conduct a demographic analysis, various demographic factors such as age, gender, qualifications, and experience were taken into account to gain insights into the background of the

respondents. The demographic data was collected by including questions about gender, age, and qualifications. The results revealed that 87 respondents (56.5%) were male, while 67 respondents (43.5%) were female. The majority of respondents fell within the age range of 18 to 25 years, accounting for 63 respondents (40.9%). In terms of experience, the largest group consisted of 55 respondents (35.7%) with 5 to 10 years of experience. Table 1 provides a comprehensive breakdown of the age groups, qualifications, and experience levels of the respondents.

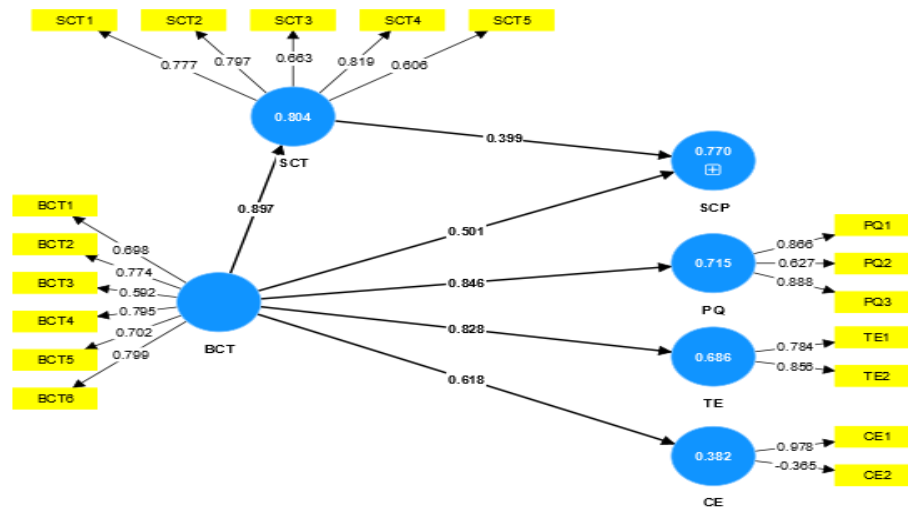
Table 1: Demographic Analysis

	Description	Frequency	Percentage
Gender	Male	87	56.5
	Female	67	43.5
Age	Below 18 years	26	16.9
	Between 18-25 years	63	40.9
	Between 25-33 years	39	25.3
	Above 33 years	26	16.9
Qualification	High school degree	38	24.7
	Graduate	55	35.7
	Diploma	41	26.6
	Post graduate degree	20	13.0
Total		154	100

4.2. Assessment of Measurement Model

The Partial Least Squares Structural Equation Modeling (PLS-SEM) was utilized to analyze the model construct, which included three variables

and three dimensions of supply chain performance. Figure 2 illustrates the path coefficients of the model, indicating the relationships between the variables and their respective dimensions.



4.3. Assessment of Structural Model

In this study, the bootstrap confidence intervals method was employed, with 5,000 iterations. The purpose was to investigate and provide empirical evidence of the mediating roles of Supply Chain Transparency in the relationship between Blockchain Technology and the three dimensions of Supply Chain Performance (H1a, H1b, H1c). This method was used to determine the size and statistical significance of the indirect effects, as shown in Table 2. Regarding the direct effects, H1, which examines the direct impact of blockchain technology on supply chain performance, was found to be significant ($\beta=0.501, t=3.10$), providing support for this hypothesis. H2 explores the impact

of blockchain technology on SC transparency, and it was found to have a significant relationship ($\beta=0.897, t=36.5$), supporting H2. Furthermore, the impact of SC transparency on supply chain performance was also found to be significant ($\beta=0.399, t=2.49$), supporting H3. These results indicate that supply chain transparency acts as a mediating variable between blockchain technology and supply chain performance, positively influencing their relationship.

The direct impacts of blockchain technology on supply chain performance, as shown in Table 2, were found to be significant within the confidence intervals range ($\beta=0.358, t=2.38$). The statistical summaries are provided in Table 2 to further elucidate these findings.

Table 2: Hypothesis Testing Direct, and Indirect effect

Paths	Effects	Direct Effects		Indirect Effects		Conclusion
		B	t	B	t	
BCT->SCP	H1+	0.501***	3.10			Supported
BCT->QP	H1a+	0.846***	28.30			Supported
BCT->TE	H1b+	0.832***	12.60			Supported
BCT->CE	H1c+	0.618***	11.80			Supported
BCT->SCT	H2+	0.897***	36.50			Supported
SCT->SCP	H3+	0.399***	2.49			Supported
BCT->SCT->SCP	H4+	0.358***	2.38	0.453***	3.63	Supported
BCI LL		0.132		0.115		
BCI UL		0.720		0.670		

BCT=Blockchain Technology, SCP=Supply Chain Performance, SCT=Supply chain Transparency, QP=Quality Production, TE=Time Efficiency, CE=Cost Effectiveness, BCI LL=Bootstrapped Confidence Interval Lower level; BCI UL=Bootstrapped Confidence Interval Upper level; *** $p < 0.001$; ** $p < 0.01$; NS= Not Supported

The performance measurement of blockchain technology adoption in the pharmaceutical

manufacturing sector is illustrated in Figure 3. The statistical analysis conducted in this research revealed significant improvements in production

quality, timeliness, and cost-effectiveness as a result of adopting blockchain technology.

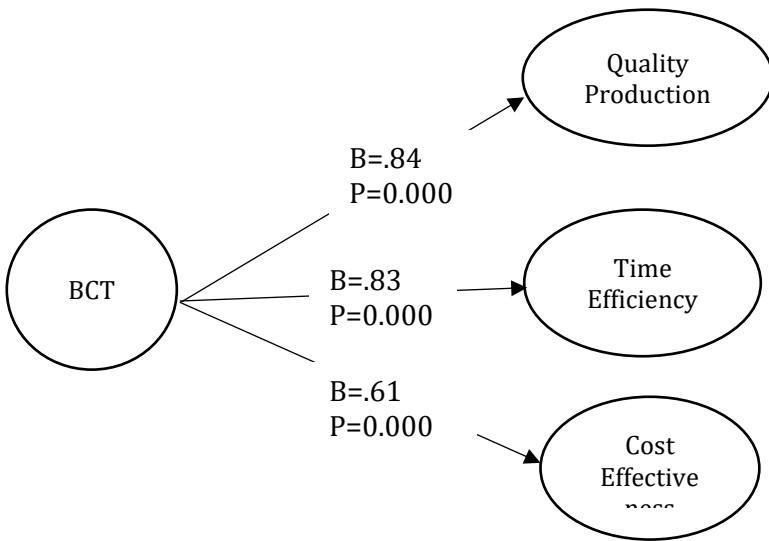


Figure 3: Supply Chain Performance Measurement Statistics

5. RESULTS AND DISCUSSION

The findings of statistical studies paint an intriguing picture of the relationships and synergies between data analytics. Blockchain technology has emerged as a promising solution to address various challenges in supply chain management, including issues of transparency, counterfeiting, and inefficiencies. By providing a decentralized and secure platform for recording transactions and storing data in an immutable ledger, blockchain technology offers companies the potential to enhance supply chain performance in several ways. These include improving transparency and accountability, reducing fraud and errors, enhancing traceability, and enabling real-time tracking of goods and assets.

One of the key advantages of blockchain technology in the supply chain is its ability to enhance transparency. Through the use of distributed ledgers, every transaction and record can be accessed and verified by all parties involved, fostering trust and credibility. This shared transparency mitigates the risks of fraud and errors, as all stakeholders have access to consistent and reliable information.

To fully understand the impact of blockchain

technology on supply chain performance, it is important to consider the mediating role of supply chain transparency. Transparency in the supply chain refers to the ability to track and monitor the flow of products and services from raw material sourcing to final delivery. Blockchain technology facilitates supply chain transparency by providing a secure and tamper-proof platform for storing and exchanging data.

Research indicates a positive correlation between supply chain success and supply chain transparency. For example, when supply chain partners have real-time access to information regarding the movement and condition of goods, they can make informed decisions to reduce lead times, improve operational efficiency, and enhance customer satisfaction. Transparency also enables the identification of supply chain inefficiencies and bottlenecks, allowing businesses to take corrective measures and improve overall performance.

However, the research findings suggest that the level of blockchain technology adoption, the complexity of the supply chain, and the availability of supporting technologies can influence the effectiveness of blockchain in improving supply chain performance. The benefits of transparency may be limited, for instance, if only a few participants in the supply chain embrace blockchain technology. Similarly, in highly complex supply chains, blockchain technology alone may not be sufficient to address all challenges and optimize performance.

6. CONCLUSION

The primary focus of this research was to examine the influence of blockchain technology on supply chain performance, considering the mediating role played by supply chain transparency. The findings demonstrate that by enhancing transparency, blockchain technology has the potential to positively impact supply chain performance, leading to decreased inefficiencies and increased customer satisfaction. However, it is important to acknowledge that the effectiveness of blockchain in the supply chain context can be influenced by several factors, such as the extent of adoption, the complexity of the supply chain, and the presence of complementary technologies.

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The Reality of SMEs and Sustainable Development from the Perspective of Innovative Economic Vision of the Kingdom of Bahrain 2030

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ABSTRACT

The study aimed to identify the reality of SMEs and the sustainability of their development from the perspective of innovation in light of the economic vision of the Kingdom of Bahrain 2030. The study used the descriptive analysis approach, based on the published reports of small and medium enterprises. In addition, the survey has been used to find out the size of the obstacles and challenges facing these small and medium enterprises in the Kingdom of Bahrain. The sample consists of 270 small and medium enterprises in the Kingdom of Bahrain as the population of this study was 829 company, were the data collected has been analyzed using the SPSS version 27. The study's findings highlight the significance of institutions' long-term viability and growth in light of their central function in the advancement of the economic development cycle. Another significant factor is the requirement for the company to grow and innovate in its operations, as well as the financial and marketing help that the state may provide as a partner in the economy's growth. Furthermore, Companies greatly contribute to the strategic and economic planning of governments due to their significant impact on the economy and involvement in it. In order to achieve the maximum levels of the economy, which in our day has become the most important priority, the researchers advised enhancing the activation of institutional processes and working toward the creation of creative and smart institutions crucial for nations, which in turn promotes the growth of entrepreneurship initiatives and their operations. Additionally, he exhorted small and medium-sized businesses to step up their support by investing in the creation of their cutting-edge goods in order to keep up with the market and achieve the goals of the Kingdom of Bahrain's Vision 2030.

1. INTRODUCTION

Small and medium enterprises are an essential pillar of the economy of any country, whether developed or developing, due to their success in contributing to employment, income generation,

contribution to the gross domestic product and the wheel of economic development, at a low financial cost compared to large enterprises (Kata et al., 2020). In OECD countries, small and medium-sized

enterprises constitute about 99% of all and are considered the most important main sources of employment and provide about 70% of jobs, as well as contribute to the creation of added value by 50% to 60% (Feasibility investment, 2019). On the other hand, in China, for example, small and medium-sized enterprises constitute about 99.7% of all enterprises, and it is believed that 80% of jobs are available in urban areas, 90% of new jobs are available, and they contribute 60% of GDP, and they also hold 65%. From patents to innovations, finally provides 75% of technological innovations in small and medium enterprises with periodic development of more than 80% of new products. (International Council on Small Business, 2018: 54) (Cecilia Igwemeka et al., 2015).

While in the Arab countries, the number of micro, small and medium enterprises reaches about 5.5 million enterprises, and the percentage ranges between 90% and 99% of the total number of enterprises, and the emphasis here is that most of them are in the Arab state of Egypt, at a rate of 44%, while in the Kingdom of Saudi Arabia, the percentage reaches 18 %, Tunisia 11%, about 9% in Morocco, 6% in the United Arab Emirates, and the rest is divided into the rest of the Arab countries. Despite the huge size of these sectors, their contribution to the GDP is still weak in the oil-exporting countries (Abdel Moneim, 2005).

The texts of the economic vision of the Kingdom of Bahrain 2030, which was launched by His Majesty King Hamad bin Isa Al Khalifa, the great king of the country, may God protect and preserve him in October 2008, is "to provide a comprehensive economic vision for the Kingdom of Bahrain that would set a clear direction for the continuous development of the Bahraini economy, and it reflects the goal The main goal is to achieve the principle of competition, justice and sustainability in order to build a better life for all Bahraini citizens. The success of the economic project casts a shadow over the markets, as it improves the national income, increases the diversity of sources of income, leads to the emergence of new institutions that increase investment opportunities in the Kingdom of Bahrain, and helps reduce economic and social problems and unemployment problems in society "Economic Vision 2030".

1.1. Problem Statement

In the foregoing, the formation of the research

problem involved the existence of some divergence of views on the reality of small and medium enterprises in general and their reality in the Kingdom of Bahrain about their reality and how to improve them to reach the realization of the vision of the Kingdom of Bahrain 2030. And the need to increase attention and objective evaluation of it, and therefore the formulation of this problem in the form of the following questions:

1. What is the reality of small and medium enterprises in the Kingdom of Bahrain?
2. What are the challenges and obstacles facing small and medium enterprises in terms of the opinion of owners of small and medium enterprises in the Kingdom of Bahrain?
3. What are the roles played by business incubators that support small and medium enterprises in the Kingdom of Bahrain?
4. What are the available opportunities in Bahrain Vision 2030? What is the extent to which they are used to develop this type of small and medium enterprises in the Kingdom of Bahrain?

2. REVIEW OF THE LITERATURE

Today, most rising nations rely on the expansion and creation of new businesses to boost their economies and generate employment. One of the most popular methods for promoting the formation of new businesses and boosting entrepreneurial activity is the establishment of business incubators. Through business incubation, entrepreneurs may get knowledge and support to launch successful start-ups.

The goal of company incubation is to support entrepreneurs to nurture and build new and small businesses, products, and innovations in their early stages of development. It is a unique and highly flexible combination of business development techniques, infrastructure, and people. Small and medium-sized businesses (SMEs) are organizations that employ less than a specific threshold of personnel. There are many more small enterprises than large ones. Benefits from the improved employment opportunities as well as the additional revenue and wealth that these new firms bring to the area (Rifai et al., 2016). Together, these communities can assist a nation in developing a large portion and employ a lot more people. SMEs are responsible for fostering innovation and competitiveness in many economic sectors

(Akpoviro, Oba-Adenuga & Akanmu, et al., 2021).

Business incubators, according to (Oshewolo, 2010), support the growth of new businesses, employment growth or job creation, improved industry structure, the acquisition, commercialization, and/or transfer of technology owned by universities and research institutions, wealth creation, and the encouragement of techno-entrepreneurship culture (Keegan et al., 2022)

The importance of business incubators is undeniable, according to (Ayad et al., 2022); incubators are an essential stepping-stone for delivering investments in sectors that are practical for the national economy. incubators for technology, help for small firms, undertakings using information are among them. Business incubators display innovations and creativity in the form of projects that might be produced while considering the results of scientific research (Kata et al., 2020). By creating suitable conditions, the required competencies, and requirements for starting small projects are strengthened.

Business incubators support entrepreneurs with innovative ideas by offering startup capital, guidance, and consulting services, as well as by creating regulations for them, according to the OECD and the European Commission (2019). According to (Hunitie et al., 2022), the principle of incubation development promotes offering significant firms collective services including workspaces, funding, networking opportunities, and marketing. intervenes in the relationship between incubators and the outside world, including external networking services and other entities (Li et al., 2020)

According to (Meru and Struwig, 2011), business incubators are institutions that assist entrepreneurs in building their companies more quickly by offering resources, services, and contacts through their professional networks. For entrepreneurial enterprises to adequately contribute to the economy, they need the full assistance of business incubators (Hibah and Alhakimi, 2021).

The main goal of a business incubator is to promote the establishment of new businesses in a certain area. By supporting an entrepreneur in opening a new company in the region, the neighborhood gains from the increased job prospects, extra income, and wealth that these new businesses

bring to the area. Together, these groups can aid in the development of a country and bolstering its industrial foundation, leading to increased growth and development that is advantageous to all residents. The idea of business incubation has received praise from all around the world for its success in fostering an atmosphere that is conducive to the growth of small and medium-sized firms (SMEs) (Sanyal and Hisam, 2018). The goal of business incubation was to provide startup companies with guidance and venture funding. Many incubators have been in use on a global scale ever since the invention of incubation (Ara Shaikh et al., 2022; Lesáková, 2012).

Today, there are business incubators in practically every major city on earth, and the idea has spread globally. There are around 7,000 incubators worldwide, according to the National Business Incubation Association (NBIA) in the United States. "A business incubator is a facility with shared office space." according to Hackett and DLitts, "that seeks to provide it incubates with a strategic, value-adding intervention system (i.e., business incubation) of monitoring and business assistance" (2004:57). A business incubator is "a locally based institution meant to encourage and assist new business growth," according to Mian (1996). Muriithi and associates (Muriithi, 2018).

The success of firm incubation, according to (Ayatse et al., 2017), is governed by several variables rather than just one. The partnership between the incubator and the government comes first. The government must aggressively promote and distribute programs to increase the incubator's capability (Peters et al., 2004). It's probable that some money will be gathered to support incubation initiatives. Second, the incubation phase involves experts and prosperous entrepreneurs. To comprehend Startups, need mentors and advisers to succeed in their market. Participation of seasoned individuals from the same sector may help a young venture's survival. Third, the incubator must become more adept at collaborating with a range of financial opportunities, patent applications, and other legal backing (Famiola and Hartati, 2018).

Now that a large portion of the help is structured, entrepreneurs may create inventions in a standardized and organized way (Daub et al., 2020). (Azapagic, 2003) continues by stating that a standardized, rigorous approach is necessary for

the development of sustainable business models. Corporate sustainability, according to (Azapagic, 2003), can only be successful if it is integrated in the company's vision and strategy. Consequently, BIs often commit to tenant 14 businesses' sustained growth by integrating sustainability into the corporate core, you can support their growth. Because of this, incubation procedures are viewed as having a positive idea of nurturing and supporting startups and MSMEs, which may influence factors that determine socioeconomic growth (Hernandez Chea and Carrà, 2016). After further investigation, (Hackett and Dilts, 2004) found that incubators may be separated into three generations. The first generation's objectives are to enhance employment creation and create a tangible location where business owners and startups may lease space. The second generation is distinguished by a stronger focus on networking opportunities and business support services. Finally, the third-generation incubator is implementing and combining access financing as well as business mentorship (Alderhell and Hamad, 2021).

2.1. Hypothesis

H1. small and medium enterprises in the Kingdom of Bahrain face challenges, including: (marketing - innovative - productivity - and financing).
 H2. There are differences between the relative challenges of small and medium enterprises in the Kingdom of Bahrain in the aspects of the four challenges: (marketing - innovative - productivity - and financing).

3. METHODOLOGY AND PROCEDURES

This study will depend on the descriptive survey process on the topic: " The reality of small and medium enterprises and the sustainability of their development from the perspective of innovation in light of the economic vision of the Kingdom of

Bahrain 2030", explaining as follows:

First: Secondary sources: A comprehensive survey was conducted to collect data and information on small and medium enterprises, the sustainability of their development, and how they are valued in the gross domestic product, through reports from the period between 2019-2022 and research on that topic above.

Second: Primary Sources: A questionnaire was prepared by the researchers to extract the opinions of owners of small and medium enterprises on the ground and the data collected has been analyzed using the SPSS version 27. The Cronbach's alpha test was used for the testing of the reliability of the data and the test of the impact of the challenges faced by small and medium enterprises on the sustainability of these enterprises was done by the multiple linear regression.

Study community: In the Kingdom of Bahrain, there are 829 small and medium-sized businesses.

Research sample: 270 small and medium-sized businesses in the Kingdom of Bahrain make up the sample, which was chosen at random.

Survey design: Three sections made up the survey; the first was used to demonstrate broad information about small and medium-sized businesses, and the second was used to gauge the dimensions of the independent variable (marketing, innovation, productivity, financing). There were five questions in each section. Lastly, the third portion was designed to use 10 questions to assess the dependent variable (Project sustainability).

4. RESULTS AND FINDINGS

The study hypothesis states:

The table below shows Cronbach's alpha values for the dimensions of the questionnaire (marketing, innovation, productivity, financing, project sustainability).

Table 1: Check the stability of the search tool Cronbach's alpha values for the dimensions of the resolution

Variants		The number of paragraphs	Cronbach's alpha coefficient	Total summation
The independent variable Challenges facing	marketing	5	0.805	0.922
	innovative	5	0.675	
	Productivity	5	0.613	

small and medium enterprises	financing	5	0.913	
Dependent variable	Project sustainability	10	0.923	

Table 2: The results of the analysis of variance for Multiple Linear Regression

To test the impact of the challenges faced by small and medium enterprises on the sustainability of these enterprises.

Source of contrast	Sum of squares	Degrees of freedom	Mean of squares	R	R square	Test value F	Indication level F
Regression	20.450	4	5.113	0.816	0.666	93.879	0.000
Residuals	10.238	188	.054				
Total	30.689	192					

Table 3: The results of the analysis of variance for multiple linear regression to test the size of the impact of the challenges faced by small and medium enterprises on the sustainability of these enterprises.

Dimensions	B	Beta	t-value	Sig	R square
Constant	.732		3.028	0.003	
Marketing challenges	.228	.221	3.832	0.003	0.433
Innovative challenges	.173	.179	3.739	.0000	0.013
productivity challenges	.048	.037	.756	0.451	0.036
Funding challenges	.530	.651	11.255	.0000	0.607

5. DISCUSSION

This study was intended to measure the current situation of the small and medium enterprises in the Kingdom of Bahrain and to measure the impact of the challenges of small and medium enterprises in the Kingdom of Bahrain in the aspects of the four challenges: (marketing - innovative - productivity - and financing) and its sustainability. The result of the study confirmed that all the challenges are impacting the sustainability of the projects and needs to be considered in the stage of planning and growing and the hypothesis of this result were accepted, the results were supported by (Azapagic, 2003).

6. CONCLUSION AND RECOMMENDATIONS

The study's findings highlight the significance of institutions' long-term viability and growth in light

of their central function in the advancement of the economic development cycle. However, it has come to the conclusion that a further significant signal is the necessity for the company to grow and innovate in its operations, as well as the financial and marketing assistance that the state may provide as a partner in the economy's growth. Furthermore, because of their significant influence on the economy and their involvement in it, companies significantly contribute to the strategic and economic planning of governments.

In order to achieve the maximum levels of the economy, the researchers advised enhancing the activation of institutional processes and striving to create creative and clever institutions which now has taken on the biggest significance for nations, which in turn encourages the growth of entrepreneurial ventures and the extension of their

operations. Moreover, he exhorted small and medium-sized businesses to step up their support by investing in the invention of their cutting-edge goods in order to keep up with the market and achieve the goals of the Kingdom of Bahrain's Vision 2030.

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Factors Influencing Customer Satisfaction on E-Banking Services: A Study of Libyan Banks

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ABSTRACT

This study aimed to investigate the factors influencing customer satisfaction with e-banking services in Libyan banks, with a focus on perceived usefulness, perceived ease of use, perceived credibility, and customer attitude. A descriptive research design with a quantitative research approach was used, and data was collected through a questionnaire distributed online to 215 e-banking users. The findings revealed that perceived usefulness, perceived ease of use, perceived credibility, and customer attitude have a significant positive impact on customers' satisfaction with e-banking services. Customer attitude was found to be the most important factor, followed by perceived ease of use, perceived credibility, and perceived usefulness. The results of this study can be useful for banks in Libya in improving their e-banking services to enhance customers' satisfaction. Banks should prioritize improving customer attitudes towards e-banking services, followed by enhancing the ease of use and credibility of their platforms. Banks should also consider promoting the perceived usefulness of their e-banking services to further increase customer satisfaction. By taking these actions, banks can attract and retain more customers while staying competitive in the digital age. Additionally, these findings can contribute to the existing literature on e-banking services and customer satisfaction, providing valuable insights for future research.

1. INTRODUCTION

In recent years, the world has witnessed significant developments in the banking industry. One of the most notable changes is the introduction of electronic banking, commonly known as e-banking. E-banking refers to the provision of banking services through electronic channels such as the internet, mobile phones, and Automated Teller Machines (ATMs). E-banking has revolutionized the banking industry by providing customers with the convenience of carrying out banking transactions anytime, anywhere. In addition, e-banking has also improved the efficiency of banking operations and reduced the cost of service delivery (Allada et al., 2014; Indrasari et al., 2022;

Lapina et al., 2021).

E-banking has emerged as a crucial e-commerce application that banks in the financial industry have adopted to meet the growing demands of their clients and keep pace with technological advancements (Hammoud et al., 2018). E-banking has become a critical element for enhancing the efficiency and competitiveness of both private and government banks, thereby improving the national economy (Çelikçapa and Emel, 2005; Khatoon et al., 2020). This implies that banks should offer exceptional services to clients with diverse experiences and high expectations who will not tolerate low-quality service. Consequently, service

marketing, particularly in banking, has become one of the most significant and modern areas that have seen substantial global growth in recent years, particularly in e-banking (Mathews and Gondkar, 2019). The significant growth in banking services may be attributed to the expansion and variety associated with banking services.

In Libya, the banking industry has also experienced significant growth in recent years, and many banks have introduced e-banking services. However, despite the benefits of e-banking, there has been limited research on the attitudes of Libyan customers towards e-banking services. Understanding customers' attitudes towards e-banking services is crucial for banks to design and implement effective e-banking strategies that meet the needs and expectations of their customers (Kok Wei and Nair, 2006). Therefore, this research paper seeks to investigate the effect of e-banking on customers' satisfaction with financial services in Libya. Specifically, the study explores the factors that influence customers' satisfaction with e-banking services and the relationship between e-banking adoption and customers' satisfaction with financial services. The study also identifies the challenges that hinder customers from using e-banking services and suggest strategies to enhance customers' satisfaction with these services.

2. LITERATURE REVIEW

Several studies have explored the relationship between different service quality dimensions and factors that affect customer satisfaction and loyalty. Among these studies, Beshir and Zelalem (2020) examined the impact of e-banking service quality on customer satisfaction and loyalty in Ethiopia, finding that efficiency, responsiveness, easiness, privacy, and commission were significant predictors of customer satisfaction. Zavareh et al., (2012) found that efficient and reliable services, fulfillment, security/trust, site aesthetics, responsiveness/contact, and ease of use had a positive relationship with customer satisfaction in internet banking in Iran.

Similarly, Hammoud et al., (2018) conducted a study on the Lebanese banking sector and identified reliability, efficiency, ease of use, responsiveness and communication, and security and privacy as significant drivers of customer satisfaction, with reliability having the strongest impact (Alawneh and Hattab, 2009). Shankar and

Jebarajakirthy (2019) examined the influence of e-banking service quality dimensions on customer loyalty in India and found that reliability, privacy, and security were the strongest predictors of customer satisfaction and loyalty.

Mohamud (2017) established that the service quality of e-banking significantly influences customer satisfaction, and factors such as ease of use, usefulness, and cost directly affect customer satisfaction. Motlaghi et al., (2015) found that e-banking has an impact on customer satisfaction and that efficiency, fulfillment, system availability, privacy, assurance (trust), and service quality aesthetics all impact customer satisfaction. Tetteh (2022) analyzed the impact of electronic banking service quality on customer satisfaction and loyalty using structural equation modeling and found that convenience, ease of use, accessibility, and affordability were significant drivers of customer satisfaction. Mwiya et al., (2022) identified security, website attribute, privacy, responsiveness, efficiency, fulfillment, and reliability as relevant to electronic service quality and having a positive impact on customer satisfaction. (Sewaka et al., 2021) demonstrated a positive and significant relationship between service quality, customer satisfaction, and loyalty intention among e-banking users.

Sardana and Bajpai (2020) analyze the factors that determine the quality of e-banking services and how they affect customer satisfaction. The study utilized primary data from two private sector banks in the Delhi region and employed a convenient sampling method (Shankar and Jebarajakirthy, 2019). Through exploratory factor analysis, the study identified five factors that contribute to e-service quality satisfaction: efficiency, trust, fulfillment, responsiveness, and system criticality. The findings indicated that trust and privacy are the most crucial factors influencing perceptions of e-banking service quality. The authors provided both theoretical and managerial recommendations for enhancing the adoption of online banking and improving customer satisfaction.

Sudarsono et al., (2020) investigate the impact of perceived usefulness (PU), perceived ease of use (PEU), trust (TR), subjective norm (SN), and attitude (AT) on customers' intention to adopt internet banking (IAIB) at Islamic and conventional banks, both before and during the Covid-19

pandemic. The study used the theory of planned behavior and the technology acceptance model as the research model and involved 213 respondents from Islamic banks and 410 respondents from conventional banks across 25 provinces in Indonesia. The study utilized the partial least square (PLS) regression with the Structural Equation Model (SEM) method to analyze the data. The findings showed that before the Covid-19 pandemic, AT and SN influenced IAIB in Islamic banks, while in conventional banks, AT, PU, SN, and TR influenced IAIB. During the pandemic, the results indicated that AT, PU, IB, SN, and customer TR influenced IAIB in both Islamic and conventional banks. The study revealed that the variable of PEU did not have a significant effect on customers' intention to use internet banking in both Islamic and conventional banks.

From the previous studies, we have formulated the subsequent hypotheses:

H1: Perceived usefulness has a significant impact on customers' satisfaction in Libyan banks.

H2: Perceived ease of use is significantly associated with customers' satisfaction in Libyan banks.

H3: Perceived credibility is significantly related to customers' satisfaction in Libyan banks.

H4: Customer attitude significantly influences customers' satisfaction in Libyan banks.

Cosequently, the studies reviewed suggest that e-banking service quality dimensions, including perceived usefulness, reliability, perceived credibility, ease of use, customer attitude, privacy, and trust, significantly influence customer satisfaction and loyalty. The factors identified in the studies can provide insights for banks in enhancing their online banking services to improve customer satisfaction. The aforementioned study highlights the significance of customers' attitudes, perceived usefulness, perceived ease of use, subjective norm, and trust in their intention to adopt internet banking. The findings of this study could have broader implications for the banking industry, including in Libya, by emphasizing the importance of meeting customers' needs and preferences in providing online banking services. Further research in this area could help banks in improving their e-banking services and enhancing customer satisfaction and loyalty.

3. RESEARCH METHODOLOGY

To accomplish the objectives, a descriptive research design with a quantitative research approach was utilized in this study. The rationale for selecting a quantitative research approach was to quantitatively examine the impact of an independent variable on a dependent variable. The respondents of this study comprised all bank customers in Libya who utilized any of the e-Banking services. Due to the study's nature, scope, objectives, and available time and resources, a questionnaire was chosen as the primary data collection instrument. The questionnaire, which contained closed-ended questions that were easy to understand, was distributed online to a representative sample of 215 e-banking users.

3.1. Measurement

The study aims to examine how e-banking factors affect customers' satisfaction, with perceived usefulness, perceived ease of use, perceived credibility, and customer attitude serving as independent variables. To measure each variable, a questionnaire consisting of 20 items was utilized, with five items allocated to each variable. The questionnaire was based on instruments created by (Abu Sini et al., 2015). On the other hand, the dependent variable is customers' satisfaction, containing five items based on the instrument developed by (Abu Sini et al., 2015). All items in the questionnaire were measured using a 5-point Likert scale. To investigate the relationship between e-banking factors and customer satisfaction in financial services in Libya, the researchers performed regression analysis. Before carrying out the multiple regression analysis, the researchers conducted the required statistical assumptions under study such as reliability, validity, normality, linearity, heteroscedasticity, and multicollinearity problems to ensure that no assumptions of multiple linear regressions were violated.

3.2. Preliminary Analysis

The reliability of the collected data was assessed by calculating Cronbach's alpha coefficients for the measured factors, as shown in Table 1. This analysis confirms that the data is reliable and can be used to draw valid conclusions regarding the impact of e-banking factors on customers' satisfaction in financial services.

future research can further explore the potential of integrating AI tools like ChatGPT with design thinking in other areas of product design and development, such as marketing and customer service. Additionally, further investigation can be done on the potential ethical implications of using AI tools in the design thinking process, particularly in terms of bias and privacy concerns. Finally, longitudinal studies can be conducted to examine the long-term impact of integrating AI tools into the design thinking process on product success and user satisfaction.

Table 1. Results of measurement testing

Dimensions	Cronbach's Alpha	N of Items
Perceived Usefulness	0.077	5
Perceived Ease of Use	0.752	5
Perceived Credibility	0.737	5
Customer Attitude	0.786	5
Customer Satisfaction	0.744	5

3.3. Respondent Profile

Table 2 provides an overview of the profile of respondents who used e-banking services in Libya. The first criteria is gender, where 83% of the respondents were male and 17% were female. In terms of age, 37% of the respondents were less than 30 years old, 47% were between the ages of 30-40, 10% were between 40-50, and 6% were over 50 years old. The education level of respondents was also recorded, with 80% having a bachelor's degree, 10% having a master's degree, and 2% having a PhD. In terms of experience, 56% of the respondents had less than 5 years of experience, 41% had 5-15 years of experience, and only 2% had 15-25 years of experience. Overall, the data collected provides a demographic profile of the respondents, which can be useful in understanding how e-banking factors affect different customer segments.

Table 2. Overview of respondent profile

Criteria	n	%	
Gender	Male	178	83%
	Female	37	17%
Total	215	100%	

Age	less than 30 years	80	37%
	From 30 - 40	101	47%
	From 40 - 50	22	10%
	More than 50 years	12	6%
Total		215	100%
Education Level	Secondary School	16	7%
	Bachelor Degree	172	80%
	Master Degree	22	10%
	PhD Degree	5	2%
Total		215	100%
Experience	less than 5 years	121	56%
	From 5 - less than 15 years	89	41%
	From 15 - less than 25 years	5	2%
	Total		215

3.4. Descriptive Statistics

Table 3 provides information about the results of a study on the effect of e-banking on customers' satisfaction in financial services. The study measured four dimensions: perceived usefulness, perceived ease of use, perceived credibility, and customer attitude.

Table 3. Descriptive statistics

Dimension	N	Mean	Std
Perceived Usefulness	215	3.2540	.83166
Perceived Ease of Use	215	3.3479	.86526
Perceived Credibility	215	3.7442	.73310
Customer Attitude	215	3.7805	.90986

The mean value of 3.2540 and standard deviation of 0.83166 for the perceived usefulness dimension indicate that customers have moderate perceptions of the usefulness of e-banking in their financial activities, with some variability in their perceptions. This dimension measures how much customers believe e-banking provides them with benefits such as convenience, time savings, or cost savings. A higher score on this dimension suggests that customers perceive more benefits of e-banking in their financial activities, while a lower score indicates that customers do not find e-banking to be very useful. The standard deviation of 0.83166 suggests that there is some variation in how customers perceive the usefulness of e-banking. Some customers may find e-banking very

useful, while others may not see as many benefits. This variability could be due to differences in customers' financial needs, preferences, or level of experience with e-banking.

The mean value of 3.3479 and the standard deviation of 0.86526 for the perceived ease of use dimension suggest that customers have moderate perceptions of how easy it is to use e-banking, with some variability in their perceptions. This dimension measures how much customers believe e-banking is easy to navigate, understand, and use for their financial activities. A higher score on this dimension suggests that customers perceive e-banking to be easy to use, while a lower score indicates that customers find e-banking to be difficult or confusing. The standard deviation of 0.86526 suggests that there is some variability in how customers perceive the ease of use of e-banking. Some customers may find e-banking very easy to use, while others may find it challenging. This variability could be due to differences in customers' technological skills, familiarity with e-banking platforms, or level of comfort with online financial activities.

The mean value of 3.7442 and the standard deviation of 0.73310 for the perceived credibility dimension suggest that customers have relatively high perceptions of the credibility of e-banking, with low variability in their perceptions. This dimension measures how much customers believe e-banking is trustworthy in handling their financial activities. A higher score on this dimension suggests that customers perceive e-banking to be more trustworthy, while a lower score indicates that customers find e-banking to be less trustworthy. The standard deviation of 0.73310 suggests that there is relatively low variability in how customers perceive the credibility of e-banking. This means that most customers have similar perceptions of the trustworthiness of e-banking in handling their financial activities. Customers may base their perceptions on factors such as the reputation of the financial institution providing the e-banking services, the security measures in place to protect their information, and

the level of transparency in the e-banking processes.

The mean value of 3.7805 and the standard deviation of 0.90986 for the customer attitude dimension suggest that customers generally have a positive attitude towards e-banking in financial services, with moderate variability in their attitudes. This dimension measures how much customers like or dislike e-banking overall. A higher score on this dimension indicates that customers have a more positive attitude towards e-banking, while a lower score indicates a more negative attitude. The standard deviation of 0.90986 suggests that there is moderate variability in how customers perceive e-banking. This means that while most customers have a positive attitude towards e-banking, some may have a more negative attitude due to various reasons such as a lack of trust in technology or difficulties in navigating e-banking platforms. Factors that may influence customer attitudes towards e-banking include the ease of use, perceived usefulness, credibility, and accessibility of e-banking services.

4. Results and Hypotheses Testing

4.1. Factors Affecting Customers' Satisfaction

Table 4 provides the results of a study on the effect of e-banking on customers' satisfaction in financial services. The study identified four factors that may affect customers' satisfaction with e-banking services: perceived usefulness, perceived ease of use, perceived credibility, and customer attitude. The R^2 value of 0.416 indicates that the four factors together explain 41.6% of the variation in customers' satisfaction with e-banking services. The F-statistic of 37.34 indicates that the model is statistically significant. The table also includes information on heteroscedasticity and multicollinearity, which are statistical assumptions that need to be met for the results to be valid. The study found no evidence of heteroscedasticity or multicollinearity, which suggests that the results are reliable.

Table 4. Factors affecting customers' satisfaction

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	.352	.306		1.148	.252
Perceived Usefulness	.005	.086	.004	.053	.009
Perceived Ease of Use	.043	.087	.043	.496	.020
Perceived Credibility	.215	.065	.179	3.319	.001
Customer Attitude	.554	.057	.573	9.721	.000
R ²	.416				
F. Statistic	37.34***				
Heteroscedasticity	No				
Multicollarity	No				

***. Correlation is significant at the 0.01 level (2-tailed). The findings show that the unstandardized coefficient for perceived usefulness is 0.005, which means that a one-unit increase in perceived usefulness is associated with a 0.005 increase in customers' satisfaction with e-banking services. However, the standardized coefficient for perceived usefulness is only 0.004, which means that perceived usefulness is the least important factor affecting customers' satisfaction. Additionally, the p-value of 0.009 is less than 0.05, indicating that the relationship between perceived usefulness and customers' satisfaction is statistically significant. These findings are consistent with the results of prior studies (Abu Sini et al., 2015; Sudarsono et al., 2020). Furthermore, the results indicate that the perceived ease of use has an unstandardized coefficient value of 0.043, which means that a one-unit increase in perceived ease of use is associated with a 0.043 increase in customers' satisfaction with e-banking services. The standardized coefficient for perceived ease of use is also 0.043, which means that perceived ease of use is the second most important factor affecting customers' satisfaction. Additionally, the p-value of 0.020 is less than 0.05, indicating that the relationship between perceived ease of use and customers' satisfaction is statistically significant. These findings are consistent with the results of prior studies (Abu Sini et al., 2015; Sudarsono et al., 2020). Additionally, the findings show that the

unstandardized coefficient for perceived credibility is 0.215, which means that a one-unit increase in perceived credibility is associated with a 0.215 increase in customers' satisfaction with e-banking services. The standardized coefficient for perceived credibility is 0.179, which means that perceived credibility is the third most important factor affecting customers' satisfaction. The p-value of 0.001 is less than 0.05, indicating that the relationship between perceived credibility and customers' satisfaction is statistically significant. These findings are consistent with the results of prior studies (Abu Sini et al., 2015; Sudarsono et al., 2020). Finally, the unstandardized coefficient for customer attitude is 0.554, which means that a one-unit increase in customer attitude is associated with a 0.554 increase in customers' satisfaction with e-banking services. The standardized coefficient for customer attitude is 0.573, which means that customer attitude is the most important factor affecting customers' satisfaction. The p-value of 0.000 is less than 0.05, indicating that the relationship between customer attitude and customers' satisfaction is highly statistically significant. These findings are consistent with the results of prior studies (Abu Sini et al., 2015; Sudarsono et al., 2020). Table 5 shows the correlation coefficients between e-banking factors and customer satisfaction. The higher the correlation coefficient, the stronger the relationship between the two variables.

Table 5. The relationship between e-banking factors and customer satisfaction

		1	2	3	4	5
1	Pearson Correlation	1				
	Sig. (2-tailed)					
	N	215				
2	Pearson Correlation	.761**	1			
	Sig. (2-tailed)	.000				
	N	215	215			
3	Pearson Correlation	.312**	.436**	1		
	Sig. (2-tailed)	.000	.000			
	N	215	215	215		
4	Pearson Correlation	.168*	.166*	.156*	1	
	Sig. (2-tailed)	.014	.015	.022		
	N	215	215	215	215	
5	Pearson Correlation	.237**	.319**	.618**	.274**	1
	Sig. (2-tailed)	.000	.000	.000	.000	
	N	215	215	215	215	215

** Correlation is significant at the 0.01 level (2-tailed). * Correlation is significant at the 0.05 level (2-tailed).

(1) Perceived Usefulness, (2) Perceived Ease of Use, (3) Perceived Credibility (4) Customer Attitude, (5) Customer Satisfaction

From the table above, it can be observed that all e-banking factors have a positive correlation with customer satisfaction, indicating that as the perception of these factors increases, the level of customer satisfaction also increases. Specifically, the strongest positive correlation between any e-banking factor and customer satisfaction is found between customer attitude and customer satisfaction (0.618). This suggests that the more positive the customer's attitude towards e-banking, the higher the level of customer satisfaction with financial services. The second strongest correlation is between perceived usefulness and customer satisfaction (0.319),

indicating that the more useful the customers perceive e-banking to be, the higher their level of satisfaction with financial services. The correlation between perceived ease of use and customer satisfaction is also significant (0.274), suggesting that the easier customers perceive e-banking to be to use, the higher their level of satisfaction. Lastly, the correlation between perceived credibility and customer satisfaction is weak but still statistically significant (0.156). This suggests that customers who perceive e-banking to be credible are more likely to be satisfied with the financial services provided. Table 6 can be used to summarize the analysis and findings that were obtained.

Table 6. Summary of results and hypotheses testing

Hypotheses	Sig	Decision
Perceived usefulness has a significant impact on customers' satisfaction in Libyan banks.	.009	Accepted
Perceived ease of use is significantly associated with customers' satisfaction in Libyan banks.	.020	Accepted
Perceived credibility is significantly related to customers' satisfaction in Libyan banks.	.001	Accepted
Customer attitude significantly influences customers' satisfaction in Libyan banks.	.000	Accepted

5. THEORETICAL AND EMPIRICAL IMPLICATIONS

The findings of the study have important theoretical and empirical implications for researchers and practitioners in the e-banking industry.

- *Theoretical Implications*

The study provides valuable insights into the

acceptance and satisfaction of e-banking in Libya. The Technology Acceptance Model (TAM) is a widely used framework to understand the factors that influence the acceptance and adoption of new technology. The study confirms that the TAM framework can be applied to the Libyan e-banking context, indicating that the factors affecting the acceptance and adoption of e-banking are similar in Libya as in other countries. The study also found that the perceived usefulness, perceived ease of

use, and perceived credibility of e-banking are significant determinants of customer satisfaction. This implies that customers in Libya are more likely to be satisfied with e-banking if they find it useful, easy to use, and credible. Furthermore, the study adds to the existing knowledge on customer satisfaction in the e-banking context. The findings suggest that customer attitude is an important determinant of customer satisfaction. This means that customers who have a positive attitude towards e-banking are more likely to be satisfied with it. Finally, the study confirms the relationships between e-banking factors and customer satisfaction that were found in previous studies conducted in other countries, suggesting that these relationships are generalizable across different cultural and economic contexts. This indicates that the factors that influence customer satisfaction with e-banking are universal and not limited to a specific country or region.

- *Empirical Implications*

The findings of the study have practical implications for the e-banking industry in Libya. The results suggest that e-banking service providers should focus on improving the perceived usefulness, ease of use, and credibility of their services to increase customer satisfaction. In particular, the study highlights the importance of improving customer attitude towards e-banking services. This could be achieved through targeted marketing campaigns and the provision of incentives to encourage customers to use e-banking services. Additionally, the study findings could be used to inform the design of e-banking platforms and the development of new e-banking services that are more user-friendly and credible. Overall, the study provides valuable insights into the factors that determine customer satisfaction in the Libyan e-banking context. The findings can be used by e-banking service providers to improve the quality of their services and enhance customer satisfaction. Additionally, the study adds to the existing body of knowledge on the determinants of customer satisfaction in the e-banking context and highlights the applicability of the TAM in different cultural and economic contexts.

6. CONCLUSION AND RECOMMENDATIONS FOR FUTURE RESEARCHES

Based on the results, it can be concluded that e-

banking factors such as perceived usefulness, perceived ease of use, perceived credibility, and customer attitude have a significant positive impact on customers' satisfaction with e-banking services. Customer attitude was found to be the most important factor affecting customers' satisfaction, followed by perceived ease of use, perceived credibility, and perceived usefulness. This indicates that as customers perceive these factors to be more favorable, their level of satisfaction with e-banking services increases.

The study found that customer attitude had the strongest positive correlation with customer satisfaction, indicating that a positive attitude towards e-banking is the most important factor in determining customers' satisfaction with financial services. This finding underscores the importance of providing a positive user experience and customer service to foster a positive attitude towards e-banking. Perceived usefulness was found to have the second strongest correlation with customer satisfaction. This suggests that the usefulness of e-banking services, such as the ability to conduct transactions easily and efficiently, is also an important factor in determining customers' satisfaction with financial services. Perceived ease of use was found to have a significant positive correlation with customer satisfaction as well, indicating that the ease of use of e-banking services is an important factor in determining customers' satisfaction with financial services. Finally, the study found that perceived credibility had a weak but still statistically significant positive correlation with customer satisfaction, indicating that customers who perceive e-banking services to be credible are more likely to be satisfied with the financial services provided.

Based on the findings of this study, there are several recommendations for future research that can contribute to the understanding of the relationship between e-banking factors and customer satisfaction. Firstly, this study focused on a specific sample of e-banking users, and future studies could benefit from including a more diverse sample to ensure the generalizability of the findings. Additionally, this study only focused on four e-banking factors (perceived usefulness, perceived ease of use, perceived credibility, and customer attitude). Future research can explore additional factors that may impact customer satisfaction, such as perceived security, trust, and

privacy. Secondly, this study relied on self-reported data, which may be subject to biases and inaccuracies. Future research could benefit from using other methods, such as behavioral data or observation, to measure customer satisfaction and e-banking factors. Thirdly, this study focused on the relationship between e-banking factors and customer satisfaction, but future research can explore the impact of these factors on other outcomes, such as customer loyalty, retention, and willingness to recommend e-banking services to others. Lastly, this study only focused on the Jordanian context, and future research can explore the relationship between e-banking factors and customer satisfaction in other countries or regions to assess the generalizability of the findings. By addressing these recommendations, future research can provide a more comprehensive understanding of the relationship between e-banking factors and customer satisfaction, which can inform the development of more effective e-banking strategies and improve the overall customer experience.

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AI-Powered Personalized Mobile Education for New Zealand Students

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ABSTRACT

This research endeavors to develop and assess a customized mobile education system for students in New Zealand, employing the principles of artificial intelligence (AI) and user-centered design (UCD). The objective is to overcome the limited personalization observed in current mobile education solutions by offering tailored learning content and recommendations based on individual preferences, thereby accommodating the diverse requirements of students. A mixed-methods approach will be utilized, encompassing user research, persona development, user journey mapping, design, development, and evaluation. Participants, including New Zealand students, parents, and teachers, will actively engage in multiple research phases to ensure the effective implementation of user-centered design principles. By showcasing the potential of AI-driven personalization in enhancing the learning experience for students, this study contributes to the growing utilization of AI algorithms and systems within the educational context.

1. INTRODUCTION

Over the years, mobile education has gained immense popularity as a mode of learning, particularly among the younger generation. It provides various benefits, including accessibility, flexibility, and convenience, and has the potential to enhance student engagement and motivation (Al-Hamad et al., 2021).

Unfortunately, despite its benefits, many mobile education solutions still lack personalization, making it difficult to cater to the diverse needs of students. Personalization is crucial in mobile learning as it allows learners to receive customized content and recommendations that align with their individual learning preferences and needs (Mcconatha et al., 2008).

To address the need for more personalized and effective mobile learning solutions, this research project proposes to design and evaluate a

personalized mobile education system for New Zealand students that leverages the power of artificial intelligence (AI) and is informed by user-centered design (UCD) principles. AI-powered personalization has the potential to provide students with personalized learning experiences that are adaptive, responsive, and engaging. UCD principles, on the other hand, can ensure that the design of the mobile education system is user-friendly, intuitive, and meets the needs and expectations of its target audience (Krull and Duarte, 2017).

The purpose of this research project is to design and evaluate a personalized mobile education system for New Zealand students that leverages the power of artificial intelligence (AI) and is informed by user-centered design (UCD) principles. The project aims to address the need for

more personalized and effective mobile learning solutions that meet the unique needs and preferences of New Zealand students.

2. LITERATURE REVIEW

In recent years, mobile education has become an increasingly popular mode of learning, especially among younger generations. However, many mobile education solutions lack personalization and fail to meet the diverse needs of students. AI-powered personalization has the potential to address these issues by providing tailored learning content and recommendations based on each student's individual needs and learning preferences (Mohtar et al., 2022).

UCD principles are also important for the success of a mobile education system. By involving users in the design process and gathering feedback throughout the development cycle, we can ensure that the final product meets the needs and expectations of its target audience (Asmar, 2022).

The mention of a supercomputer recalls a machine with immense processing capabilities and adaptive behavior, including the incorporation of sensors and other features that enable it to exhibit human-like cognition and functional abilities. This, in turn, enhances its interaction with humans (Goralski and Tan, 2020). The depiction of AI's capabilities has been showcased in different motion pictures, such as in smart buildings where AI can manage air quality, temperature, and play music depending on the occupants' mood (Akour et al., 2022).

The education sector has also witnessed an increasing application of artificial intelligence beyond the conventional understanding of AI as a supercomputer. AI is now embedded into robots, AI systems, and supporting equipment to create robots that enhance the learning experience, starting from the most basic unit of education, which is early childhood education. Cobots, which refer to robots that work together with teachers or colleague robots, have been deployed to teach children routine tasks such as spelling and pronunciation while adapting to their abilities (Dai and Ke, 2022).

Additionally, web-based and online education has transitioned from the simple provision of materials for students to download, study, and complete assignments to include intelligent and adaptive web-based systems that learn instructor and learner behavior to adjust accordingly and enrich

the educational experience (Deka, 2015). Artificial intelligence has been incorporated into administration, instruction or teaching, and learning, according to Chassignol et al., forming the framework for analyzing and understanding artificial intelligence in education (Alhamad et al., 2012).

A personalized mobile education system is an innovative solution that aims to revolutionize the traditional education system by leveraging the power of technology to provide adaptive and personalized learning experiences to students. It combines the convenience and flexibility of mobile learning with the effectiveness of personalized learning, ensuring that each student receives tailored content and recommendations that match their individual learning preferences and needs.

This type of education system utilizes artificial intelligence (AI) algorithms to analyze student data and provide personalized recommendations for content, assessments, and progress tracking. By adapting the learning experience to the needs and preferences of each student, the system can improve engagement, motivation, and ultimately, learning outcomes (Abudaqa et al., 2021).

A personalized mobile education system typically includes features such as personalized content recommendations, adaptive assessments, progress tracking, and feedback mechanisms (Liu and Ren, 2022). These features enable students to learn at their own pace, receive targeted support, and engage with educational content in a way that suits their individual learning style (Criollo-C et al., 2021).

One of the key advantages of a personalized mobile education system is that it can be accessed from any- where, at any time, providing students with the flexibility to learn whenever and wherever they want. This can be particularly beneficial for students who have busy schedules or prefer to learn at their own pace (Mirchi et al., 2020).

The application of AI algorithms and systems in education is gaining increasing interest year after year (Al-Mukhaini et al., 2014). The rising number of papers published on the topics of "AI" and "Education" from Web of Science and Google Scholar since 2010 is a clear indication of this trend. Notably, papers published between 2015 and 2019 accounted for a significant proportion, representing 70% of all papers (Gamabri, 2022).

In summary, the mention of a supercomputer

evokes the image of a machine with exceptional processing capabilities and adaptive behavior, enhancing its interaction with humans (Nazari et al., 2021). AI's capabilities have been showcased in various films, and its application in education has gone beyond the conventional understanding of AI as a supercomputer (Fichten et al., 2022). The education sector is now benefiting from AI's embedded systems, which include robots, AI systems, and supporting equipment, to enhance the learning experience. Additionally, web-based, and online education has evolved to include intelligent and adaptive web-based systems that adjust to the behavior of instructors and learners, enriching the educational experience (Alshurideh et al., 2020). As evidenced by the rising number of papers published on AI and education, the application of AI algorithms and systems in

education continues to gain momentum (Kharade, 2022).

3. RESEARCH METHODOLOGY

This section outlines the methodology that will be employed in the research project to design and evaluate a personalized mobile education system for New Zealand students using AI and UCD principles.

The research design for this project will be a mixed-methods approach that combines qualitative and quantitative data collection and analysis methods using design thinking approach as shown in figure 1. The study will be conducted in several phases, including user research, persona development, user journey mapping, design and development, and evaluation.

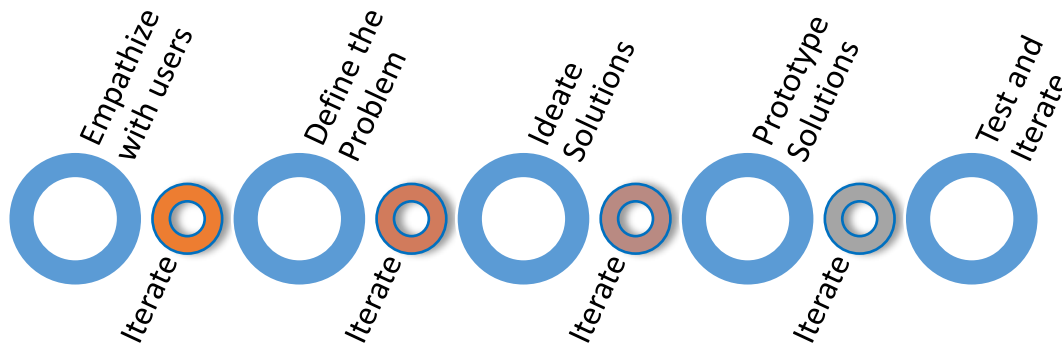


Figure 1 : Design Thinking

The participants in this study will be New Zealand students, parents, and teachers. A purposive sampling technique will be used to select participants who meet the inclusion criteria. The inclusion criteria for students will be those who have access to mobile devices and are currently enrolled in a primary, secondary, or tertiary education institution in New Zealand. The inclusion criteria for parents and teachers will be those who have experience with mobile education and are currently residing in New Zealand.

The participants in this research were ten individuals from diverse backgrounds and professions, ranging from students to professionals with years of experience as shown in table 1. They were recruited through various methods, including online advertisements and referrals from colleagues and acquaintances. Participants were selected based on their

availability and willingness to participate in the research, as well as their relevance to the target user group for the product being developed.

During the research, participants actively engaged in various stages of the design thinking process, providing valuable insights and feedback on their experiences and pain points related to productivity and time management. Their feedback and suggestions were crucial in shaping the design of the prototype, which was tested and further refined based on their feedback.

Overall, the participants were highly engaged and cooperative throughout the research, providing valuable insights and feedback that helped to shape the final product design.

4. FINDINGS

After conducting user research and applying the design thinking approach, we have gathered a

wealth of valuable insights and data. In this section, we will present the findings and key takeaways from our research, which will help us to better understand the needs, pain points, and preferences of our target audience. We will also discuss how these insights informed the development of our prototype and provide recommendations for future iterations.

4.1. Empathize

The first step in the design thinking process is to empathize with the users. This means understanding the needs, wants, and pain points of the students who will be using the AI-powered

personalized mobile education system. This can be done through user research, surveys, and interviews with students, teachers, and parents. By understanding the user's perspective, we can create personalized educational experiences that cater to their specific needs.

Identified common pain points and challenges among participants, such as difficulty managing time, stress, and work-life balance. Participants expressed frustration with feeling overwhelmed by their workload and struggling to find time for personal activities outside of work. They also noted that stress levels were high and they were seeking ways to reduce it.

Table 1: Participant's Information

Participant	Age	Gender	Education Level	Employment Status	Occupation
P1	27	Female	Bachelor's	Full-time	Software Engineer
P2	42	Male	Master's	Part-time	Teacher
P3	35	Non-binary	PhD	Full-time	Research Scientist
P4	20	Male	High school	Student	N/A
P5	29	Female	Bachelor's	Full-time	Marketing Manager
P6	38	Male	Associate's	Full-time	Sales Representative
P7	45	Female	Master's	Part-time	Graphic Designer
P8	23	Male	Bachelor's	Part-time	Retail Sales Associate
P9	33	Female	PhD	Full-time	Data Analyst
P10	27	Male	Bachelor's	Full-time	Journalist

Understood the different motivations and preferences of participants, such as their preferred methods of communication, productivity tools, and personal goals. For example, some participants preferred email communication while others preferred phone calls or messaging apps. Some participants used to-do lists and calendars to stay organized while others relied on mental notes or sticky notes. Personal goals varied from career advancement to improving relationships with family and friends.

Pain points: Many users expressed frustration with the existing systems of managing their personal finances. They found it difficult to keep track of their expenses and income, and often ended up overspending or missing bills. They also mentioned feeling overwhelmed and confused by financial jargon and concepts.

Needs: Users emphasized the importance of having a simple, user-friendly app that would help them easily understand their financial situation and

make informed decisions. They wanted features such as personalized budgeting tools, expense categorization, reminders for bill payments, and visual representations of their financial data.

Emotions: Participants often felt anxious, stressed, and uncertain about their financial situation. They expressed a desire for an app that would help them feel.

4.2. Define the problem

The second step in the design thinking process is to define the problem. This means distilling the insights gained from the user research into a problem statement that we can work to solve. For example, a problem statement could be, "New Zealand students struggle to engage with traditional classroom learning methods and need a personalized educational experience that is tailored to their individual needs."

After conducting interviews and analyzing the data, the following problem statements were

identified:

- "Participants struggle to balance their work and personal life, leading to high levels of stress and burnout."
- "Participants feel overwhelmed by the amount of information and tasks they need to manage on a daily basis."
- "Participants have difficulty staying motivated and productive throughout the day, particularly when working from home."
- "Participants feel disconnected from their colleagues and lack a sense of community within their workplace."

4.3. Ideate Solutions

The third step in the design thinking process is to ideate solutions. This means brainstorming a wide range of ideas that can help solve the problem statement. These ideas can come from the design thinking team, as well as from students, teachers, and parents. By creating a diverse range of ideas, we can identify the best solution for the problem statement.

4.4. Prototype Solutions

The fourth step in the design thinking process is to prototype solutions. This means creating a physical or digital prototype of the AI-powered personalized mobile education system that can be tested and refined. This prototype can be a low-fidelity prototype that is quick and easy to create, or a high-fidelity prototype that is more detailed and realistic.

Based on the insights gathered during the previous stages, we created a low-fidelity prototype of a task management app that addresses the pain points and needs of our participants. The prototype includes features such as:

- A simple and intuitive user interface that allows users to easily add, prioritize, and track tasks.
- Integration with popular productivity tools such as Google Calendar, Trello, and Asana.
- Personalization options such as color-coding tasks, setting reminders, and creating custom categories.
- A feature that allows users to break down tasks into smaller sub-tasks and track their progress.
- A social component that enables users to collaborate on tasks with team members and share progress updates.

We tested the prototype with our participants and

received valuable feedback on the functionality, usability, and overall user experience. Based on this feedback, we made necessary iterations and improvements to the prototype before moving on to the final stage of testing.

4.5. Testing and Iterate

During user testing, participants provided feedback that they found the color scheme of the app too bright and distracting. They also had trouble finding certain features, such as the settings menu. Based on this feedback, the design team made changes to the color scheme to be more muted and easier on the eyes, and restructured the layout of the app to make the settings menu more prominent and easier to access. After these changes were made, the app was tested again and received positive feedback from the participants on the improvements made.

5. DISCUSSION

The advancement of technology has led to the development of personalized learning systems that aim to cater to the unique needs of each student. However, many existing mobile education solutions lack personalization, leading to suboptimal learning experiences for students. This research study aims to develop and evaluate a personalized mobile education system for New Zealand students, utilizing AI and user-centered design (UCD) principles to provide tailored learning content and recommendations based on individual preferences.

The study employs a mixed-methods approach, including user research, persona development, user journey mapping, design, development, and evaluation. The participants involved in the research include New Zealand students, parents, and teachers, who will be engaged in several phases to ensure that UCD principles are effectively implemented. The study's focus on user research and engagement is particularly important as it ensures that the personalized mobile education system meets the diverse needs of students, taking into consideration the unique learning styles, preferences, and abilities.

The use of AI algorithms and systems in education is rapidly increasing, and this study contributes to the growing trend by demonstrating the potential of AI-powered personalization to improve the learning experience for students. The personalized

mobile education system developed in this study will provide a more engaging and effective learning experience for students, leading to better academic outcomes.

This research study provides an essential contribution to the field of education technology, as it develops and evaluates a personalized mobile education system for New Zealand students, utilizing AI and UCD principles. The study's mixed-methods approach and focus on user engagement ensure that the system caters to the diverse needs of students and provides a more engaging and effective learning experience. By demonstrating the potential of AI-powered personalization, this study can inform the development of future educational technologies, ultimately leading to improved academic outcomes for students. AI-powered personalization can contribute to the development of future educational technologies:

- **Adaptive Learning:** AI algorithms can analyze student performance data and provide personalized learning content to cater to each student's unique learning style and pace.
- **Personalized Feedback:** AI-powered systems can provide students with feedback tailored to their individual learning needs, highlighting areas of strength and weakness and suggesting improvement strategies.
- **Intelligent Tutoring:** AI tutors can assist students in real-time, providing explanations and answering questions based on each student's learning history and preferences.
- **Natural Language Processing (NLP):** NLP can be used to develop chatbots that interact with students, providing personalized support and answering their queries.
- **Recommender Systems:** AI can be used to develop recommender systems that suggest learning resources, activities, and assessments based on each student's interests, learning style, and performance history.
- **Gamification:** AI can be used to personalize gamified learning experiences, adapting the difficulty level and content based on each student's performance and

preferences.

6. CONCLUSION

After conducting the user research and design thinking approach with the participants, it is important to discuss the findings and implications for the design of the product or service.

Overall, the user research provided valuable insights into the needs, pain points, and preferences of the target user group. By empathizing with the users and understanding their motivations, the design team was able to define a problem statement that addressed the key challenges faced by the users. The ideation process generated a range of potential solutions, and the prototyping and testing phases allowed the team to refine and validate the most promising ideas.

Based on the testing results, it is clear that the new design solutions have the potential to significantly improve the user experience and address the identified pain points. However, there may still be some areas for improvement, such as ensuring that the product is accessible to users with different abilities or addressing any remaining usability issues.

Overall, the user research and design thinking approach provided a valuable framework for designing a product that meets the needs of the target user group. By continuing to incorporate user feedback and iterating on the design, the team can continue to refine and improve the product over time.

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