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DESIGN THINKING FOR RELIABLE DIGITAL FINANCIAL INFORMATION

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Abstract *The rapid changes in the finance industry regulations and fast-changing customer needs pressured banks to stay competitive. This is factored in due to the pace of innovation in technology. Banks have creative financial heads; however, pursuing efficient, customer-centric, creative work within an organisation is frequently challenging. Moreover, banks often operate in complex environments with legacy systems and processes, making conducting experiments rapidly with new ideas and technologies challenging. Likewise, banks often need more resources to invest in the right people, processes, systems, and technology to create a customer-centric core. The authors introduce design thinking as a robust methodology used in various fields, and its applications could ensure reliable digital financial information in today's contemporary business environments. This research article explores the existing literature to identify gaps in addressing the challenges associated with digital financial information reliability. Qualitative research examines the traces of these challenges and opportunities to propose and suggest innovative solutions through design thinking principles. The authors used a systematic literature review to evaluate and examine articles, reports, publications, and more related to the research problem. The findings highlighted five key weaknesses and opportunities, supplemented by a design thinking mapping table that draws and outlines potential solutions. This research increases the knowledge of digital financial systems, paving the way for more secure and reliable financial information for customers.*

Keywords: *Financial Statements, Design Thinking, Financial Accounting*

INTRODUCTION

There is an increasing dependence on digital financial information due to the quick digitisation of financial systems (Zhang et al., 2020). Hence, reliable financial information is crucial to performance in the financial environment. This research article aims to investigate ways how design thinking can be used to improve the vulnerabilities in the digital financial information systems that are now in use within banks. Moreover, this article is relevant in today's digital world, where digital platforms are becoming valuable for financial transactions. The research article's findings could significantly influence the security and dependability of digital financial data.

The financial sector has been changing. Financial institutions have been integrating cutting-edge technologies, while consumers have concerns about financial data accuracy.

Design thinking is a technique that focuses on innovative solutions through collaborative efforts. Moreover, various businesses use design thinking, and finance is not excluded. Design thinking includes five stages to identify and solve problems. The empathise stage targets end users' demands, habits, and preferences to acquire a thorough capacity for their difficulties. This comprehension is the foundation for identifying the root causes and creating possible fixes. Testing and prototyping come next, allowing quick idea iteration and improvement in response to user feedback. Design thinking's structured process guarantees that ideas are workable and closely match user expectations.

Moreover, design thinking is effective in digital financial information because it recognises how dynamic and user-driven financial interactions are. Nevertheless, design thinking is relevant because it can handle the complex issues of digital financial systems. For instance, first and foremost, design thinking puts forward a user-centric methodology, ensuring that the requirements and experiences of the final user are prioritised during the problem-solving phase. This is remarkably significant in the financial sector, where user engagement, trust, and knowledge are fundamental for effectively adopting digital financial platforms.

Second, design thinking fosters collaboration between stakeholders, such as end users, technologists, designers, and finance specialists. So, the collective approach of design thinking nurtures a complete comprehension of the complexities integral to digital financial information systems, resulting in more extensive and constructive solutions. Additionally, the iterative design thinking methodology aligns with the rapidly growing technology.

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Financial systems constantly change, and design thinking enables quick fixes for new chances and problems, ensuring robustness and adaptability.

In conclusion, trustworthiness issues in digital financial information can be addressed tactically and strategically with a human-centred approach (Vyshak et al., 2022) such as design thinking. This is significant in promoting user involvement, facilitating teamwork, and offering fundamental solutions associated with digital financial circumstances. This research article aims to explore, identify, and suggest novel ways to improve dependability, security, and user experience in modern financial systems.

LITERATURE REVIEW

In the dynamic environment of the digital age, this research article investigates how design thinking ideas might be applied to improve the dependability of financial information systems and, therefore, a piece of information. Organisations may effectively manage the challenges of digital transformation by utilising a user-centric approach, which guarantees the accuracy, accessibility, and resilience of financial data against interruptions (Zhang et al., 2020; Almahdi & Yan, 2018; Ertenlice & Kalayci, 2018; Ozbayoglu et al., 2020).

Small fintech startups and big technology enterprises continuously challenge incumbent financial institutions to find ways to offer new, customer-centric, and, most importantly, digital services (Singh et al., 2024; Feher & Varga, 2019). Therefore, finance has to manage and adapt to the Digital Era (Mosteanu & Faccia, 2020).

Due to the potential of digital banking, bank institutions invest in digital banking to obtain substantial benefits and stay competitive with the challenges of the digitalisation era (Indriasari et al., 2021). Besides, public finance and economic development management are the arts by which a nation improves its people's economic, political, and social well-being (Mosteanu & Faccia, 2020; Lv et al., 2021; Yu et al., 2020; Mhlanga, 2020).

The financial data management environment has changed due to digital transformation, requiring creative solutions to meet businesses' changing demands (Li et al., 2021; Yu et al., 2020). Organisations can create financial information systems that offer precise and timely data and enhance the resilience and sustainability of their operations. They can do this by methodically using design thinking (Ozbayoglu et al., 2020; Manjunath et al., 2021). Additionally, businesses must help maintain operations while handling financial data in the quickly changing digital age (Zhang et al., 2020). Design thinking, with its emphasis on empathy, teamwork, and iterative problem-solving, offers a strategic framework for creating financial information systems that are dependable and flexible enough to change with the rapidly evolving digital environment (Yu et al., 2020; Lv et al., 2021).

Financial markets and technological evolution are related to every human activity in the past few decades (Hasan et al., 2020). Big data technology connects the financial services industry and will drive future innovations (Hasan et al., 2020; Yu et al., 2020; Lv et al., 2021).

Today, computational intelligence in finance is a trendy topic for academia and the financial industry, so numerous studies have been published, resulting in various models (Ozbayoglu et al., 2020). Financial data forecasting is conducive to better understanding the future economic situation (Huang et al., 2021; Zhang et al., 2020).

FINANCIAL INFORMATION SYSTEMS

Financial information systems portray the networked parts, procedures, and technologies an organisation uses to gather, process, store, and distribute financial data (Lv et al., 2021; Manita et al., 2020; Zhang et al., 2020). Besides aiding decision-making measures, guaranteeing regulatory compliance, and improving an organisation's overall financial stability, these systems are necessary for managing and reporting financial data (Ozbayoglu et al., 2020; Wuyu et al., 2020). Systems gather financial information from multiple sources within a company (Almahdi & Yan, 2018). Some examples are accounting transactions, sales records, inventory data, payroll information, etc. (Ertenlice & Kalayci, 2018). Moreover, automation is often a crucial element, assisting in restructuring the data collection procedure and reducing the prospect of mistakes (Aguilar-Rivera et al., 2015; Zhang et al., 2020; Lv et al., 2021).

After data is collected, financial information systems process and arrange it into applicable and valuable information (Lv et al., 2021). This requires applying accounting rules, completing computations, and classifying transactions (Yu et al., 2020; Hasan et al., 2020). The objective is to convert unprocessed data into precise and practical financial data. Furthermore, databases and other data repositories hold financial data (Ozbayoglu et al., 2020; Mhlanga, 2020). Effective systems for storing and retrieving data ensure that users get the data required for analysis, reporting, and making decisions promptly (Chen et al., 2023).

Reports on financial performance and position are created by financial information systems (Kar, 2020). For instance, cash flow statements, balance sheets, income statements, and other financial statements are examples of these reports (Feher & Varga, 2019; Zhang et al., 2020; Lv et al., 2021). Reporting tools aid in summarising complex financial data into a form that investors, management, and regulatory bodies understand for further decision-making (Ozbayoglu et al., 2020; Mosteanu & Faccia, 2020). Therefore, decision support tools are made accessible through financial information systems to facilitate management to make well-informed decisions (Indriasari et al., 2021). For instance, these tools include financial modelling, forecasting, budgeting, and scenario analysis (Feher & Varga, 2019).

Organisations can increase resource allocation and make informed strategic decisions based on dependable financial data (Hasan et al., 2020). Besides, organisations can observe financial regulations and reporting standards with the aid of FIS (Ozbayoglu et al., 2020; Lv et al., 2021). These systems frequently have mechanisms that ensure obedience to legal standards and accounting rules (Huang et al., 2021). They strengthen risk management by monitoring and disclosing financial risks (Manjunath et al., 2021).

Security is a fundamental component of financial information systems since financial data is sensitive (Indriasari et al., 2021; Hasan et al., 2020). Security measures are put in place by these systems to protect against illegal access to or modification of data (Huang et al., 2021). Moreover, audit trajectories keep track of modifications made to financial data and display who accessed or changed it. Additionally, FIS needs to be scalable (Ozbayoglu et al., 2020). This requires managing rising financial transaction volumes, accommodating new reporting standards, and integrating new technologies (Li et al., 2021). Lastly, using financial information systems efficiently requires an interface that is easy to use. Accessibility features accelerate remote work and partnership by guaranteeing authorised users can access financial data from various locations (Mosteanu & Faccia, 2020; Lv, Shao & Lee, 2021).

The basis of an organisation's financial management is its financial information systems (Huang et al., 2021). They endow effective financial data handling, facilitate decision-making, and support risk management practices (Ozbayoglu et al., 2020). Organisations hoping to be competitive and financially stable in the digital age must build and execute robust financial information systems (Li et al., 2021; Mosteanu & Faccia, 2020; Hasan et al., 2020; Ozbayoglu et al., 2020).

One of the most studied sectors in the global economy is the finance sector. Organisations' continuous changes and their role in the global digital finance system generate loads of structured and unstructured data. Any institution using this financial data efficiently will improve its internal business processes and decision-making. As an example of the importance of digital data, we refer to modern commercial banks that use customer data to predict their behaviour and needs and deliver targeted personalised banking products to them. In addition, digital data can enable new forms of artificial intelligence algorithmic trading and specific personalised asset management (Serrano et al., 2023).

To benefit from these data, organisations need to find effective ways to analyse and manage a large volume of unstructured, semi-structured, and structured data. Processing these different types of data requires significantly using analytics algorithms and some real-time analytics to subtract meaningful information from heterogeneous data types. Managing this heterogeneous data has become one of the biggest concerns and challenges in the financial sector. A considerable amount of time and money is spent by companies on their IT resources and know-how in order to improve their usage of the available data. Despite the current evolution in Artificial Intelligence, Blockchain, and Big Data technologies, there is still a need for a new and different solution to understand better and manage the above-cited challenges and to be able to use financial data more efficiently; for example, there is a need for big data applications for digital finance that could be customised to each company's needs (Soldatos & Kyriazis, 2022).

Recently, users of digital finance information raised the issue of transparency in operating the currently used Big Data systems. This transparency issue is considered an essential prerequisite for the wider use and adoption of the new analytics systems. A recent working paper by the Bank of England in 2019 illustrated the importance of providing explained and transparent credit risk decisions (Bracke et al., 2019).

DESIGN THINKING: DEFINITION, GENERAL SCOPE, AND BENEFITS FOR INNOVATION

Within a constantly changing environment, leaders and managers face many challenges to overcome those uncertainties and complexities. Since 1950, multiple research projects have focused on innovation and its characteristics, especially regarding uncertainty (Hofstede, 2016; Simon &

March, 2015; Olson et al., 2014). Recent studies focused on the management approaches to reach performance objectives within this uncertainty and the surrounding risks (Pleis, 2014). Some existing literature discussed those technological innovations and their impact on uncertainty (Rai & Gupta, 2022; Blok & Lemmens, 2015). However, those technological innovations are not the only factor that led to uncertainty; we can find this uncertainty in all new ideas and processes.

Effective management of the innovation process should direct this innovation through a responsible development path, considering its impacts on external factors, such as social, economic, and environmental factors (Pavie & Daphne, 2015).

The most commonly used definition of design thinking is: "a discipline that uses the designer's sensibility and methods to match people's needs with what is technologically feasible and what a viable business strategy can convert into customer value and market opportunity" (Brown, 2008). This method appeared in the 1980s but was more developed by Kelly and Brown in the 1990s (Kelley, 2001).

With applications in many fields, design thinking is becoming a pragmatic technique for facilitating human-centred design (HCD), a modern-day necessity, through a well-defined systematic process. (Manjunath, Sohan & Subramanya, 2021).

DESIGN THINKING METHOD FOR DEVELOPING RESPONSIBLE INNOVATIONS

It was proven that design thinking is a powerful tool to solve "wicked problems" (Zimmerman et al., 2010) that have no simple or straightforward method of solution (Rittel & Webber, 1973). Moreover, creating reliable financial statements instantly for organisations represents a wicked problem.

This technique uses a three-pronged approach to solve problems based on needs and technical aspects (Brown, 2008). This approach includes this solution's human need or desirability, business needs or viability, and technical feasibility.

Design thinking has become an essential part of the innovation process. In addition to its traditional role in the downstream innovation process that provided limited results in user value creation, design thinking has become an integral part of the innovation process. Today, it plays a strategic role in value creation by creating new ideas and innovations that exceed the customers' expectations. Due to their linkage with strategies, design thinking methods will vary from one organisation to another and from one sector to another as they will be specific for each company.

DESIGN THINKING'S CONTRIBUTION TO THE PRACTICAL IMPLEMENTATION OF RESPONSIBLE INNOVATION

Design thinking aims to provide a process to implement and assess an innovation and identify any potential innovative and responsible products and services that satisfy all stakeholders. The method links the required skills, know-how, and technology to address innovation as a wicked problem. The method used by Pavie and Daphne in 2015 included five stages (Fig. 1): Idea, Feasibility, Capability, Launch, and Post–Launch.

The idea phase, or the 'philosophical issues,' should address how to satisfy customers' needs. The first step is to evaluate the potential social, economic, and environmental impacts and to create the first set of risk hypotheses. The analysis of potential social, economic, and environmental impacts is run in the feasibility phase, and guidelines for developing projects are used to guide the project's further development in the right direction. The capability stage, known as 'norms,' verifies the second phase regarding social, economic, and environmental impacts. This phase should also specify the risk hypotheses that could differ from those created in the first stage as the project becomes more precise and more defined. The launch phase is the implementation of the chosen innovation or solution. The post-launch stage is called 'measures,' where the risk hypotheses are tested and verified upon the launching of the project; the purpose is to improve and facilitate control over the project's lifecycle.

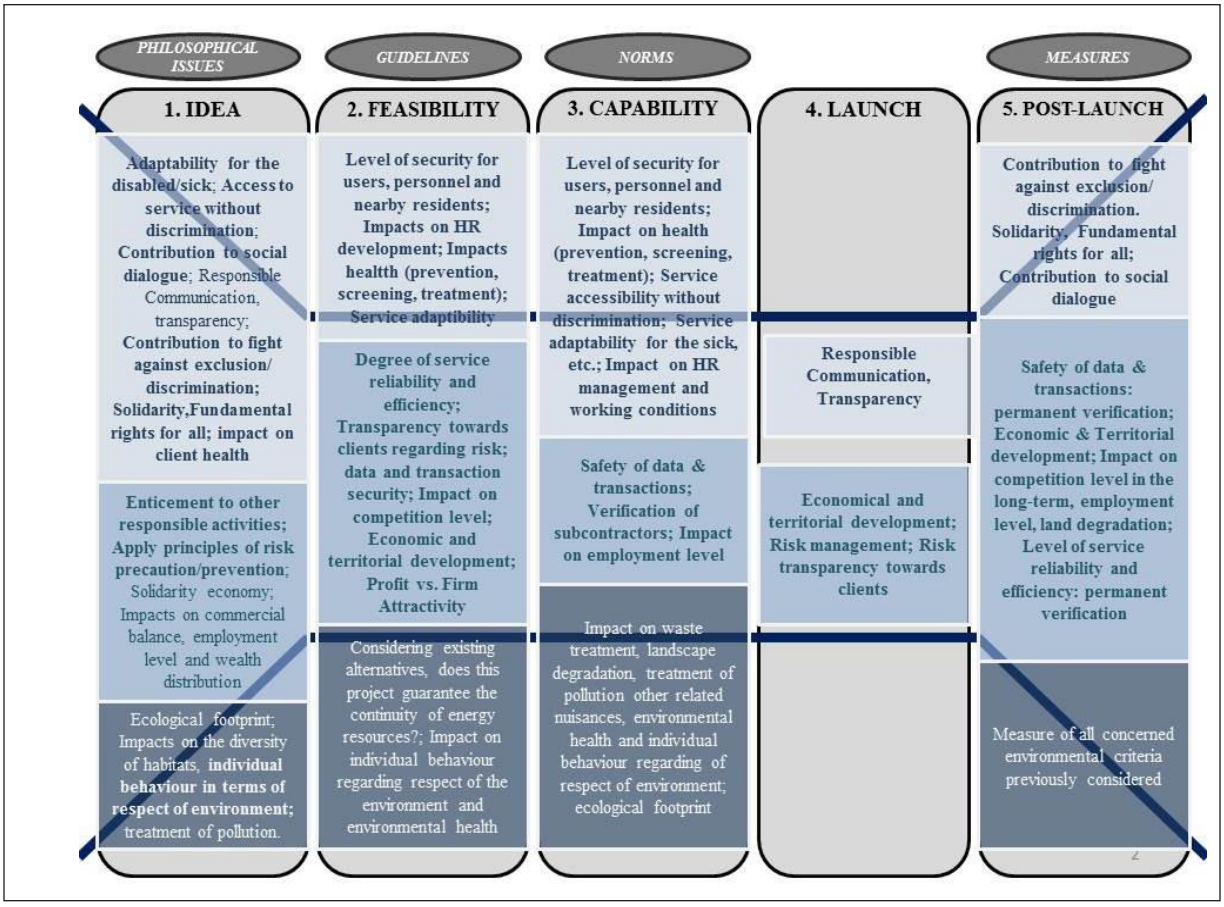

Fig. 1: Monitoring the Direct and Indirect Impacts of the Innovation

Design thinking is a structured approach to creating, developing, and testing new creative solutions using the company's know-how to solve "wicked problems." The primary purpose is to create better customer satisfaction, and by finding solutions, the companies will turn their challenges into opportunities (Vendraminelli et al., 2023). Design thinking depends on five phases to turn these challenges into opportunities (Zamakhsyari & Fatwanto, 2023).

The first stage is "emphasise": the initial phase of design thinking begins with searching for and gathering information and gaining a deep understanding of the problem that needs to be solved. This stage depends on observations of the object and the problems to deepen the understanding. Empathised design is human-centred; the purpose is to understand and gain more insight into the needs of customers or end users.

The second stage, "define," is about using the information gathered in the initial stage and turning it into data by running a deeper analysis of observations to obtain more specific problems. Similar to the first phase, the phase should always be human-centred and approachable, but it should also be understandable, actionable, and have a clear scope. The hardest part is to have information that is not too broad or too small and not too complex or too simple.

The third stage is ideate. This brainstorming phase collects ideas for solutions to the previously predetermined problem statements. Other possible techniques could be used as the worst possible idea or brain write. It is crucial to get as many ideas as possible to find the best solution to solve the problem.

The fourth stage is the prototype. Several alternative solutions are created from the ideate stage. Different members and users will test the solutions prototypes to determine the best resolution to the problem that needs to be solved. Prototypes will be developed, reviewed, and approved or rejected based on user feedback. At this stage, the team will gain a deeper understanding of the offered solution before being tested by the end user.

The fifth and final stage is testing. In this last phase, the team should choose the best solution from the prototypes identified during the prototyping phase. The chosen solution will be tested and re-evaluated by the end user again.

The results obtained at this stage will be used to redefine the understanding of the whole process, and changes and refinements of the solution will be based on the needs of the end users.

To conclude, the design thinking method combines creativity and monitoring. Thus, the uncertainty decreases, and one of the responsibilities of companies will be to create and develop better innovations that will satisfy the users' needs.

ADVANTAGES AND DISADVANTAGES OF DESIGN THINKING

"Design thinking" is a set of tools used to create human-centred solutions, products, and services by establishing a personal connection with the end users of the solution that is being developed. The purpose is to create and maintain strong connections with users. This method's criticism is that it seems subjective and overly personal and that the design-thinking connections with customers are sometimes uncomfortably emotive and overwhelmingly affecting (Bason & Austin, 2019).

The core element of design thinking is finding and testing possible quick solutions in a collaborative task between employees, customers, and other stakeholders. This could lead to building new models or making videos of their possible solutions. This collaboration and brainstorming will be detailed, concrete, and practical. Managers should enable this practice, investing in resources and allocating time, and support the idea that it is a long-term learning process, even if failed prototypes progress. The design thinking process specifies the problems, users, and what we are trying to achieve.

DIGITAL FINANCIAL SERVICES IN BANKS

Digitalisation and technological advancements have transformed most sectors, industries, and economies by providing new opportunities. It reshaped our daily living in different and profound ways; it changed how we talk, communicate, and work. Digital financial services result from the development in digitalisation and technology; they are mainly used in banks and have transformed the form of banking services delivery to customers (Aggarwal & Patel, 2023). Digital financial services include various new services, including digital payment, internet banking, banking applications on phones and tablets, and digital payment platforms. Daily, more and more people become connected to the internet, which affects and increases the adoption of these services. These innovations and technologies have revolutionised all sectors, especially the financial sector, enabling easier accessibility and connectivity and enabling the emergence of an efficient financial ecosystem (Abbasi & Weigand, 2017). Digitalisation increased the transparency of transactions, and improved technologies facilitated the development of customised financial services (Pazarbasioglu et al., 2020).

During the COVID-19 pandemic era, social distancing measures were critical and mandatory. This necessitated the development and adoption of fintech solutions to protect individuals' safety and ensure the continuous functioning of financial systems (Pazarbasioglu et al., 2020). On the other side, this rapid pace of development has also increased customers' expectations and shaped their needs. With the development of artificial intelligence, customers expect user-friendly, intelligent, and personalised digital offerings and solutions (Bapat, 2022). However, the user experience with digital products is radically influenced by the familiarity with and availability of the internet (Flavian et al., 2009). In 2018, Mbama and Ezepue examined the various factors that may influence the usage of digital banking services. They found that factors influencing the perception and experience of digital banking are service and functional quality, perceived value and usability by customers and their engagement, and perceived risk (Mbama & Ezepue, 2018). Another McKinsey study on factors affecting customer experiences in DFS found that the availability and quality of digital interfaces are crucial for user satisfaction. In addition, companies that can offer personalised and customised payment services will more likely receive customer recommendations (Breuer et al., 2020).

However, the complexity of these financial systems still exists and poses a risk as many individuals need more technical skills, know-how, or the required financial literacy to use these digital financial services (Bapat, 2022). Thus, the importance of user-friendly and accessible Digital Financial Services that a wide range of users could use. Although this online service offers users more flexibility in managing finances, it also increases the complexity. It could expose users to financial fraud by increasing the likelihood of making imprudent financial choices (OECD, 2018). Therefore, there is a need to improve financial literacy and educate users on utilising digital services effectively (Bapat, 2022).

The DFS sector can improve the financial inclusion of marginalised people and reduce transaction costs. It can contribute by improving customers' financial well-being and literacy, eventually driving economic growth and development.

NEED FOR TECHNOLOGY WITHIN MSME

Better technology will improve the performance of all companies, especially for Micro, Small, and medium Enterprises (MSMEs) (Gunawan & Pulungan, 2023; Meiryani et al., 2021). For prolonged survival and profitability, financial management and accounting play some of the most critical roles in business progress (Hendieh, 2023). Latifah et al. (2021) showed that innovation and accounting information systems intervene when testing the relationship between business strategies and MSME performance.

There are approximately 332.99 million SMEs worldwide that account for the majority of businesses (90%) and create more than 50% of the employment worldwide while contributing around 40% of national income (GDP) in emerging economies (World Bank, 2024). In general, SMEs need to gain a deep knowledge of accounting. Even some small businesses are running and making a profit without using or understanding accounting (Gunawan et al., 2023). For most of these owners, their business is running and performing well, while they need to grow and develop. By not using a proper financial management system, companies will commit errors and mistakes and generate losses while expecting success.

Development in technologies and, expressly, the internet has provided new opportunities for these SMEs, as they are more flexible and responsive in decision-making than the large and multinational companies. However, this flexibility and responsiveness are coupled with a need for more skills and resources in SMEs, especially regarding Information and Communication Technology (ICT) (Mohanty & Mishra, 2020). Preparing financial statements is complicated for most small businesses, so they need to pay attention to it. With financial planning and control, they will be able to know their daily and monthly turnover. With the financial statement, they can plan for further business development.

The current continuous advancement of technologies has shifted user needs and expectations in most industries and sectors. There is a growing demand for digitalisation of products and efficient and intuitive digital experiences. Moreover, this evolution of technology is constant, leading to a quick and changing development in users' needs and expectations. As users become more familiar with and understand the new digital tools and platforms, their demand for an improved user experience increases. Nowadays, users of technology expect a spontaneous, fast, and error-free use of technology (Robinson et al., 2018). Users are asking for more than just basic functionalities; they want unique and personalised experiences and expect technology to be reliable and secure. Companies and organisations must be cautious while adopting technologies to satisfy those ever-changing needs and remain competitive in the market.

Digital transformation is "the application of technology that digitises business operations with the aim of more optimal business operations and making them much more efficient" (Mihu et al., 2023). Digitalisation in accounting can be found in transforming regular financial statements into digital ones. Financial digitalisation aims to make financial statements more efficient while recording and analysing the company's financial performance.

RESEARCH METHOD AND METHODOLOGY

The authors used qualitative research methods to explore the existing literature and identify knowledge gaps in addressing challenges connected to the reliability of digital financial information. The methodology involved an in-depth review of scholarly articles through systematic literature analysis in Fig. 1. This approach permitted the authors to comprehend the complexities associated with digital financial information systems.

A systematic literature review process permits researchers to gather, evaluate, and synthesise available literature. Contrasting traditional literature reviews, a systematic review emphasises predefined tactics to reduce bias for transparency. This methodology involves clearly defined inclusion and exclusion criteria, comprehensive search strategies across multiple databases, systematic screening of identified studies, and rigorous data extraction and analysis techniques.

This research article explored the existing literature to identify gaps in addressing the challenges associated with digital financial information reliability, facilitating evidence-based decision-making, and identifying gaps for future research.

The first stage was the identification. The authors explored secondary data using Scopus, Web of Science, and Google Scholar platforms. Consequently, using keywords the authors identified 428 articles related to the research problem. 117 articles were from Scopus, 124 from Web of Science, and 187 from Google Scholar. Next, the authors checked selected publications on duplicates, and 99 articles were eliminated from research consideration.

The second stage was screening. The authors used the following exclusion categories such as articles that do not directly address the intersection of finance and design thinking or fail to contribute meaningfully to the understanding or application of either discipline; articles that rely on outdated research, methodologies, or data,

which may not accurately represent current trends, best practices, or the evolving landscape of finance and design thinking and lastly articles lacking credibility, such as unreliable sources, lacking peer-review, or promoting biased viewpoints without sufficient evidence or support from reputable sources. The authors screened articles on the title, consequently, 76 articles were eliminated.

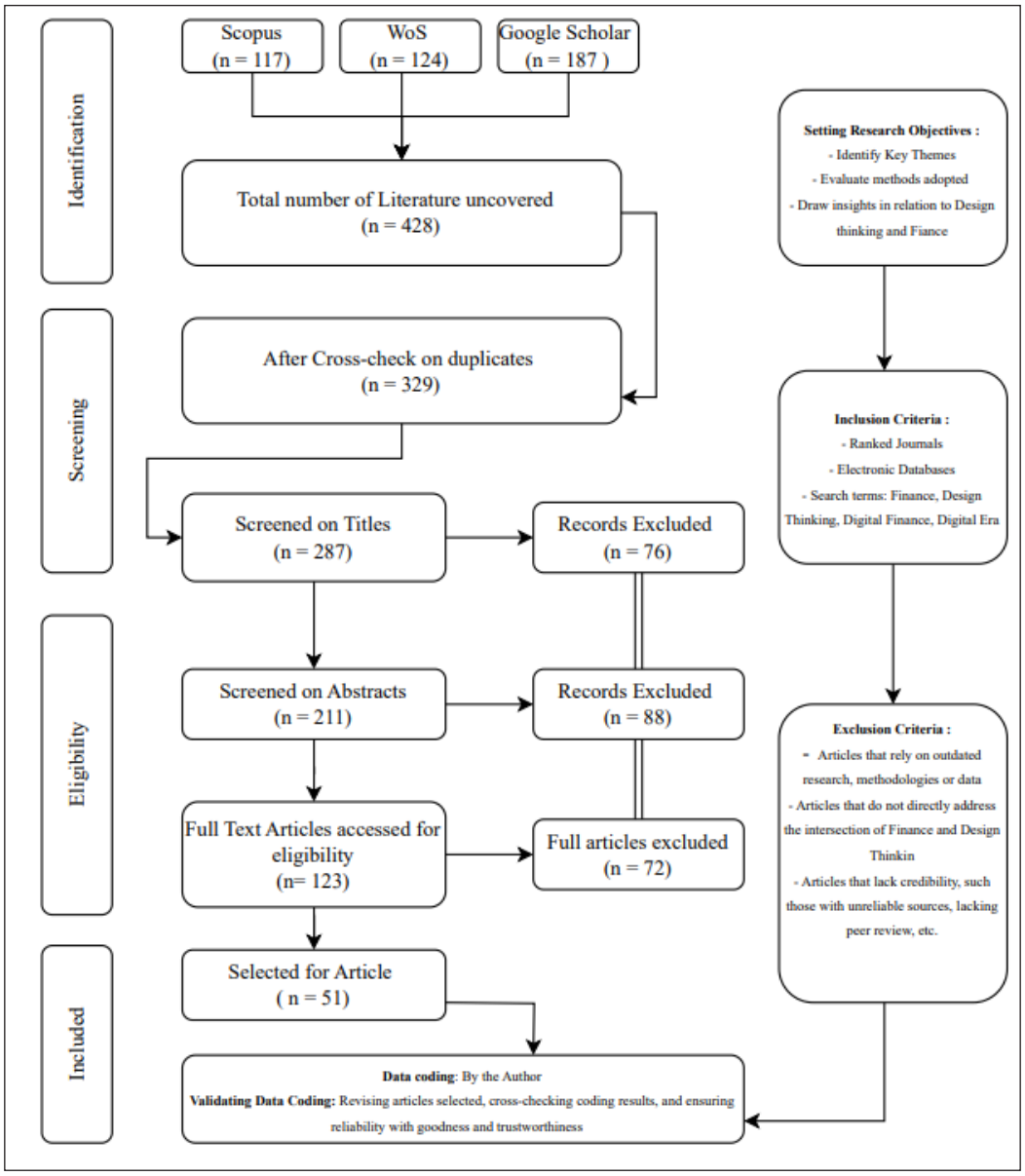

Fig. 1: Systematic Literature Review

Afterward, stage three involved checking articles on eligibility. Consequently, authors screened articles first on abstracts, where 88 articles were eliminated. Furthermore, full articles were examined, and another 72 articles were eliminated.

Lastly, the authors selected 51 eligible articles for this research. To address goodness and trustworthiness, and validate findings, the authors cross-check information. Both authors were involved in coding the data and its transcription into valuable insights.

RESEARCH FINDINGS

After an extensive systematic literature review, the authors highlighted four key weaknesses and opportunities in the context of digital financial information reliability. The

findings are summarised in a design thinking mapping Table 1, highlighting justifications for each weakness and opportunity based on literature analysis.

The identified weaknesses and opportunities in Table 1, must be studied via quantitative research to identify relationships, statistical significance, and predictors of these characteristics.

Table 1: Weaknesses and Opportunities in Digital Financial Information Reliability

Digital Financial Information Reliability			
Weaknesses		**Opportunities**	
Characteristics	**Justification**	**Characteristics**	**Justification**
Security Vulnerabilities	The susceptibility of digital financial systems to cyber threats and hacking.	**Blockchain Technology**	Leveraging blockchain for secure and transparent financial transactions.
Data Accuracy	Financial data entry and processing inaccuracies lead to unreliable information.	**Advanced Analytics**	Utilising advanced analytics to enhance data accuracy and identify anomalies.
User Interface Challenges	Difficulty understanding and navigating complex financial interfaces, leading to errors.	**User-Centric Design**	Prioritising user experience in the design of financial interfaces for improved usability.
Limited Transparency	Lack of transparency in the processes involved in generating digital financial information.	**Transparency Protocols**	Introducing protocols that ensure transparency in generating and disseminating financial information.

DESIGN THINKING CONCEPTS IN FINANCE

Furthermore, applying design thinking to guarantee reliable financial information in the digital era requires understanding users' needs, involving iterative problem-solving, and leveraging technology for efficient and effective solutions. The authors, based on systematic literature analysis systematically synthesised insights showcasing the collaboration between design thinking and finance. Table 2 highlights the findings and provides the justifications.

Table 2: Navigating Design Thinking Concept in Finance (Developed by the Authors)

Navigating Design Thinking Concepts in Finance	
Stages	**Justification**
Empathise	Understand the financial information needs of stakeholders. Consider the impact of the digital era on data security and privacy.
Define	Clearly define the problem by synthesising the information gathered during the empathise phase. Identify key metrics and financial data.
Ideate	Brainstorm innovative solutions and consider both technological and process-oriented solutions. Encourage a collaborative approach.
Prototype	Develop prototypes and test the prototypes with a small group of users to gather feedback.
Test	Conduct usability testing and gather feedback from a more comprehensive user group. Assess the reliability, accuracy, and efficiency of the financial information provided by the prototypes.
Implement	Collaborate with IT teams to implement the chosen solution, ensuring seamless integration with existing systems.
Monitor and iterate	Implement monitoring mechanisms to track the performance of the new financial information system.
Ensure Compliance	Align the design with relevant financial regulations and compliance standards. Employ security measures to protect sensitive financial information.
User Education	Foster a culture of continuous learning to ensure users stay proficient with the evolving digital tools.

RELIABLE FINANCIAL INFORMATION

Moreover, the authors identified that in business and finance, utilising informed and reliable financial information is fundamental for making clear decisions, ensuring transparency, and maintaining the trust of stakeholders. Table 3 illustrates crucial elements associated with informed and reliable financial information based on systematic literature analysis.

Table 3: Indicators of Reliable Financial Information

Indicators of Reliable Financial Information		
Indicators	**Informed**	**Reliable**
Data Accuracy	The financial information should be based on accurate and verifiable data.	The data should be consistently accurate over time, reflecting a commitment to precision and reliability.
Timeliness	Users should have access to financial information promptly. Delays in reporting may hinder decision-making.	Consistency in timely financial information releases trust and enables stakeholders to stay current with the organisation's financial performance.
Transparency	Financial reports should provide a clear and transparent view of the organisation's financial health, including disclosures about significant events or risks.	Transparency fosters confidence among stakeholders, as it demonstrates a commitment to openness and accountability.
Compliance with Standards	Financial information should adhere to accounting standards and principles, ensuring consistency and comparability.	Compliance with established standards enhances the reliability of financial information, making it easier for external parties to assess and analyse.
Technology and Security	The use of advanced technologies ensures efficient data processing and management.	Robust cybersecurity measures to safeguard financial information, preventing unauthorised access and ensuring the integrity and confidentiality of sensitive data.

To summarise, informed and reliable financial information is primary for effective decision-making, and sustaining an organisation's credibility. By prioritising accuracy, transparency, and faithfulness to standards, businesses can ensure that their financial information is a trustworthy foundation for internal and external stakeholders.

Moreover, the authors synthesised the findings and proposed that there is a positive relationship between identified intersections, that leads towards a successful integration of design thinking into the finance sector. Furthermore, nurturing trust in reliable digital finance information. On the contrary, quantitative research would be recommended to further study this phenomenon. Fig. 2 represents the rich picture of the intersection between Design Thinking and Finance.

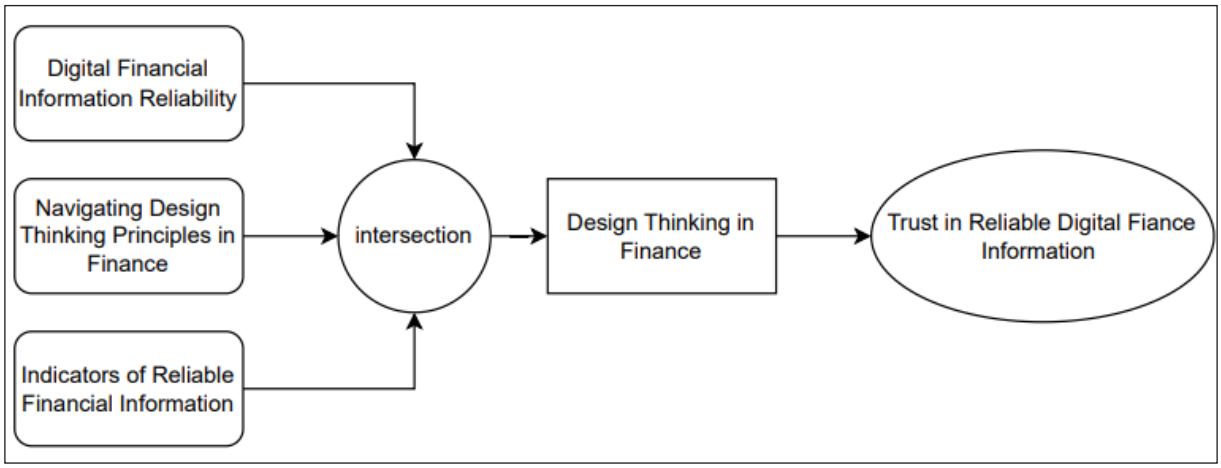

Fig. 2: Intersection of Design Thinking and Finance

CONCLUSION AND RECOMMENDATIONS

In conclusion, this research article highlighted the consequence of applying design thinking principles to understand weaknesses and capitalise on opportunities in the reliability of digital financial information. The results offer a holistic methodology to develop digital financial systems' security, accuracy, and transparency. The author's recommendations include integrating blockchain technology, embracing standardised practices, and a user-centric approach to design. By agreeing on design thinking, stakeholders can collaboratively work towards creating a robust and reliable digital financial ecosystem, guaranteeing the integrity of financial information in today's dynamic digital environment.

RECOMMENDATIONS

The authors recommend the following based on design thinking philosophy: first, empathising to understand the diverse needs of stakeholders is paramount in designing reliable financial systems. Design thinking advocates for empathy to identify and comprehend the concerns and expectations of end-users, executives, and regulatory bodies. By empathising with these stakeholders, organisations can uncover insights that shape the foundation of a resilient financial information infrastructure.

Second, define the information gathered during the empathy stage to articulate the problem at hand clearly. Defining key metrics, user personas, and the impact of the digital era on financial data security establishes a solid framework for subsequent design stages. Furthermore, Ideate. This phase encourages collaborative thinking, bringing together financial experts, IT professionals, and end-users to generate innovative ideas that address identified pain points and challenges. Moreover, develop prototypes of financial dashboards and reporting systems to test and refine potential solutions iteratively. Prototyping ensures that the proposed system aligns with user needs and organisational goals.

Test to evaluate the reliability, accuracy, and efficiency of the financial information system prototypes. Testing nurtures the proposed system to meet compliance standards and can withstand the demands of the digital environment. Implement Collaboration with IT teams is crucial to integrating the new financial information system with existing infrastructure seamlessly. Training sessions are conducted to familiarise users with the system's capabilities and functionalities. Moreover, monitoring is essential to track the performance of the implemented system. This phase ensures the ongoing reliability and relevance of the financial information system.

FUTURE RESEARCH

When applied systematically to financial information systems, design thinking offers a holistic approach to addressing the challenges of the digital era. Organisations can create financial information systems that provide reliable data and contribute to overall business continuity and resilience in the face of digital disruption. Consequently, the authors recommend conducting further studies with primary research. The necessary variables and information are already provided in this research article. Future quantitative research, and research in different sectors and countries are also required for a better understanding of the application and usefulness of design thinking while linked to financial information.

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