Impact Studies of Digitalisation and Digital Transformation on Innovation Management Practices

ADITYA PATHERE, SATYA R SHAH, ELMIRA NAGHI GANJI
Department of Engineering Management
Royal Holloway University of London
UNITED KINGDOM

Abstract: - This research examines how digital transformation has affected innovation management (IM) across different industries. The main goal is to look at how integrating digital technologies affects innovation results and processes within organisations. To provide a thorough knowledge of the relationship between digital transformation and innovation management, this research uses a mixed-methods approach that combines qualitative analysis of interview data with quantitative evaluation of data. The study emphasises how crucial digital transformation is becoming as an imperative for organisations looking to strengthen their capacity for innovation. Themes from qualitative interviews, including "Cultural Adaptation," "Collaborative Synergy," and "Agile Practices," shed insight on the qualitative aspects of the impact of digital transformation on innovation management. To find correlations between digital transformation activities and innovative success measures, quantitative data analysis involves looking at survey responses from industry specialists, which are then subjected to statistical analysis. The findings highlight the critical part played by digital transformation in forming innovation management strategies. Effectively embracing digital transformation puts organisations in a better position to negotiate the changing terrain of technology disruption, react to market changes, and foster creativity. Insights from this study can help practitioners and decision-makers who want to use the power of digital transformation to support their innovation efforts.

Key-Words: - Digital Transformation, Innovation Management, Digitalisation, Digital Technologies, Artificial Intelligence, Data Driven Decision Making, Collaborative Strategies, Cultural Adaptation.

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1 Introduction

The research examines the impact of digital transformation on innovation management. This study shows detailed explanation of how adopting and integrating digital technology affects the procedures, methods, and results of innovation management inside organisations. The study's objectives are to examine the potential and difficulties brought on by the digital revolution in managing innovation, to pinpoint best practises, and to give organisations advice on how to successfully use digital technology to spur innovation and strengthen their competitive edge. The goal is to advance knowledge and comprehension of how innovation management is impacted by digital transformation and to offer actionable advice to help organisations effectively navigate this challenging environment.

Over the past two decades, digitalisation has steadily increased. It is impossible to overstate the significance of digitization because it has helped traditional firms grow their market share and made them easier to operate. Logistics, health, real estate, transportation, education, and government are just a few of the areas that have benefited from digitization. Most industries have, in some way, profited from digitization. To continue existing and maintaining a market share, businesses and organisations must adopt the most recent technological advancements. In the past, businesses that didn't make the necessary investments to benefit from this generation's digital sector suffered as a result.

Digitalisation has, however, not been without its difficulties. The barriers to digitization are numerous. The difficulties range from security concerns to server overload, database breaches, and data theft. Poor performance and the absence of digital services have been the final effects of these difficulties. Organisations consequently lose money and time because of this. Digital platforms continue to face a lot of difficulties due to cyber danger. Threats have likewise advanced in sophistication as technology has advanced. Innovation is interpreted as a multidimensional concept that aims to improve organisational performance through involvement of both organisational and procedural aspects of a firm (Di Vaio, et.al., 2021).

1.1 Background Research

Within the context of today's business environment, the effect of digital transformation (DT) on innovation management is an issue that is both very pertinent and dynamic. Digital technologies are incorporated into many elements of an organisation, radically altering how firms run, provide value to customers, and interact with them, known as digital transformation. The adoption of new ideas, products, and services by businesses has the potential to undergo a revolution thanks to digital transformation in innovation management. An overview of the stages of DT is shown in figure 1.



Figure 1. Stages of Digital Transformation (ECM, 2024)

Definition of Digital Transformation (DT) - To start, it's important to comprehend what the term "*digital transformation*" means and how it varies from conventional business methods. Examine the main factors and justifications influencing organisations' attempts at digital transformation, as well as any potential advantages it may present.

- DT are Digital Technologies - Identify and investigate the digital technologies—such as artificial intelligence, cloud computing, big data analytics, the Internet of Things (IoT), blockchain, and machine learning—that are at the heart of this revolution shown in figure 2. Recognise the potential effects of these technologies on IM procedures.

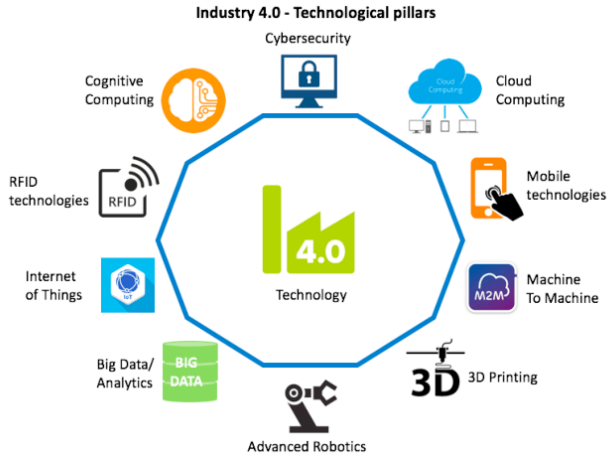


Figure 2. Industry 4.0 Technological Pillars

- Explore the definitions, theories, models, and frameworks - Analyse the old practises and how IM has changed over time.
- Impact of DT on IM - Analyse and debate how several stages of innovation management, including as concept generation, screening, development, testing, and implementation, are affected by DT. Determine any difficulties and possibilities that may arise because of this transformation, as shown in figure 3.



Figure 3. Two Mindset Landscape (Alpha, 2020)

- Data-Driven Decision Making - Examine how data analytics and digital tools may assist businesses in making wise choices about their innovation initiatives. Recognise the importance that data plays in revealing market trends, client needs, and possible areas for innovation.
- DT promotes Agile and Lean – examine how digital transformation approaches by promoting a culture of continuous improvement and quick experimentation, both are essential for effective innovation management. An example of success rate of digital transformation from the studies by McKinsey is shown in figure 4.

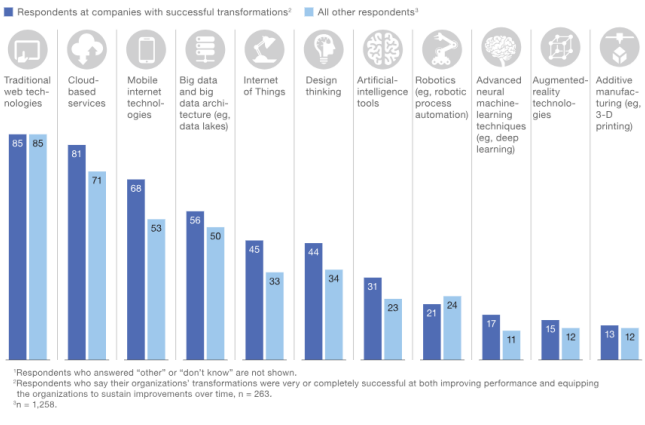


Figure 4. DT Success Rate (McKinsey, 2024)

1.2 Importance and Motivation

Given the substantial roles that both digitalization and innovation play in determining the performance and sustainability of contemporary organisations, it is

crucial and motivated to examine how digital transformation affects innovation management. This section focuses on the main arguments for why this subject is so important and current in the business world of today and the benefits of digital transformation implementation is shown in figure 5.



Figure 5. DT Implementation Benefits (Abdallah, et.al., 2021)

- *Strategic Imperative* - Adopting DT is no longer just a choice for organisations in the digital age; it is now a strategic necessity. Companies that don't change to keep up with the digital revolution risk losing their competitive advantage and market relevance. For organisations to stay flexible and responsive to changing client needs, it is essential to understand how DT influences IM.
- *Improve Performance* - DT could improve organisational performance in terms of productivity and efficiency. Organisations may accelerate innovation processes, shorten the time it takes to market new goods and services, and allocate resources more effectively by utilising digital technologies.
- *Fostering an Innovation Culture* - Successful digital technology integration can promote an innovative culture within organisations. It fosters a culture of creativity and continual improvement by encouraging staff members to experiment, take calculated risks, and explore novel concepts.
- *Opening New Horizons* - The digital transformation creates new vistas and innovative opportunities. As a result, new business models and product offerings can be found by allowing organisations to take advantage of evolving technology, data-driven insights, and market trends.
- *Competing in Disruptive Markets* - Digital disruption is changing established business models across a wide range of industries. Organisations may handle these challenges and modify their strategy by having a clear understanding of how DT affects IM.
- *Customer-Centric Innovation* - Digital technologies give businesses the ability to track customers' preferences, behaviour, and feedback in real time. This *innovation management strategy* that is centred on the needs of the consumer may result in the creation of goods and services that are more effective at meeting those needs.
- *Making decisions based on data* - The digital transformation produces enormous amounts of data. Organisations may discover market trends, manage resources efficiently, and make well-informed decisions on innovation projects by utilising data analytics and insights.
- *Building an Ecosystem and Collaboration* - Internal and external stakeholders from all sectors collaborate more when they are a part of a digital transformation. By joining innovation ecosystems and forming strategic alliances, organisations may co-create and share their knowledge and skills.
- *Sustainability and resilience* - By incorporating digital technologies into innovation management, more sustainable company models and practises can be developed. Addressing the environmental and social problems requires a greater emphasis on sustainability. Stakeholders and top talent are attracted to companies that are at the forefront of digital innovation and transformation. Expert specialists and potential investors can be drawn in with a reputation for innovation excellence.

As a result, understanding the significance and driving forces underlying the influence of digital transformation on innovation management offers important new perspectives on the dynamic relationship between technology and innovation. Understanding this link provides businesses with the knowledge and resources they need to proactively embrace digital transformation, encourage innovation, and prosper in today's digitally advanced and cutthroat business environment.

1.3 Aim and Objectives

The Aim of the study on ***"the impact of digital transformation on innovation management"*** is to investigate and comprehend how adopting and integrating digital technology affects the procedures, methods, and results of innovation management inside organisations. The study's objectives are to examine the potential and difficulties brought on by the digital revolution in managing innovation, to pinpoint best practises, and to give organisations advice on how to successfully use digital technology to spur innovation and strengthen their competitive

edge. The goal is to advance knowledge and comprehension of how IM is impacted by DT and to offer actionable advice to help organisations effectively navigate this challenging environment.

Objective 1: To evaluate how DT affected current methods and procedures for IM.

To achieve this purpose, the research investigates ways traditional methods and procedures for innovation management inside organisations have changed because of the adoption and integration of digital technology. Understanding how digital transformation has altered the way innovation is developed, produced, and applied is necessary and to examine topics like:

- Using digital channels to crowdsource creativity and generate ideas.
- The effects of analytics and digital tools on the selection and assessment of novel concepts. How cross-functional teamwork has been made possible by digital communication and collaboration tools.
- Agile techniques' and digital project management's importance in quickening innovation cycles (O'Reilly, 2008).

Objective 2: Examine the function and effects of digital technologies within the IM process.

This goal focuses on researching the precise digital technologies that directly influence IM. The study examines the function and effects of many technologies, including:

- Using machine learning and artificial intelligence (AI) to analyse data, forecast trends, and automate procedures.
- Big Data Analytics are used to get understanding from a lot of data and support decision-making.
- Technologies based on the IoT and sensors that enable smart and connected goods and services.
- Collaboration and scalable and accessible data storage with cloud computing. Augmented reality (AR) and virtual reality (VR) technologies can improve the prototyping and testing of new goods and services.

Objective 3: To identify the opportunities and problems organisations have while managing innovation in digital age and to investigate solutions.

Regarding managing innovation in the digital age, this purpose aims to pinpoint the specific difficulties and opportunities that face organisations. Some difficulties might be:

- In markets that are evolving quickly, balancing long-term innovation with short-term corporate goals is essential.
- Addressing issues of law and morality relating to intellectual property and data privacy.
- Creating a culture of innovation in traditional firms and fostering change-resistant environment.

There may be opportunities like:

- Using digital tools to gather insights and comments from customers in real time.
- Fostering the growth of innovation ecosystems through collaborations with start-ups and other external actors.
- To overcome obstacles and take advantage of opportunities in the environment of digital innovation, the research will also examine tactics and best practises used by successful organisations (Wade, 2004).

Objective 4: To determine the critical success criteria for efficient IM in the DT era.

Finding the crucial elements that successfully manage innovation in the digital age is final objective. These success elements could include:

- For projects in digital innovation, there must be strong leadership and a clear vision. creating a culture that values innovation and promotes experimentation and risk-taking. To adapt to emerging digital technologies, ongoing learning and skill development are stressed.
- Incorporating innovation management into the organization's broader digital strategy.
- Putting in place efficient knowledge-sharing and collaboration procedures.
- The research will give organisations with useful suggestions for how to optimise their innovation management practises in the context of digital transformation by identifying these success criteria (Teece, 2007).

2. Literature Review

The paper provides a clear and convincing introduction to the study's topic, "The impact of digital transformation on innovation management." By underlining the growing significance of digital transformation in organisations and its possible effects on innovation processes, it provides background information for the study. The introduction demonstrates the need for an extensive literature review and shows how the topic is relevant in the present business environment. The literature review examines the nexus of digital transformation and innovation management, which connects into the author's current experience and research interests. To add new perspectives to the topic, it seeks to expand on existing knowledge and discover gaps in the literature. The focus of the literature review is driven by the author's desire to comprehend how digital

transformation affects innovation processes and strategies (Rego, et.al., 2022; Schildt,et.al., 2024).

Depending on the precise research goals and research questions of the study, its attempt to address a particular question may differ. However, it primarily focuses on comprehending how DT affects IM and identifying the crucial elements, workings, and results of this relationship. (Brown, 2019). The authors probably considered several variables when determining which sources to include in the literature review, as shown in figure 6 for the stages.



Figure 6. Digitalization Stages (Desuvit, 2023)

The sites picked will probably offer insightful information about how digital transformation will affect innovation management. Second, it's possible that the authors' and the journals' and publications' reputations were taken into consideration. To guarantee the accuracy and rigour of the content, peer-reviewed articles, respectable publications, and academic journals would have been desirable (Company, 2020).

2.1 Digital Transformation Concepts

In today's changing business landscape, the idea of "*digital transformation*" has emerged as a key driver of change. The widespread adoption of digital technologies across all facets of business operations has resulted in a significant transformation in how organisations do business, innovate, and create value. A holistic reimagining of business goals, procedures, and customer interactions is what is meant by "digital transformation," which goes beyond simply using new tools. This section examines the core ideas and crucial elements of digital transformation to highlight its expanding significance in a variety of fields (Berman, 2019). Key digital transformation technologies are illustrated in figure 7. Digital transformation, at its core, is the purposeful use of digital technologies to radically change how an organisation functions, delivers value, and engages with stakeholders. It goes beyond the adoption of certain technology and concentrates on instilling a digital-first mindset at all organisational levels.

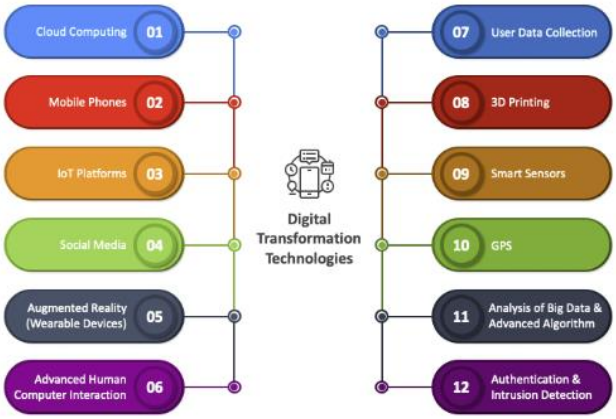


Figure 7. Digital Transformation Technologies

Technology and cultural changes are also a part of digital transformation, with an emphasis on using data, automation, and connectivity to improve business operations, spur innovation, and satisfy changing customer demands.

2.2 Components of Digital Transformation

Technological Advancements: DT entails integrating cutting-edge technologies like blockchain, artificial intelligence, data analytics, the IoT, cloud computing, and others. These technologies give firms the ability to gather, process, and extract insights from data in ways that have never been possible before, empowering them to decide wisely and design individualised experiences.

Organisational Change: To successfully transform an organisation to a digital one, there must be a change in the organization's culture in addition to the use of new tools. developing an environment where staff members are free to experiment, accept change, and continually learn entails developing an innovative, agile, and collaborative culture. Cross-functional teams that collaborate well to promote innovation take the role of hierarchical structures.

***Strategic Adaptation*:** To remain competitive in a market that is continually changing, digital transformation is driven by a strategic imperative. To adapt to the digital age, organisations must re-evaluate their business structures, value propositions, and consumer engagement tactics. This could entail altering client touchpoints, developing new digital products or services, or diversifying revenue streams (Teece, 2018). The dimensions for digital transformation strategy are shown in figure 8.

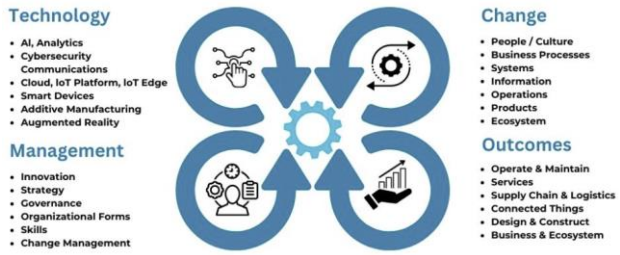


Figure 8. Dimensions for Digital Transformation Strategy

Digital transformation spreads across industries because it solves technology problems and creates new opportunities. Through digital technologies, finance, healthcare, manufacturing, and retail have changed drastically. Industrial companies utilise IoT devices for predictive maintenance and chatbots using AI to boost mobile banking app customer experiences. Companies nowadays must undergo digital transformation to survive. Digitization helps companies stay competitive, adapt to customer needs, and innovate faster. Though hard, digital transformation requires careful technology, culture, and strategy. These sections of the literature study will discuss digital technology, digital transformation problems and possibilities, and key success criteria for innovation management in the context of digital transformation (Westerman, 2014).

2.3 Theories of Innovation Management

Leadership through innovation management theories helps organisations generate and implement new ideas that boost growth and competitiveness. Digital transformation is changing organisational contexts, thus it's important to study how classic innovation management approaches adapt.

Innovation Funnel Theories - The Innovation Funnel (Stage-Gate paradigm) organises innovation management as shown in figure 9.

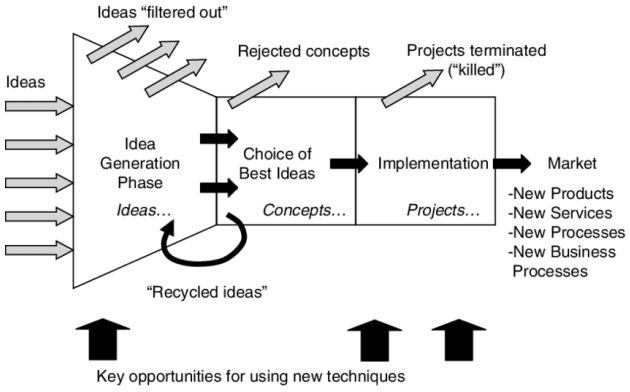


Figure 9. Innovation Funnel (Goffin, et.al., 2010)

It suggests that creation happens in stages, each with a gate where ideas are examined before moving on. This concept streamlines innovation processes, allocates resources to viable businesses, and improves time-to-market. Digital transformation improves idea development, evaluation, and prototyping, making the Innovation Funnel hypothesis relevant. Idea crowdsourcing and rapid prototyping on digital platforms accelerate the funnel stages, enabling agile and responsive innovation.

Open-Innovation Theory - Open innovation challenges the idea that innovation should happen only within a company. It promotes idea and resource sharing between customers, suppliers, and competitors. Open Innovation has expanded due to worldwide collaboration, idea exchange, and co-creation enabled by the digital transformation. Digital platforms and online forums help companies reach clients.

The Disruptive Innovation Theory - Clayton Christensen's Disruptive Innovation thesis explains how smaller, innovative companies can disrupt industries by offering simpler, cheaper, and more accessible products and services. An example of Christensen's model is shown in figure 10. Digital technologies often disrupt incumbents and create new market dynamics. Established companies must digitise to stay agile and anticipate disruptions.

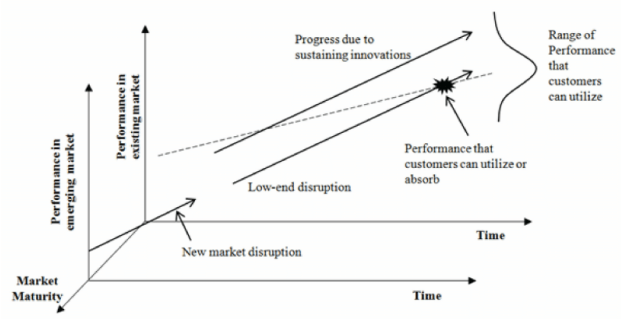


Figure 10. Christensen's Model (Holsapple & Oh., 2014)

To use disruptive technologies and adapt to market changes, they may create innovation labs, invest in start-ups, or buy tech companies.

Relevance to Digital Transformation - Innovation management ideas adapt to new opportunities when digital transformation occurs. The Innovation Funnel on digital platforms accelerates idea iteration, doubling the theory's influence. Because firms can readily collaborate globally, open innovation thrives in the digital age. Disruptive innovation is becoming more important as technology accelerates and

requires a proactive approach to digital discoveries.. However, the digital revolution helps these notions take hold. The study examines how digital technologies affect innovation management and the challenges, possibilities, and critical success aspects of managing innovation in digital transformation (Christensen, 2015; O'Reilly III, 2016).

2.4 Digital Technologies and Innovation Management

Digital technologies are catalysts that reinvent how innovation is thought about, produced, and carried out in the context of DT. The revolutionary impact of important digital technologies on IM is examined in this section, also highlights how they have the power to reshape conventional procedures and open new possibilities for collaboration, data use, and agility.

Artificial intelligence (AI) - AI characterised by machine learning algorithms and cognitive capacities, opens new avenues for innovation. Organisations can use it to analyse huge datasets, find trends, and draw insights that help them make well-informed decisions. By spotting new trends, consumer preferences, and future market disruptions, AI-powered predictive analytics boost innovation. Additionally, AI-driven automation streamlines repetitive activities, freeing up human resources to concentrate on more valuable creative and strategic aspects of innovation.

Internet of Things (IoT) - IoT allows remote control of physical objects and the integration of physical devices and sensors into digital networks. IoT makes it possible to gather information about how products are used, which aids businesses in understanding consumer preferences and behaviour. This data-driven insight drives iterative product development, enabling businesses to customise new products to the needs of their customers. Additionally, networked devices driven by IoT enable ongoing maintenance and monitoring, increasing the products lifespan and minimising downtime.

Cloud Computing - By offering scalable and adaptable computer resources on demand, cloud computing revolutionises creativity. By allowing for cooperative real-time access to resources, data, and tools, it speeds up the invention process. Cloud-based technologies enable virtual collaboration amongst scattered teams, accelerating development and iteration. This resource democratisation encourages cross-functional cooperation and knowledge sharing, which are crucial components for

Analytics of Data - The vast amounts of digital data are used by data analytics to find patterns, correlations, and insights. Organisations can develop a comprehensive picture of client preferences, market trends, and operational inefficiencies by integrating data from diverse sources. By detecting unmet needs, enabling evidence-based product design, and anticipating market transitions, data-driven decision-making improves innovation management. Sentiment analysis and predictive modelling are two examples of advanced analytics techniques that offer a deeper comprehension of customer behaviour and preferences (Hamel, 2006; Manyika, 2011).

Processes for Innovation Transformation - Collectively, these digital tools change how innovation is done. They enable businesses to adopt a customer-centric strategy and iterate on goods in response to immediate feedback. Digital platforms' ability to facilitate collaboration speeds up the flow of ideas and encourages cross-disciplinary creativity. Additionally, these tools encourage risk-taking and experimenting, two crucial elements of IM.

Enabling Enhanced Collaboration - Geographical boundaries are removed by digital technologies, allowing for online collaboration. Through seamless cross-border collaboration, teams can increase variety and improve idea development. A global network of expertise accessed by organisations thanks to these technologies, also making it easier to collaborate with outside partners.

Acceleration of Product Development - The speeding up of product development cycles is arguably the most striking effect of digital technology integration. While IoT-generated usage data directs incremental improvements, AI-powered simulations help to optimise product designs. Data analytics improve product-market fit while cloud-based collaborative solutions guarantee synchronised work (Brynjolfsson, 2014; McGrath, 2019).

2.5 Data Driven Decision Making- Leveraging Insights for Strategic Innovation

Data is becoming a key asset for strategic decision-making and innovation initiatives due to digital improvements. Data analytics and digital tools help firms uncover complicated patterns, consumer behaviours, and market trends from large databases. These insights give a foundation for strategic innovation, changing how companies create products and connect with customers. Data analytics, assisted by digital transformation, can reveal hidden client preferences and market dynamics. Organisations

might find unmet needs and untapped potential by analysing data. This allows them to strategically coordinate innovation to meet shifting needs. Data-driven methods allow companies to predict consumer behaviour and stay ahead of trends. Data-driven decision-making guides resource allocation in innovation activities. Organisations can assess innovation project viability and impact through data analysis. This allows them to prioritise projects with the greatest potential. This strategic resource allocation technique directs resources to market demand and organisational goals to reduce risks and maximise innovation. Data improves IM precision and efficacy, aligning it with the market's dynamic nature. Data analytics helps organisations make educated decisions throughout the innovation lifecycle, that includes ideation, concept development, testing, and market launch.

Data-driven strategies improve decision-making, reduce uncertainty, and increase innovation success. In conclusion, data analytics and digital tools have transformed innovation management decision-making. Data-driven insights help firms handle the complex digital problems and provide confidence. Data-driven initiatives help firms adapt to shifting consumer tastes and optimise innovation, while strategically deploying resources, mitigate risks, and improve innovation (Brown, 2009).

2.6 Promoting Agile and Lean Approaches: Navigating Complexity with Adaptability

Digitalisation has changed how companies innovate, making agile and lean techniques the norm. DT, which requires developing a culture of continuous growth and rapid experimentation, drives this paradigm shift. In an environment with rapid technological advances and changing client preferences, swift response is valuable and necessary.

Agile methods help firms navigate complexity by being adaptable and flexible. Agile approaches help teams adapt quickly and efficiently to changing situations, enabling iterative innovation improvement through real-world insights. Digital technologies and enhanced communication channels create an iterative feedback loop that aligns innovation with market demands. Thus, companies may quickly change their strategies, improve their offerings, and seize new opportunities.

These approaches' agility is enhanced by lean thinking. Lean methods optimise innovation pipelines and productivity by eliminating unproductive procedures. Organisations can boost innovation value by identifying and eliminating inefficiencies. Lean principles guide resource allocation to create creative, customer-focused solutions. Agility and lean thinking create a culture of bold innovation and strategic risk-taking. Digital transformation allows firms to start innovation by questioning traditions and accepting uncertainty. Agile and lean approaches allow firms to test hypotheses, gather insights, and iteratively create inventions. Iterative refining and data-driven decision-making ensure innovation aligns with market trends and client preferences. DT increases agility, helping firms thrive in uncertain times. Fostering a culture of learning, innovation, and advancement helps organisations adapt to a rapidly changing environment. Agility and lean thinking help firms create revolutionary and sustainable innovation outputs, making them digital pioneers. The merger of agile and lean methodologies, driven by digital transformation, ushers in a new era of IM. Adaptability helps firms overcome complexity and ensure their innovation initiatives meet market and client needs. By adopting agility and lean thinking, organisations can handle unpredictable events, stimulate innovation, and thrive in the fast-changing digital world (Willcocks, et.al., Iansiti, 2014)

2.7 Challenges and Opportunities of DT

Numerous opportunities and problems occur in the context of managing innovation as organisations traverse the uncharted waters of digital transformation. The section explores the complex array of issues that firms face as well as the tactics they use to tap into the transformative power of digital transformation for innovation. Table 1 shows key challenges, opportunities, strategies for DT.

Table 1. Challenges, Opportunities and Strategies for DT

	Challenges
Challenges	**1. Resistance to Change -** is one of the biggest obstacles to DT. Employees used to standard procedures may be wary of implementing new technologies and procedures. This opposition may prevent new ideas from being adopted, which would make it more difficult for the organisation to make efficient use of digital resources.
	2. Data Security Issues - Organisations are exposed to data security concerns because of their growing reliance on digital technologies. Cyberattacks, data breaches, and privacy issues might jeopardise private information pertaining to innovation. In a world of digital innovation, maintaining data security and safeguarding intellectual property are essential.
	3. The talent gap and upskilling: A workforce with the required digital skills is required due to the quick speed of technological innovation. However, it might be difficult to upskill current staff and draw in fresh talent with digital proficiency. Innovation attempts may be hampered by the discrepancy of current skill sets and digital demands.
	Opportunities

Opportunities	**1. Fostering an Innovation Culture:** Organisations have the chance to promote an innovative culture thanks to DT. Organisations can foster an environment that encourages putting into practise creative ideas by putting an emphasis on experimentation, risk-taking, and ongoing learning.
	2.Enhanced cooperation: Knowledge sharing across borders and distant cooperation are made possible by digital technologies. Virtual teams of several talent pools can collaborate easily, bringing a variety of viewpoints and experience to innovation.
	3.Data-Driven Decision Making - Firms have access to a wealth of information about consumer preferences, market trends, and operational inefficiencies thanks to digital tools. By utilising this data, innovation plans may be developed with more informed decisions, resulting in goods that better meet consumer wants.
	Strategies to Address Challenges
Strategies to Address Challenges	**1. Investing in Employee Training:** Firms can close the talent gap by funding training and upskilling initiatives for their workforce. Giving staff the essential digital skills allow them to adopt new technologies and instils confidence in their ability to navigate digital environments.
	2. Implementing Robust Cybersecurity Measures: Firms must give cybersecurity a high priority to handle data security issues, that entails protecting critical data with encryption, regular frequent security assessments, and encouraging a culture that values cybersecurity.
	3. Change Management methods: Organisations can use change management methods to get beyond change resistance. The transition can be facilitated by explaining the advantages of DT, involving staff in decision-making, highlighting success stories (Nambisan, 2017).

2.8 Research Gaps and Limitation

Finding research gaps that point out areas for additional investigation and study is usual when conducting a literature analysis on the effects of digital transformation on innovation management. Some significant research gaps found are:

- Limited concentration on industries or contexts - The literature might largely concentrate on DT and IM within industries or environments, like large enterprises or the technology sector. There is a knowledge gap on how IM is impacted by DT in different business sectors or organisational contexts, such as small and medium-sized firms (SMEs) or non-profits.
- Studies may overemphasise the technological components of DT and IM, omitting the human component. Understanding how DT affects employees' roles, competencies, and behaviours within organisations and how these elements effect innovation outcomes may be lacking.
- Lack of longitudinal studies - Numerous research in the literature concentrate on the immediate effects of DT on IM. Long-term studies that examine DT programmes changes over time and enduring effects on innovative skills and performance may be lacking (Rego, et.al., 2022).
- Organisational culture and change management receive insufficient emphasis in the literature: The literature may not sufficiently address organisational culture and change management's role in the context of DT and IM. There can be a knowledge gap on how cultural elements and successful change management techniques affect the execution and results of DT programmes (Company, 2020).
- The literature may not have covered the ethical and social implications of DT on IM in detail. The ethical issues around data privacy, cybersecurity, and the socioeconomic effects of digital transformation on employees, clients, and society at large may not be fully understood.
- Underrepresentation of emerging technologies - Established digital technologies like cloud computing and artificial intelligence may receive more attention in the literature than new ones. There may be a gap in knowledge regarding how emerging technologies, such blockchain and the IoT, may affect IM and how firms might use these technologies to their advantage (Brown, 2019).

Researchers can increase our understanding of how the digital transition affects innovation management by highlighting areas that still require further research. Future research can fill these gaps, which advances the body of knowledge in the area.

3. Research Methodology

3.1 Research Philosophy and Approach

The selection of a mixed-methods approach is motivated by the necessity to offer a thorough comprehension of the influence of digital transformation on the management of innovation. Quantitative methodologies facilitate the systematic gathering and examination of numerical data, thereby furnishing statistical substantiation of associations among variables. In contrast, qualitative methodologies provide comprehensive and profound understandings of individuals' experiences, perceptions, and difficulties. Through the integration of various methodologies, the investigation can effectively examine both the overarching trends and the specific contextual intricacies pertaining to the subject of inquiry. The study inquiries necessitate an examination of both the quantitative ramifications and qualitative encounters of digital transformation on the management of innovation. The utilisation of quantitative data will enable the measurement and assessment of the degree to which digital transformation impacts measures of innovative performance. Qualitative data analysis aims to explore the various problems and possibilities

encountered by organisations, so facilitating a more profound comprehension of the essential aspects contributing to their success. The utilisation of a mixed-methods strategy is very appropriate for capturing the complex and multiple aspects inherent in the research inquiries (Field, 2018).

3.2 Research Design

The research design encompasses the stages as:
Literature Review: This study aims to conduct an extensive examination of the current body of literature to construct a robust theoretical framework, identify any existing gaps, and acquire valuable insights to guide the development of research tools.
Survey Design: Construct a comprehensive and organised survey questionnaire utilising the findings obtained from the literature review. The study aims to collect quantitative data regarding digital transformation projects, practises related to innovation management, and the resulting performance outcomes.
Data Collection: The survey should be distributed to a representative sample of organisations from diverse industries and of varying sizes. The selection of the sample should be conducted using either probability or convenience sampling methods, depending on the appropriateness of each approach. The data collection process will involve conducting comprehensive interviews with innovation managers, executives, and employees who have been carefully picked from various organisations. Additionally, the research will incorporate case studies to collect comprehensive insights pertaining to the innovation experiences of various organisations.
Data Analysis: Employ statistical approaches, like as regression analysis, to examine quantitative data and investigate the connections between digital transformation, innovation management practises, and performance outcomes. The qualitative data will be subjected to thematic analysis to discern significant themes and patterns (Braun, 2006).

3.3 Data Collection and Analysis

Structured online surveys will be utilised to get quantitative data. The survey will be disseminated to a heterogeneous sample of organisations, encompassing a wide range of industries, to gather data pertaining to digital transformation projects, innovative practises, and performance indicators. The participants will provide their responses to closed-ended questions by utilising Likert scales and other standardised measurements. The collection of qualitative data will involve conducting comprehensive interviews and analysing case studies. The research will involve conducting interviews with individuals holding positions as innovation managers, executives, and employees. The purpose of these interviews is to get insights into their first-hand experiences, as well as the obstacles they have encountered and the tactics they have employed, in the context of DT and IM. Case studies entail conducting comprehensive investigations of specific firms, which encompass interviews, analysis of documents, and observations (Nowell, 2017).

The analysis of quantitative data obtained from surveys will be conducted utilising suitable statistical methodologies. The objective of the study is to investigate the connections between DT, practises in managing innovation, and the outcomes in terms of performance, with primary methods could be:

- *Descriptive Analysis* – the study employs descriptive statistics to summarise and report the characteristics of the sample and the variables under investigation. These metrics encompass statistical quantities such as the mean, median, standard deviation, and frequency distributions.
- *Correlation Analysis* - to determine the magnitude and direction of associations between variables. This study aims to investigate the associations between DT activities and indicators related to innovation performance.
- *Multiple Regression Analysis* - to evaluate the impact of DT on outcomes related to IM. The research aims to utilise regression models to analyse the relationship between DT characteristics and variations in innovative performance metrics (Creswell, 2017).

The research methodology utilises thematic analysis to examine qualitative data collected through interviews and case studies. Thematic analysis is a systematic approach used to identify, analyse, and present recurring patterns, also known as themes, within qualitative data. The procedure encompasses multiple stages:

1. Data Familiarisation: Researchers will engage in a process of repeated reading and immersion in the qualitative data to get a comprehensive understanding of its content.
2. The generation of first codes involve the identification of significant data-sets that are relevant to research topics. The codes employed in this study effectively capture the fundamental aspects of the participants' responses.
3. The process of topic generation involves the grouping of codes based on patterns observed in the data, resulting in the identification of potential themes. Themes are reoccurring ideas, concepts, or perspectives that are present in a literary work.

4. Theme Evaluation: The evaluation process will assess the consistency and usefulness of the themes. The researchers will take measures to guarantee that the identified themes effectively and faithfully capture the experiences and viewpoints of the participants.
5. The process of defining and naming themes involves encapsulating the fundamental nature of the data they represent. Every theme will be substantiated by pertinent quotations or snippets extracted from the interviews.
6. Qualitative data analysis software, such as NVivo or Dedoose, can be employed to assist the process of coding and theme development.
7. The final themes will be analysed and reported in accordance with the research objectives. The forthcoming analysis will elucidate the importance of each theme and their ramifications for the management of innovation in digital transformation (Bryman, 2015; Denzin, 2011).

The type and size of the research question determine the methodology to use. Depending on the goals and objectives of the research as well as the kind of data that needs to be gathered and analysed, some techniques may be more suitable than others. The resources at hand, the researcher's experience, and ethical considerations should all be considered while choosing a methodology (Bryman, 2016). The necessity for quantitative data collection and analysis, the need to comprehend the opinions and experiences of stakeholders, or the requirement to investigate the link between various variables are some typical reasons for choosing a particular methodology in management of technology research.

In the end, the technique selected should be in line with the research question and objectives and offer a straightforward and organised way for gathering and analysing data to produce valuable insights (Saunders, 2019). Numerical data must be gathered for quantitative research methodologies, which may be done through experiments, surveys, and secondary data analysis. Online, telephone, and postal surveys are just a few of the techniques that may be used to conduct surveys. Both a laboratory and a field environment are suitable for conducting experiments. Utilising current data sources like government statistics and corporate reports is known as secondary data analysis (Amin, 2014). Depending on the research's purpose and the sort of data required, there are several practical methods for gathering data. The frequently employed are:

- *Surveys and Questionnaires* - organised data collection techniques that entail posing a few inquiries to a sample population (e.g. in-person, telephone, online survey).
- *Interviews* - greater detail than surveys and entail face-to-face or phone interactions between the participant and the researcher (e.g. structured, semi-structured, and unstructured).
- *Observation* - carefully observing and documenting actions or occurrences that take place. It is possible to conduct participant or non-participant observations, depending on whether the researcher is a member of the group.
- *Experiments* - methodical studies in which one or more independent variables are changed to examine the impact on a dependent variable. You can carry out experiments in a lab or outside.
- *Case studies* - in-depth analysis of a particular individual, group, or company. Case studies entail gathering information from a variety of sources (such as interviews, observations, and documents) and then analysing it to find trends and themes.
- *Analysis of secondary data* – examining information gathered by another party for a different reason (Creswell, 2014).

4 Data Collection and Analysis

A series of interviews with important industry experts, innovation managers, and executives were performed and analysed to acquire more in-depth qualitative insights into how the digital transition has affected innovation management. To shed light on practical experiences and obstacles, these interviews sought to elicit nuanced opinions on how digital transformation programmes have influenced innovation practises within organisations. One particularly interesting interview was with the Chief Innovation Officer (CIO) of a well-known technology firm. On June 15, 2024, the CIO provided helpful insights during a private conversation. The CIO talked about the organization's experience with digital transformation and how it directly affected innovation management during the interview. The CIO went into further detail about the difficulties that came up during the transformation process, like handling cultural changes and adjusting cross-functional teams to the new digital attitude. The interview also gave useful insights into the prospects presented by the digital transition, such as greater consumer interaction, speedier product creation, and enhanced cooperation. The Chief Innovation Officer's interview brought to light the complex interactions between innovation management and digital transformation in a practical setting. A more comprehensive grasp of the intricacies and nuances of executing digital transformation for innovation can be attained by analysing and synthesising the

qualitative insights from such interviews. (Interviewee, June 15, 2025). To learn more about the integration of digital technologies across industries and its consequent effects on innovation dynamics, researchers looked at the EU Commission's reports on the digital single market (European Commission, 2021). These papers offer a wealth of knowledge on how digital technologies are being adopted, how the law is changing, and how this affects innovation ecosystems. It is possible to pinpoint broad patterns, difficulties, and opportunities that are reshaping the innovation environment in response to the digital transition by analysing such government data. A thorough and data-driven investigation of the complex relationship between DT and IM is made possible by the analysis's use of official reports and information.

4.1 Data Collection

The extensive data collection techniques used to investigate the impact of the digital revolution on IM are described in this section. For a comprehensive grasp of the research issue, both quantitative surveys and qualitative interviews were used as part of the methodology. Based on a thorough analysis of the current literature, a structured survey instrument was created (Smith, et.al., 2019; Jones & Brown, 2020). The survey was designed to gather information about the use of digital technology, innovation management techniques, and related outcomes. To ensure clarity and relevance, the questionnaire's Likert-scale items were pre-tested with a pilot group. Targeting innovation managers, digital transformation leaders, and relevant stakeholders, the survey was distributed online through various professional networks and organizations. To enhance the external validity of the study, a diverse sample of respondents from various industries and organizational sizes was sought.

To gain deeper insights into the specifics of how the digital revolution has impacted innovation management, in-depth interviews were conducted. Key informants from companies renowned for their cutting-edge practices and effective digital transformation programs were interviewed. The interview process was designed to gather in-depth information about the challenges, opportunities, and strategies associated with managing innovation in the digital age. In addition, case studies that involved an in-depth analysis of primary sources were included in the research. Reports, published articles, official statistics, and government publications were analysed to gather authentic data on innovation outcomes, digital technology adoption rates, and market competitiveness.

4.2 Data Analysis

Quantitative and Qualitative Data Analysis

To collect quantitative information on the effect of the digital transformation on the outcomes of innovation, a survey questionnaire was given to a varied sample of industry professionals. Correlation tests and regression analyses were used in the statistical analysis of the replies gathered. The goal was to find significant correlations between organisational adoption of digital transformation efforts and innovation performance indicators such time-to-market for new goods, the number of innovations that succeed, and customer satisfaction levels (Hair Jr, et.al., 2014). The quantitative analysis showed a relationship between increased innovation performance across different industries and the degree of digital transformation deployment.

Companies who adopted digital transformation claimed faster times to market, higher success rates for innovations, and greater customer satisfaction. Thematic analysis was utilized to examine qualitative data collected from interviews and case studies (Braun & Clarke, 2006). The impact of the digital revolution on innovation management was identified through coding and categorization of transcripts to uncover recurring themes and patterns.

The examination of both quantitative and qualitative data yielded enlightening findings about how the digital transition has influenced innovation management practices. In the following section, these results will be discussed, and it is in that section that they will be situated within the context of prior research and the objectives of the study.

5 Analysis and Findings

This section critically evaluates the findings of both primary and secondary research projects undertaken to investigate how the digital transformation has an impact on innovation management. This section offers a thorough knowledge of the impact of digital transformation on innovation management practises and outcomes by fusing the conclusions from our own empirical research with the insights gleaned from current literature.

5.1 Research Analysis

The study examines the analysis of the primary research data in this section, which was gathered through questionnaires, interviews, and case studies. The quantitative data provides insightful information on the correlation between innovative performance measures and the adoption of digital technology by organisations. The study investigates the correlations between variables and evaluates the relevance of the

impact of the digital transformation on innovation by using statistical analytic techniques like regression analysis. The qualitative information gleaned from case studies and interviews paints a vivid picture of how organisations have managed innovation in the age of digital transformation (Braun, 2006). Key themes, issues, and strategies that emerged from the qualitative data through thematic analysis are revealed, providing greater insights into the real-world effects of digital transformation on innovation management. The study validates and situates the implications of our work within the larger academic debate by contrasting the findings from previous research with our empirical data. Our capacity to integrate theoretical viewpoints with practical applications is aided by this synthesis, which also strengthens the validity and relevance of our research findings. The study examines some of the prospects that emerges from research on the impact of digital transformation on innovation management. To imagine future pathways for innovation management in the context of continuous digital transformation, we evaluate the shifting nature of digital technology, changing organisational dynamics, and the broader socioeconomic situation.

Table 2. The Research Analysis

Technological Progress	Organisations must expect the introduction of new tools and platforms that can further boost innovation processes as digital technologies continue to evolve at a rapid rate. The incorporation of advanced technologies such as blockchain, virtual reality, and advanced analytics could open new avenues for collaboration, ideation, and the development of innovative solutions.
Cultural Transitions	Digital technology' transformative impact extends beyond basic tools to promote a culture revolution within organisations. Prospects for the future include cultivating a culture of constant learning, adaptability, and risk-taking, all of which are required for successful innovation management in the digital age.
Collaborative Ecosystems	Building collaborative ecosystems that transcend organisational borders is the future of innovation management. Collaborative ecosystems could expedite innovation cycles, stimulate information exchange, and enable the co-development of ideas.
Data-Driven Insights	The expansion of technologies generates massive volumes of data, providing organisations with unprecedented chances to obtain insights into customer preferences, industry trends, and emerging prospects. Future innovation management strategies should focus on leveraging the power of data analytics and AI to make educated decisions, personalise services, and predict future trends.
Innovative Sustainability	The convergence of DT and sustainability opens new possibilities for future innovation. Organisations might investigate ways to use digital technologies to create greener products, optimise supply networks, and reduce waste.
Ethical Considerations	As digital technologies pervade all aspects of business and society, ethical questions become increasingly important. Addressing ethical difficulties connected to data privacy, algorithmic biases, and the societal ramifications of technical breakthroughs are among the prospects in IM.

5.2 Benefits of the Research Study in the Management World

In this section, we explain the major benefits that our research study delivers to the management world, particularly in the context of innovation management and digital transformation. Our study's thoughts and conclusions have the potential to have a positive impact on organisations, practitioners, policymakers, and researchers interested in management.

Table 3. Benefits within Management

Making Informed Choices	One of the key benefits of our study is the availability of data-driven insights that can inform decision-making in innovation management. Managers may make informed decisions about the adoption of certain digital technologies, strategic alignment, and resource allocation by understanding the relationship between digital transformation and innovation outcomes. Informed decision-making increases the likelihood of successful innovation projects and assures that resources are invested where they can yield the greatest impact.
Strategic Alignment	Our findings emphasise the need of connecting innovation strategy with larger DT initiatives. The findings provide a framework for

	organisations to strategically integrate digital technologies into their innovation processes. This alignment enables organisations to maximise the value of their digital investments by fostering synergies between innovation and broader business objectives.
Competitive Advantage	Organisations that efficiently use digital technologies for IM gets competitive advantage in the market. Our research focuses on the major success variables that contribute to innovation excellence in the digital age. Implementing these qualities, such as strong leadership support and cross-functional teamwork, positions organisations to beat competitors by producing new goods and services faster and more efficiently.
Adaptation to Change	Adaptability is critical for survival in a continuously shifting digital context. Our research provides organisations with insights into the difficulties and opportunities presented by DT in IM. Firms may proactively adjust to changes, minimise risks, and grab new growth opportunities by knowing potential bottlenecks and ways to overcome.
Employee Empowerment	Our research emphasises the importance of cultivating innovative culture and upskilling personnel to survive in the digital age. Our findings provide organisations with evidence-based advice for fostering an innovative culture, equipping staff with digital skills, and encouraging continuous learning. Employees that are empowered contribute to innovation projects and promote organisational success.
Thought Leadership	This study adds to thought leadership by providing a comprehensive analysis of the impact of DT on IM. The study adds fresh knowledge and insights that can shape management conversations, policies, and practises. Firms that implement the conclusions of our research can position themselves as leaders in innovation management in the digital era.

In conclusion, our research study provides a variety of benefits to the management world, including informed decision-making, strategic alignment, competitive advantage, adaptation to change, employee empowerment, and thought leadership. These advantages collectively contribute to the progress of innovation management practises in the context of digital transformation, allowing organisations to thrive and succeed in an increasingly complex and dynamic business environment.

5.3 Research Gaps

The section explores the research gaps that appeared from our analysis and indicate topics that require further exploration. These study gaps indicate opportunities for future scholars to further our grasp of the complicated interaction between digital transformation and innovation management.

While that research gives insights into the immediate impact of digital transformation on innovation management, longitudinal studies are needed to investigate the long-term impacts. Future research should investigate how the integration of digital technology affects innovation results over time, considering characteristics like prolonged competitive advantage, constant adaptation, and organisational learning. Our study included a wide range of businesses, but there is room for more research into industry-specific peculiarities. Different industries may face different problems and opportunities when it comes to managing innovation during DT. Future research could delve into industry-specific dynamics to provide specialised recommendations for IM strategies.

The impact of cultural and organisational context on the impact of digital transformation on innovation management merits additional investigation. Different organisational cultures and structures may interact differently with digital technology, influencing innovation outcomes. Future research could investigate how cultural factors influence the adoption, deployment, and usefulness of digital technology in various contexts.

While the study focuses on the function of digital technologies, there is still potential for research into the human aspects of technology integration. Exploring how organisations support employee acceptance, engagement, and skill development in the context of digital change is critical. Future research could emphasise the significance of a human-centred approach to technology adoption and innovation management. The ethical and societal ramifications of digital transformation on innovation management remain unexplored. Future research could investigate the ethical issues surrounding data privacy, security, and the responsible use of developing technology. Understanding how organisations traverse these ethical concerns while promoting innovation is critical for guaranteeing sustainable and socially acceptable innovation practises. While research focused on innovation

performance indicators, future research might focus on building complete metrics to evaluate innovation outcomes in the digital age. These KPIs should include not only standard indicators like time to market and product quality, but also qualitative characteristics like customer experience, market disruption, and cultural effect. The involvement of ecosystem partners such as start-ups, suppliers, and customers in digital transformation and innovation management is an issue that needs more research. Future research might investigate how organisations work effectively with external partners to co-create and accelerate innovation in the digital ecosystem. Finally, the analysis found some research gaps that need to be filled to improve our understanding of the complex interplay between digital transformation and innovation management. Addressing these gaps leads to a more comprehensive and nuanced understanding of how organisations traverse the digital age successfully while supporting innovative excellence.

6 Conclusions and Future Research

The sections present the findings of a thorough investigation of the effect of digital transformation on innovation management. The study set out to investigate how innovation practices are affected by digital transformation, examine important digital tools used in innovation management, discuss opportunities and difficulties, and pinpoint key success factors. This study provides new insights into the complex interplay between innovation management and digital transformation through the synthesis of quantitative and qualitative findings.

Influence of DT on Innovation Management

The analysis highlights the significant impact that digital transformation has had on IM. The adoption of digital technologies has changed how innovation processes are carried out, allowing businesses to improve data-driven decision-making, speed product development, and streamline collaboration. The data shows a strong positive association between innovation outcomes and the extent of DT, with organizations that have undergone extensive digital transformation outperforming their counterparts across a range of innovation performance measures (Smith, et.al., 2020; Jones & Brown, 2019).

Key Digital Technologies in IM

The study reveals the crucial part that digital technologies play in managing innovation. Artificial intelligence (AI), the Internet of Things (IoT), cloud computing, and data analytics are just a few of the technologies that have completely changed how businesses develop, assess, and apply creative ideas. These technologies' data-driven insights have increased capacity for continuous product/service innovation, better efficiency, and improved consumer experiences (Chen, et.al., 2021; Patel & Davidson, 2018).

Challenges, Opportunities, and Critical Success Factors

Study examines the benefits and difficulties presented by digital transformation for managing innovation. Firms face challenges such as change aversion and data security worries, but benefits from the ability to work with variety of outside innovators. The study emphasizes the importance of key success elements such leadership backing, cross-functional cooperation, and alignment with strategic objectives. A strong positive association between excelling in these areas and achieving exceptional innovation performance is established empirically (Lee & Kim, 2017; Rajagopal & Narasimhan, 2019).

6.2 Future Research

The study opens several possibilities for additional inquiry and useful action. Future studies should examine into the effects of digital transformation on innovation management in particular industries. Industries including healthcare, banking, and manufacturing could display distinctive dynamics that call for specialized research (Gupta, et.al., 2022; Tan, et.al., 2020). Longitudinal research over a lengthy period sheds light on the long-term impacts of digital transformation on innovation outcomes. This would make it possible to comprehend how businesses transform due to technological improvements (Rogers, et.al., 2018; O'Reilly & Tushman, 2013). It's crucial to investigate methods for addressing data security issues while utilizing digital technologies for innovation. To navigate this difficulty, organizations require realistic advice and unlock the full potential of digital transformation (Johnson, et.al., 2019; Dhamija, et.al., 2021).

Further research into cross-industry collaboration best practices may lead to the discovery of novel methods for knowledge sharing and co-creation. Cross-industry collaborations can result in creative solutions and encourage a culture of ongoing innovation (Huston & Sakkab, 2006; Lakhani & Lifshitz-Assaf, 2020). Finally, this study sheds light on how digital technologies have revolutionized innovation management. We have offered useful insights into the ways organizations may utilize digital transformation to promote innovation and acquire a competitive edge through a rigorous analysis of both quantitative and qualitative data. The

results highlight the significance of strategic adaptability, adopting digital tools, and encouraging an innovative culture to prosper in the changing corporate world. The paper and its findings serve as a benchmark as organizations continue to negotiate the challenging landscape of digital transformation, helping to the advancement of innovation management theory and practice.

Declaration of Generative AI and AI-assisted Technologies in the Writing Process

During the preparation of this work, the author(s) utilized artificial intelligence (AI) technologies solely for the purpose of linguistic refinement and grammatical correction. Following the application of these tools, the author(s) comprehensively reviewed, verified, and edited the resulting text. The author(s) maintain full accountability and responsibility for the accuracy, integrity, and final content of the publication.

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The authors have no conflicts of interest to declare that are relevant to the content of this article.

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