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Assess factors influencing adoption of digital transformation among manufacturing sector firms in Nairobi region.

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ASSESS FACTORS INFLUENCING ADOPTION OF DIGITAL TRANSFORMATION AMONG MANUFACTURING SECTOR FIRMS IN NAIROBI REGION

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DECLARATION

I declare that this work has not been previously submitted and approved for the award of a degree by this or any other university. To the best of my knowledge and belief, this thesis contains no material previously published or written by another person except where due reference is made in the thesis itself.

KIPKIRUI F. MOI

Signature:  Date: …3rd May 2024……

APPROVAL

This thesis of Kipkirui F. Moi has been reviewed and approved for examination by:

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ABSTRACT

The rapid changes in technological advancement implications are for companies to keep up with the trends and exploit them to their advantage. The manufacturing sector has been signaled as one of the industries that have been slow in its digital transformation. Kenya's manufacturing sector has not been able to leverage digital transformation to enhance its performance and is behind in meeting its Vision 2030 goals. Therefore, this study assessed the influence of technological, organisational, and environmental factors on DT in Kenya's manufacturing firms in the Nairobi region. The study was anchored on the technology organisation and environment (TOE) Framework and Diffusion of Innovation (DOI) theory. A positivist research philosophy fits with the study's objective and is thus adopted. A descriptive correlational design is used as the study aims to describe the association between factors that may influence digital transformation. The target population was 725 firms from which a sample size of 176 was selected as the units of analysis. In each of the 176 firms, a senior manager involved in strategy implementation was purposively and conveniently sampled. The data was gathered using a Likert scale-based questionnaire that was checked for validity and reliability in a pilot study from which the internal consistency of items was assessed. The output indicated that technology, organisation, and environment factors together explained 47.5 % of the change in DT adoption in manufacturing firms and was significant at the 95 % confidence level. Independently, technological factors had a .577 positive and statistically significant effect on DT adoption. The study therefore concludes that increasing technological factors in manufacturing firms will contribute to an increase in DT adoption while organizational and environmental factors do not have any effects on DT adoption. the study recommends that manufacturing firms focus on using technology that has affords them a relative advantage over the existing technology.

Keywords: Digital transformation, Manufacturing, Technological, Organizational, Environmental factors.

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LIST OF ABBREVIATIONS AND ACRONYMS

AI	Artificial Intelligence
BETA	Bottom-Up Economic Transformation Agenda
CC	Cloud Computing
CIO	Chief Information Officer
CPPS	Cyber-Physical Production Systems
DT	Digital Transformation
DOI	Diffusion of Innovation Theory
DTA	Digital Transformation Adoption
EPZ	Export Processing Zone
GDP	Gross Domestic Product
GVA	Gross Value Added
HCI	Human-Computer-Interaction
ICT	Information Communication and Technology
IDC	Internet Data Center
IT	Information Technology
KAM	Kenya Association of Manufactures
KNBS	Kenya National Bureau of Statistics
LMICs	Low and Middle-Income Countries
NACSOTI	National Commission for Science, Technology, and Innovation
SMEs	Small and Medium Enterprises
SPSS	Statistical Package for the Social Sciences
SU-IERC	Strathmore University Institutional Ethics Review Committee
TOE	Technology-Organizational-Environmental

CHAPTER ONE
INTRODUCTION

1.1 Background information

The digital transformation (DT) phenomenon was present but has been hastened by the COVID-19-pandemic (Lia & Yang, 2021). An Internet Data Center (IDC) survey revealed that 67% of global top 1,000 businesses deemed DT as a significant strategy to develop and survive for modern enterprises. DT is acritical pattern for manufacturing firms as digitalization of the value chain has an impact on the entire company.

However, DT adoption in manufacturing firms remains marginal due to several factors. There is a skills gap of 20% to 40% in terms of DT in manufacturing firms while 64% organizations were not confident of the quality of staff to adopt DT (Peillon & Dubruc, 2019). A marginal number of manufacturing firms have adopted major digital technologies such as condition-based monitoring (18%) and asset tracking (13%) (Pathfindr, 2022).

The consensus among manufacturers across industries is that DT is a powerful tool that will help companies improve performance, respond to market challenges, meet the demands of their customers, and become more resilient and adaptable to the future (Fernández-Rovira *et al.,* 2020). Manufacturing firms' successful adoption of DT can improve forecasting accuracy by 85%, reducing machine downtimes from 30% to 50%, increase labour productivity from 15% to 30%, and throughput increases from 10% to 30% (Mckinsey & Company, 2022).

A global survey reported that less than one to five DT efforts were successful and a mere 18% out of seventy companies had a competent DT process. However, 69 % of DT projects fail. That organizations continue to invest in projects that fail at this rate is evidence of the high level of strategic importance that is attributed to them (Abdallah, Shehab, & Al-Ashaab, 2021).

Several scholars (Dremel, 2017; Vogelsang, Packmohr, & Hoppe, 2019; Hausberg *et al.,* 2019; Singh, Sharma, & Dhir, 2021) admit that three is need for more research on DT acceptance so as to promote the growth of the manufacturing sector. The fast technical developments of DT among manufacturing firms have been a hindrance to the realization of DT.

Digital transformation is using available digital technologies that allow organisations to cross-functional generation of value and shape their operations. These innovations include Cyber-Physical Production Systems (CPPS), the Internet of Things (IoT), Cloud Computing (CC), and Human-Computer-Interaction (HCI). These technologies can allow manufacturing companies to be smart or intelligent factories. Industrie 4.0 is used in Germany to describe manufacturing DT while the term Industrial Internet is used in the United States (Vogelsang *et al.,* 2019).

According to Bartodziej (2017) and Fremont (2021), the common term for DT in companies among researchers has been Industry 4.0 and it is a pattern that affects all industries in the new DT. Yet, the realization of Industry 4.0 presents several challenges for the manufacturing sector. Identifying factors that affect DT realization can provide clarity for gains to be made from DT. Much of empirical evidence on adoption of DT in organisations can be traced to financial institutions, marketing, and education sectors among others (Yildrim & Demirbag, 2020). However, in the manufacturing sector, Manavalan *et al.,* (2019) found that fewer firms have tried to implement DT while others are not ready for the transformation.

Yildrim and Demirbag (2020) points to lack of research on present trends in terms of DT and is a significant factor contributing to unpreparedness of firms to adopt DT. Banga and te Velde (2020) suggested that DT can be a means to reduce economic losses from the effects of the COVID-19 pandemic, but these needs targeted and inclusive DT policies in low and middle-income countries (LMICs). This implies that a DT strategy should be at the center of overcoming challenges that face firms in the manufacturing sector.

1.1.1 Overview of manufacturing sector in Kenya

The importance of manufacturing sector is represented in the bottom-up economic transformation agenda (BETA) value chain approach adopted will enable it undertake an analysis of the national economy from a competitiveness perspective and address the challenges that hinder the growth of the manufacturing Sector. The ambition is to raise contribution of the manufacturing sector to 20% of Gross Domestic Product (GDP) as envisioned in Vision 2030 (Kenya Association of Manufactures [KAM] 2022). The current contribution to GDP stands at 7.6% and are at risk due to the

COVID-19 pandemic, digitalization, and globalization signifying a proportionate reduction from 9.3% in 2016 (KAM, 2022). In 2023, the manufacturing sector contribution to GDP was 7.8% (Kenya National Bureau of Statistics [KNBS], 2023).

Manufacturing has an important role in economic development and growth via its contribution to creating employment, national output, and alleviating poverty. The more economies become industrialized, their output and employment are expected to increase rapidly and this will consequently lead to advanced levels of development and the services sector will become more significant resulting to structural variations in innovation and development in the manufacturing sector (Santacreu & Zhu, 2018).

The labour market is shaped by the retail and wholesale subsectors which are part of the manufacturing sector as they account for 32% of level entry jobs for the youth. Its manufacturing sector performance has not been impressive and this is manifested in its slow rate of growth and static number of individuals employed over time. The sector has a growth of 3% compared to the national target of 10% in the Vision 2030 and this has corresponded to a decline from 9.4 % in 2015 to 7.5% in 2019 in terms of its contribution to GDP (KNBS, 2020). Besides low growth rates, productivity of the sector is also declining (Shibia, 2021).

This underperformance has been associated to its inefficient production driven by use of obsolete technologies, prohibitive cost of energy, counterfeit products, and limited access to credit. This means that technological innovation could be an asset to the sector to improve its value addition, efficient processing, quality products, plant equipment for energy generation as spelled out in the national research priority for Science, Technology, and Innovation (ST&I) (Government of Kenya, 2018).

Therefore, the government has developed special economic zones in Machakos, Kisumu, and Naivasha to reduce its cost of production via taxes and other rewards such as green and land channel expatriates (Government of Kenya, 2018). The 40% procurement directive and Buy Kenya Build Kenya (BKBK) initiative are also critical in the promotion of local product consumptions. Other initiatives for the sector have been the Konza Technopolis that aims to be a leader in innovation and research ecosystem.

1.1.2 Challenges of technology adoption in the Kenyan manufacturing sector

The declining manufacturing sector productivity remains a concern with only 24% of the firms having shown evidence to undertaking research and development (R&D) investments and the aggregate R&D investment is approximately at 0.8 % of GDP that is less by 1 % target that has been set by the African Union Agenda 2063 and 2 % target set by the Kenyan government (Shibia, 2021).

The 2020 Industrial Development Report, the share of high and medium technology manufacturing in overall manufacturing GDP for Kenya only stands at 15 % which far less compared with other national economies including India (43%), Korea (63%), Nigeria (33%), Egypt (18%), South Africa (24%), Republic of Malaysia (44%), Thailand (41%), and China (41%) indicating its low performance in terms of technology (Shibia, 2021).

Mose, Njihia, and Magutu (2013) found that use of outdated IT equipment that needs to be changed, high cost of equipment that is compatible, change resistance, adaptation costs, irregular use by staff, lack of finances, lack of top management support, and lack of internet access among smaller suppliers in adoption of e-procurement. Anitah *et al.* (2019) found that L'Oréal and Unilever faced a myriad of challenges in implementing industry 4.0 technologies including high costs of implementation, inadequate infrastructure, employee resistance, and high cost of training. Additionally, most of the technologies were incompatible with present systems and it made it difficult for staff to operate the entire system. Consequently, adapting industry 4.0 is low in the two companies.

Despite the benefits of these engineering solutions, Institution of Engineers of Kenya (2023) revealed there were several challenges that must be overcome to promote widespread adoption of technologies in Kenya's manufacturing sector. These included high costs, skilled labour shortage, public opposition, and regulatory limitations. Okumu (2016) revealed that power costs, production costs, repairs, capital, but technology adoption challenges were more significant.

1.2 Problem statement

The manufacturing sector's performance has dwindled in terms of its output and employment (KNBS, 2022). Nevertheless, manufacturing firms that successfully

navigate DT could see forecasting accuracy increases of up to 85% machine downtime reductions of 30% to 50% throughput increases of 10% to 30% and labor productivity improvements ranging from 15% to 30% (Mckinsey & Company, 2022). Yet, less than 1 to 5 DT attempts succeed; moreover, only 18% of 70 manufacturing firms had a competent DT process and 69 % of DT projects totally failed.

This evidence of manufacturing firms investing in DT projects that fail indicates the high level of strategic importance that is attributed to success of adoption (Abdallah *et al., 2021*; Lia & Yang, 2021). Several scholars (Dremel, 2017; Vogelsang, Packmohr, & Hoppe, 2019; Hausberg *et al.*, 2019; Singh, Sharma, & Dhir, 2021) admit that there is need for research on DT adoption factors to drive the topic for the manufacturing industry forward.

Domestic manufacturing firms are struggling in implementing a DT strategy which is needed if the industry is to overcome its present challenges (Banga & te Velde, 2018; Banga & te Velde, 2020). Yet, a plethora of studies on DT have been done in the banking sector (Kinyanjui, 2020), small and medium enterprises (SMEs) (Owino & Waema, 2020), service sector (Njagi & Ndavula, 2020) while there is less academic attention in the manufacturing sector. Wanjihia (2021) found that DT strategies positively influenced performance of paint manufacturers; however, there is less evidence of studies on DT adoption factors among manufacturing firms.

1.3 Research aim and objectives.

1.3.1 Research Aim

The research aimed to assess factors influencing successful adoption of digital transformation among manufacturing sector firms in Kenya.

1.3.2 Research Objectives

The study was guided by these specific objectives:

i. To establish relationship between technological factors and adoption of digital transformation in the manufacturing sector.
ii. To determine the relationship between organisational factors and adoption of digital transformation in the manufacturing sector.
iii. To assess the relationship between environmental factors and adoption of digital transformation in the manufacturing sector.

1.4 Research Questions

The study aimed to answer these research questions.

i. What is the relationship between technological factors and adoption of digital transformation in the manufacturing sector?
ii. What is the relationship between organisational factors and adoption of digital transformation in the manufacturing sector?
iii. What is the relationship between environmental factors and adoption of digital transformation in the manufacturing sector?

1.5 Scope of the study

The study assessed factors contributing to adoption of DT in manufacturing companies in the Nairobi Region; these factors were limited to technological, organisational, and environmental factors. The sample was selected from manufacturing firms registered with the Kenya Association Manufacturers (KAM) implying that those not registered with KAM were not included into the study. The study was limited to collecting quantitative data via a structured questionnaire administered to senior management staff from each firm. The study was conducted from March 2023 to February 2024.

1.6 Significance of the study

As specified below, the findings were intended to benefit different stakeholders in the following groups.

1.6.1 Policy and decision makers

There exists a gap between the access and use of digital technology in the manufacturing sector as compared to developed economies as benefits from DT are not yet fully realized. One of the means to further DT adoption is through policy formulation and creating policies that supports DT in manufacturing. In this case, the findings will be important to policy and decision makers to design policies that create a digitally enabling environment. The recommendations are based on policy actions and if these are adopted are likely to contribute to DT realization in the industry.

1.6.2 Senior manufacturing practitioners

Updating technology in an enterprise is a fraction of DT but it is more of upgrading the strategic thinking that can empower the capturing of new opportunities in the digital world and bolster their strategic perspective. The top management of manufacturing

firms may benefit from this study as it appraised determinants of DT from the technology, human behaviour, organisation and environment perspective which provide a holistic picture on how DT can be realized for each entity and how internal capabilities are used to make sure that DT in manufacturing process is attained.

1.6.3 Theoretical contribution

There is extant literature on DT in the manufacturing sector, but the bulk of these studies are in the Western and Asian context and feature less in Kenya's upper-middle income economy. Thus, findings may hopefully spur further interest from academia on DT in the manufacturing sector while it contributed to existing knowledge on the TOE theory. Based on the findings, the technological component of the TOE framework was confirmed as critical in the DT of manufacturing firms in Kenya. The findings on the relative advantage provided by DT were confirmed as respondents agreed that their DT would be more Useful, Convenience, Reliable, and Superior to the present technologies used in the sector.

CHAPTER TWO
LITERATURE REVIEW

2.0 Introduction

This chapter outlines the theoretical framework of the study, the empirical review of studies presented thematically according to the research objectives. A summary of the literature review is done, and research gaps are identified, and the conceptual framework is proposed. The operationalization of variables is also presented in this chapter.

2.1 Theoretical Literature

Theoretical frameworks are logically connected and developed premised, and concepts borrowed from several or one theory created to support a study. It is used to define concepts and theories providing a research foundation and use them in a logical connection and associate these concepts to research (Lederman & Lederman, 2015).

2.1.1 Technology-Organization-Environment Framework

The Technology Organizational -Environmental (TOE) framework is widely used in studying IT adoption in organizations and was developed by (Tornatzky & Fleischer, 1990). Companies regard it as a solid theoretical basis when adopting various technologies. The framework is representative of one part of adopting technology and implementation of these innovations; it is a theory that explains the 3 technological, environmental, and organizational factors postulated to influence DT adoption.

The technological factors consist of all technology innovations useful to the organization and these are utilized in a company as well as those that are in the marketplace but are not yet in utilization (Baker, 2012). The technologies that exist in a company are critical in the process of adoption as they set a wider scope limit of technological change that a company can undertake. The organizational factors consist of the resources and characteristics of a company and these include associating structures among staff, communication processes within a company, and the number of resources. The environmental factors consist of the industry or sector structure, the absence and presence of technology service providers, and the regulatory environment (Baker, 2012).

Moreover, the framework has been widely applicable and has a good exploratory power in examining a wide range of technologies (Zhu, Dong, Xu, & Kraemer, 2016). The framework has been adequate in explaining and predicting the use of any technology (Fu & Lee, 2021). Therefore, the reliable empirical and solid theoretical base is evident and is essential in studying the DT adoption. Different scholars (van Dyk & Van Belle, 2019; Gašperlin, Pucihar, & Borštnar, 2019) have also adopted TOE framework in examining DT of firms. In this study, the framework will be to examine how technological, organizational, and environmental factors independently and how these contribute or militate successful DT among manufacturing firms in Nairobi region of Kenya.

The TOE is stronger than other behavioural models as it has an effect on the external and internal dimensions of the organisation in terms of the technology, organization, and environment (Nguyen, Le, & Thi, 2022). Technological dimension focuses on the current technologies and the available technologies in the market. Organizational dimension focuses on the features of a company including its resources, size, and scope. The environmental dimension focus is on the external environment in which a firm operates including its rivals, industry norms, and government. Using these criteria, respondents were able to rank these factors based on their company's unique experience.

2.1.2 Diffusion of Innovation Theory

Rogers (1962) proposed the Diffusion of Innovation (DOI) theory which aims to explain how new technologies or ideas are shared in society and is a theory of acceptance. The theory defines innovation as accepting objects, practices, and ideas that an organisation and person identify as new (Rogers, 2003). The level of acceptance of an innovation is dependent on how the organisation or person identify the features of innovation through a series of mental processes in forming an attitude and decide to accept it. The DOI presents five characteristic variables for innovation: relative advantage, compatibility, complexity, trialability, and observability (Rogers, 2003).

Relative advantage is the description for considering the profitability of an innovation in comparison to the existing innovation. Compatibility describes to what degree an innovation matches the person's values and lower matches make it difficult to accept the technology. Complexity is the extent of difficulty in using an innovative technology

and trialability explains the chance that individuals have to use it before accepting the actual innovation. Lastly, observation is the degree to which an innovation is easy to use and its consequences (Ghobakhloo *et al.,* 2022).

Based on these constructs, DOI theory was used to measure DT using the relative advantage dimension. The component of relative advantage has been used in earlier studies (Oh *et al.,* 2022; Ghobakhloo *et al.,* 2022) to measure DT adoption in firms. The idea is that DT will be reliable, convenient, useful, and superior and this gives it its relative advantage. A high relative advantage means there is a high chance of accepting DT as it is perceived to provide a value that is not present in existing technologies, the relative benefits increase.

Theories on innovation diffusion was preferred as they support other frameworks (TOE) that are adapted in strategic management Steiber et al. (2020) provided evidence to show that studies applying DOI on their digital DT of firms were able to show those factors that have a positive and negative can have an effect on the DT process. Beyond identifying factors of DT, the DOI is able to capture the quality of the DT adopted by manufacturing firms. The DOI also shows how diffusion of DT can be assessed in the organisational context but also on the manufacturing sector as a whole (Steiber et al., 2020). Based on this merit, the DOI was introduced as a theory to support the TOE framework.

2.2 Empirical literature

In this subsection, the literature review presented is based on past studies on factors influencing of successful DT, strategies adopted by manufacturing firms where research gaps are identified, and the contribution of this study is also explained.

2.2.1 Technological factors and digital transformation adoption

Oh *et al.,* (2022) examined determinants for successful DT distinguishing independent variables into 2 groups of behavioral factors and innovative characteristics. Successful DT adoption in the selected firms was measured by social acceptance, personal acceptance, and DT acceptance attitude constructs. Innovative characteristics and planned behavioural factors positively contributed on DT acceptance attitude and that DT acceptance attitude had positive effects on personal acceptance of DT. The findings

on significance of behavioral factors speak to the importance of organizational and technological factors on successful DT for manufacturing firms.

In their study, Eluekezi and Tuncay (2021) sought to identify factors leading to success and unsuccessfulness of DT adoption among manufacturing firms. The technology factors considered in the study included of technology being simple, easy to use, quite affordable, and time effective. The technological factors were critical in contributing to successful DT in manufacturing firms. This study however adopted descriptive analysis and did not use inferential statistics to determine direction and size of effect of variables. This study will be important to the present study as it focused on manufacturing sector and will contribute to the design of the questionnaire in terms of technological constructs to be adopted.

Showing interest in the importance of DT in a post COVID-19, Tripathi (2021) conducted a study to examine determinants of DT in business by developing a conceptual framework categorizing them into human, organizational and technology-related factors. In terms of readiness, DT was determined by 3 factors: consumer digital readiness, company digital readiness, and global digital infrastructure. Further, cybersecurity was found as a negative factor on the DT journey of companies during and after COVID-19 pandemic. The study was limited to literature review and did not examine the relationships between the variables. The study was conducted post-COVID 19, a period which most firms entered into so as to continue operations under the lockdown period. This review will be important in identifying constructs for technological factors and their influence on DT adoption.

In another study around COVID-19 era in Ghana, Ofosu-Ampong (2021) examined strategies and determinants of digital transformation adoption (DTA) adopting hedonic motivation, price value, technology readiness, and inherent innovativeness as predictor variables. Mixed-method approach was adopted collecting information from 40 managers using a structured questionnaire. The findings indicated that price value, technology readiness, and inherent innovativeness determined DTA. The findings may not be inferred to manufacturing sector as the banking sector has different operations in comparison. Nevertheless, the findings are important in post COVID-19 as more firms have appreciated the importance of DT.

Kwon and Park (2017) did an investigation into critical factors on firm's DT capacity focusing on the influence of technology excellence measured by information technology (IT) expertise, strategic role of IT as predictor variable and DT capacity as the outcome variable. The analysis revealed technological factors were relevant in IT governance, strategic role of IT, acquiring new technology, and experience in using it. Its focus was not on manufacturing firms; however, the study's findings will be important in discussions of factors that do contribute positively and negatively on DT adoption.

2.2.2 Organisational factors and digital transformation adoption

Salume, Cintra, and da Silva (2022) research in Brazil investigated driving factors for DT among consultants with profession in IT, communication, management, electrical engineering, computer science, and software engineering with most from service companies. The analysis revealed that key dimensions emerged that were drivers of DT were organizational structure and culture as well as organisational leadership. The results would not be generalizable to manufacturing firms as the focus was on service industry. The study did show the importance of organizational factors in relation to structure and culture of a firm and how these can hinder or promote DT adoption.

Fu and Lee (2021) investigated determinants of DT in a sample of service and manufacturing firms where independent variables consisted of resource readiness and management support while DT was measured by three statements on continuous use of DT. Management support and resource readiness and had positive effects on DT adoption. These findings would not be applicable to manufacturing firms as service firms were included; however, importance of organizational factors on DT adoption was evident and this is important for construction of items for the questionnaire.

Gašperlin *et al.* (2019) examined influencing factors of DT in adopting a literature review methodology in Slovenia. The factors considered were organisation, technological, and environmental factors. The results of the conducted analysis showed that organizational factors (strategy, management support, organization characteristics, collaboration and organizational culture) influenced DT in SMEs. The sample was limited to SMEs, and this means findings may not be generalizable to large

manufacturing firms. However, these findings are useful in constructing organizational factors in the questionnaire.

In another study on SMEs, Ab Wahid and Aziidah (2021) investigated factors affecting DT adoption which was grouped into: technology advancement, competitive pressure, environmental, and cost minimization among SMEs. There existed a relationship between competitive pressure and DT adoption and this was observed by encouragement to switch to DT due to an increasing consumer base in online shopping. The findings from this study are of importance for describing the environmental factors that contribute towards successful DT implementation.

Zhang, Xu, and Ma (2022) aimed to identify determinants of DT adoption and DT their interaction selecting environment factors as their independent variable which was measured by government support and partnerships. The DT variable was measured using three items on extent of DT use. Government support influenced DT by promoting design and implementation in SMEs by having an environment of advice, funding, and legislative framework. The partnerships also contributed to success of DT adoption in companies that show agility in creating partnerships with customers and across industries. The study was limited to SMEs and these characteristics although important in designing the DT adoption section of the questionnaire may not be generalizable to large firms.

In their study, Ano and Bent (2021) explored cultural and human resources influenced design and implementation of 5 family businesses digital strategy in France by adopting a qualitative approach. Thematic analysis showed that psychological and cultural determinants that had the ability for synergetic and positive outcomes in adopting a digital strategy. The importance of organizational factors under the cultural aspect and this will be captured in the questionnaire. However, this study was limited to family-owned business.

Martín-Martín, García, and Romero (2022) aimed to identify determinants of DT process focusing on characteristics of the businesses. The indicator for business characteristics were number of places and establishments, price of services, involvement in corporate groups, restaurant chains, and employees' education and training. DT was measured by ICT acquisition and new software and use of digital

platforms and social networks. Company characteristics studied influenced digitalization of restaurants. The research was limited to DT process in companies and not its adoption. However, the study shows the importance of technological factors in achieving successful adoption of DT which will be used in design of data collection instrument.

Using a systematic literature review, Nuraan and Osden (2017) explored factors influencing DT in retail supply chain in a sample of articles published from 2010-2019. The organisational factors considered were: organisational readiness, resource capacity, technical skills, firm size, management competency, and strategic objectives. The results revealed that resource capacity, strategic objectives, technical skill, management competency, firm size, and organisational readiness respectively contributed to DTA in retail supply chain.

In a multi-country study, Zhu *et al.* (2016) adopted a centralized model to examine determinants of post-adoption stage of DT specifying 4 innovation characteristics: compatibility, costs, relative advantage, and security concern. The contextual factors (competitive pressure, technology competence, and partner readiness) significantly influenced DTA while size had a negative effect. The study investigated DT post-adoption while identifying technological and environmental factors that are needed to design the questionnaire.

Wang and Su (2021) conducted a study on driving factors of DT for heavy industrial manufacturing enterprises exploring DT empowered by artificial intelligence (AI). The multi-case study method was adopted for the research and included 3 leading manufacturing enterprises. The environmental factors were summarized in three areas: institutional environment, economic, social and cultural aspects. The findings established that policy and market driven factors had significant effects on DTA. These findings are significant to the present study as the sample was manufacturing firms and the description of environmental factors and organizational factors will be adopted in the design of the questionnaire.

2.2.3 Environmental factors and digital transformation adoption

van Dyk and Van Belle (2019) undertook research on determinants of DTA adoption using a case study approach selecting a large retail company with 4,950 stores in 12

African countries. Thematic analysis revealed which environmental factors identified to influence DT were customers, competition/competitive advantage, time to market, and connectivity were emphasized as important. This result was limited to retail sector and a case study design which means the findings were specific to this firm and may not be applicable to other studies.

Strategies of DT have several features in common and these can be grouped into technology utilisation, creating value, financial aspects, and structural changes (Matt, Hess, & Benlian, 2015). Mitroulis and Kitsios (2019) proposed a conceptual model of the DT strategy consisting of use of technology, changes in value creation, financial aspect, change in customer experience, and structure. Any DT strategy should comprise of these dimensions in a company to be successful (Mitroulis & Kitsios, 2019). The study shows the importance of the 4 strategies in any successful DT adoption in a company as well as the changes in structure as a dimension to be included in DT adoption.

Using SME manufacturing firms, Karltorp (2017) explored key drivers for DT, opportunities in DT, and challenges experienced in DT process. SMEs were found to pursue 3 major DT opportunities, including: improved operational efficiency, customer relationships, and improved products manufacturing. The study was conducted among manufacturing firms, this study will show the opportunities for manufacturing firms to adopt DT are a consequence in any successful DT adoption for manufacturing farms.

Peter, Kraft and Lindeque (2020) sought to understand DT descriptions from a sample of 2,590 participants from 1,854 companies from which more than 4,200 descriptions of DT were provided and grouped under 7 strategic action fields (SAFs). The external perspective presented the organisational and market value creation including greater focusing on customers, using cloud data, identifying and applying new technologies associated to digital business development. The internal perspective consisted of digital leadership, use of new technologies, cloud computing, and process engineering. The study points to the importance of both external and internal opportunities for DT adoption for companies and this is significant in describing strategies used by manufacturing firms in Nairobi region of Kenya.

In a sample of SMEs, Trenkle (2019) examined the design of SMEs Dt strategy by proposing a framework with 4 strategic components: technology use, financial aspects, value creation changes, and organizational changes. The findings revealed that DT efforts are not different and all these categories serve all kind of firms. This study confirmed the importance of the 4 dimensions of successful DT adoption in a firm.

Mahmood, Khan, and Khan (2019) used literature to identify challenges, issues, and impacts either positive or negative of DT adoption using a sample of articles published from 2008 to 2018. The findings reflected the relevance to develop a DT strategy effective in companies. The proactive strategy includes process, people, technology, and their importance in their alignment in a company was critical. The study highlighted importance of taking a proactive strategy to be successful in DT adoption and this will be important to analyze DT strategies for manufacturing firms in Kenya.

2.5 Summary and literature reviewed gaps.

Table 2.1 is a summary of the empirical literature review where findings for each study are shown along with a research gap identified in these studies and the gap that the present study will fill. A column on the source of literature, the main topic, main findings, research gaps established and the gap that this study will fill are summarized below.

Table 2.1: Summary and literature reviewed gaps

Authors	Topics	Methodology	Main findings	Gaps	Study filling gap
Oh *et al.* (2022)	Determinants for Successful digital Transformation	The research was limited to a descriptive survey	Innovative features positively influenced DTA acceptance attitudes	The study was limited to innovative factors of technology	The study will go beyond innovation and include other technology dimensions
Eluekezi & Tuncay (2021)	Determinants of DT in manufacturing companies	The research adopted a desk/literature review design	Technology factors were critical in contributing to successful DT in manufacturing	A systematic literature review was used	A descriptive correlational design will be adopted to examine relationship among variables
Tripathi (2021)	Determinants of DT in post-COVID-19	The research adopted a desk/literature review design	Cybersecurity emerged negatively influenced DT during and after COVID-19 pandemic	The study was limited to literature review and did not examine relationship between variables.	The present study adopts a descriptive correlational design to empirically measure relationships between variables
Kwon & Park (2017)	Critical factors on company DT capacity in Korea	The research was limited to a case study	Technological factors considered were found to have an Influence on DT capacity	DT capacity was the outcome variable	The present study focuses on DTA as a dependent variable
Ofosu-Ampong (2021)	Determinants, Barriers, and Strategies of DTA in an emerging economy during COVID-19	The study was limited to descriptive research design	Technology readiness and inherent innovativeness significantly influenced DTA	The study was conducted among a sample of commercial banks	The present study will be limited to manufacturing firms
Fu & Lee (2021)	Determinants of DT among Chinese companies	A descriptive research design was used	It was revealed that resource readiness and management	The study included service firms in the sample	The present study will be limited to manufacturing firms

			support positively contributed to DTA		
Gašperlin *et al.* (2019)	Influencing Factors of DT in SMEs – Literature Review	The study was limited to literature review/desk research	Organizational factors influence DT in SMEs	SMEs was the focus of this research; the study also used literature review	This study focuses on small and large manufacturing firms
Ab Wahid & Aziidah (2021)	Factors affecting the adoption of DT among SMEs in Malaysia	The research was limited to descriptive research	Competitive pressure had a positive effect on DTA among SMEs	The sample of the study was limited to SMEs	This study focuses on small and large manufacturing firms
Ano & Bent (2021)	Human factors influencing DT strategy of family businesses in France	The study was limited to a qualitative research design	Change management, emotional attachment, entrepreneurial legacy, personalized involvement influenced firm digital strategy	The study adopted a qualitative research design	The study will adopt a quantitative strategy to determine relationship among variables
Salume *et al.* (2022)	Determinants DT and their effects during the COVID-19 Pandemic	The study was limited to a qualitative research design	Key dimensions emerged that were drivers of DT were organizational structure and culture as well as organisational leadership	The study adopted a qualitative research design	The study will adopt a quantitative strategy to determine relationship among variables
Martín-Martín *et al.* (2022)	Determinants of DT in the Restaurant Industry	The research was descriptive in nature	Number of establishments, corporate group membership, and staff educational level influenced DT process	The study was conducted in the services sector	This study focuses on the manufacturing sector firms.

Nuraan & Osden (2017)	Factors Affecting DT in the Retail Supply Chain	The research adopted a desk/literature review design	Resource capacity, strategic objectives, technical skill, management competency, firm size, and organisational readiness respectively contributed to DT adoption	The study was limited to a systematic literature review	This study is empirical and collects information for measuring relationship among variables
Zhu *et al.* (2016)	Determinants of post-adoption DT of European Companies	The study adopted a comparative research design	Technology competence, partner readiness, and competitive pressure significantly influenced enterprise DT while organisation size had a negative effect	The sample consisted of various industries and findings may not be generalizable to manufacturing	This study exclusively looks at manufacturing firms
Wang & Su (2021)	Driving factors of DT for manufacturing Enterprises in China	The research was limited to a qualitative approach	The findings established that policy and market driven factors had a significant effect on DT adoption	Qualitative methods were used and the sample was limited to interviews	The study uses a relatively large sample of respondents to adopt quantitative methods
Zhang, *et al.* (2022)	Successful Factors of DT in SMEs		Government support and partnerships contributed to success of DT in an organization	The sample of the study was limited to SMEs	This study focuses on small and large manufacturing firms
van Dyk & Van Belle (2019)	Factors Influencing intended Adoption of DT in South Africa	The research was limited to a case study design	Customers, competition, time to market, and connectivity were emphasized as important contributors to DT	A case study approach was used	A descriptive correlational design will be used in this study
Mitroulis &	Digital Transformation	The research adopted a	DT strategy should consist of technology use, financial	The study was based on desk research and was aimed at	This study will utilise descriptive correlation design to collect and

Kitsios (2019)	Strategy: a literature review	desk/literature review design	aspect, change in customer experience, value creation and structure	developing a conceptual model for DTA	analyse data to make inferences
Karltorp (2017)	DT strategies among Swedish manufacturing industry	The research was limited to a case study design	DT opportunities include: improved operational efficiency, customer relationships, and product and manufacturing	A case study approach was adopted focusing on one firm	This study is empirical and collects information for measuring relationship among variables from several firms
Peter *et al.* (2020)	Strategic action fields of DT among Swiss SMEs and large enterprises	The explorative research design was adopted	DT strategy was either internal or external	The study was explorative in nature	This study aims to utilise a descriptive correlation design to collect and analyse data to make inferences
Trenkle (2019)	A framework for formulating a DT strategy in SMEs	The research was limited to a case study design	DT strategies consisted of: use of technologies, changes in value creation, and financial aspects	A case-based research approach was adopted	This study aims to utilise a descriptive correlation design to collect and analyse data to make inferences
Mahmood *et al.* (2019)	Digital organizational transformation issues, challenges and impact	The research adopted a desk/literature review design	The proactive strategy of DT involves people, process, technology, and alignment in the organization	A Literature review helped in identifying the challenges of DT	A descriptive correlation design to collect and analyse data will be made

Source: Researcher (2024)

2.5 Conceptual framework

The empirical review in section 2.3 revealed that there are several indicators and dimensions that have been used to measure the study's variable and these are presented in Figure 2.1. The determinants of DT adoption considered in this study were technology, organizational and environmental factors. The internal factors such as structure, culture and norms of a firm can influence DT adoption, and these are organizational factors. Externally, competition, industry trends, customer demands and regulators can hinder or promote DT adoption, and these are the environmental factors.

Strategies for adoption of DT are explained by the purpose for which a firm adopts technology and how this is exploited within the organization to achieve its objectives. Value creation is another dimension for which a firm may adopt DT to increase value in manufacturing by innovation and product development. Structural change in an organization is also another strategy that is used to explain DT as firms seek more horizontal communication and feedback chains to create knowledge for the organization. The financial aspect of DT is a motivating and binding force as low financial pressures on core businesses may lessen the need for acting to transform digitally while firms under financial pressure may not have the means to pay for DT.

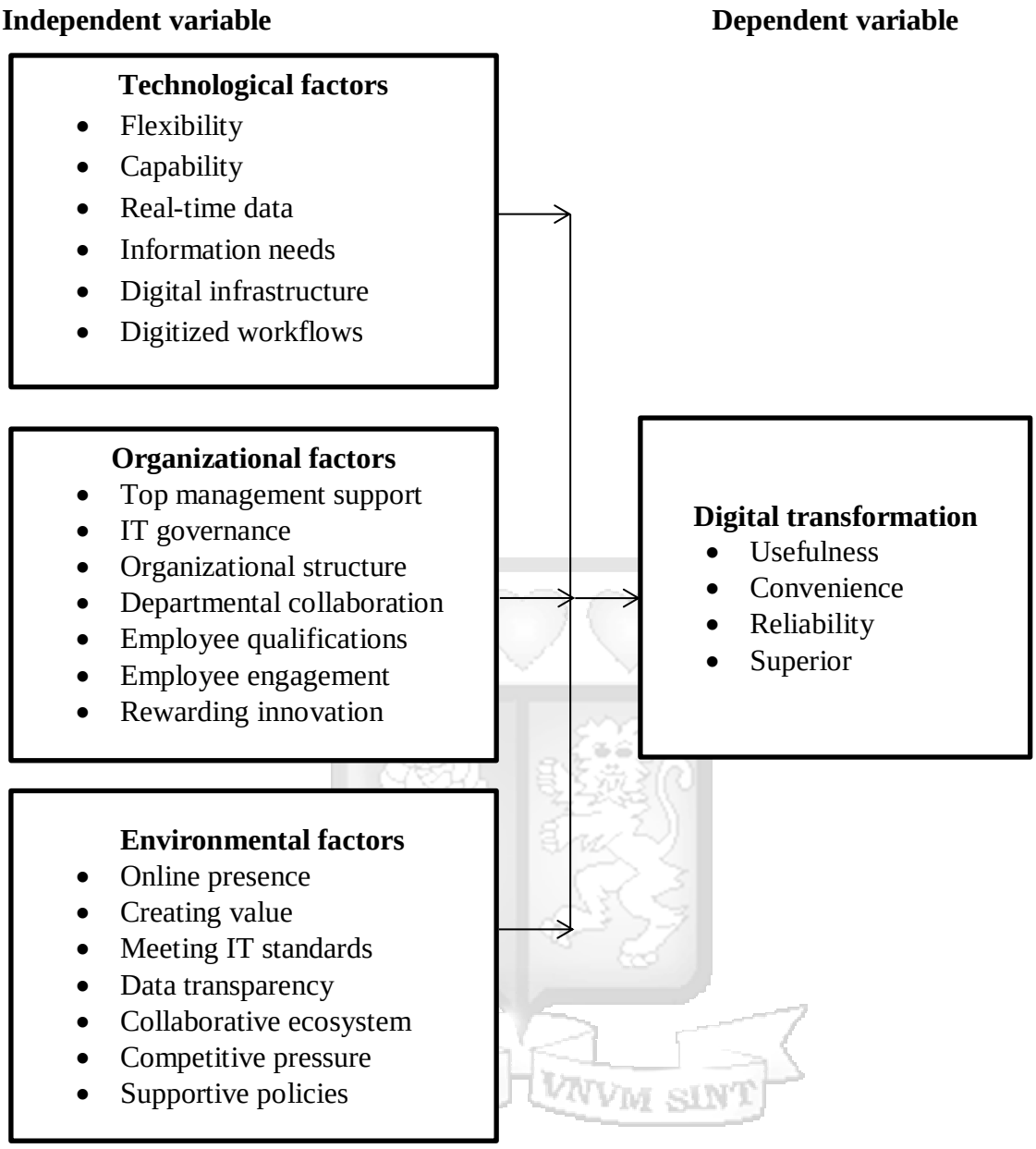

Figure 2.1: Proposed conceptual framework.
Source: Researcher (2024)

Table 2.2 variable column indicates the technology, organizational and environmental factors are selected as the independent variables. These indicators will be measured on a 5 -point Likert scale using Vogelsang *et al.* (2018; 2019) model which was created after an extensive review of literature on DT among manufacturing firms. DT was measured using Rogers (2003) and Oh *et al.*, (2022) criteria of usefulness, reliability, convenience, and superiority.

Table 2.2: **Operationalization of variables**

Variables	Sub-variables	Indicators	Source
DT adoption factors	Technological factors	• Flexibility • Capability • Real-time data • Information needs • Digital infrastructure • Digitized workflows	Vogelsang *et al.*, (2018); Vogelsang *et al.*, (2019).
	Organisational factors	• Top management support • IT governance • Organizational structure • Departmental collaboration • Employee qualifications • Employee engagement • Rewarding innovation	Vogelsang *et al.*, (2018); Vogelsang *et al.*, (2019).
	Environmental factors	• Online presence • Creating value • Meeting IT standards • Data transparency • Collaborative ecosystem • Competitive pressure • Supportive policies	Vogelsang *et al.*, (2018); Vogelsang *et al.*, (2019)
Digital transformation	(Dependent Variable)	• Usefulness • Reliability • Convenience • Superiority	Rogers (2003); Oh *et al.* (2022)

Source: Researcher (2024)

2.6 Chapter summary

This chapter presented its theoretical framework, factors inhibiting and promoting digital technologies in the sector, summary of literature review and research gaps. The chapter also presented the proposed conceptual framework and the operationalization of variables.

CHAPTER THREE
RESEARCH METHOD

3.0 Introduction

This chapter outlines the positivism as the preferred research philosophy explaining the rationale for selecting descriptive correlation as the preffered research design, targeted population and sampling techniques, instrumentation, research quality, data analysis, and ethical considerations.

3.1 Research philosophy

The positivist paradigm proposed by french philosopher, August Comte was used. According to Mellon (1987), reasoning and observation are the most critical approaches to understand human behaviour and true knolwedge based on experience and this can be attained by experiment and observation (Antwi & Hamza, 2015). A positivist assumes that reality is objective and can be measured using components which are independent of the instruments used and researcher. Moreover, knowledge is quantifable and objective (Rehman & Alharthi, 2016).

A positivist uses scientific approaches and systemize the generation of knowledge with the assistance of quantification to develop precision in describing parameters and the association among them. Positvism is motivated by uncovering truth and sharing it in empirical means (Antwi & Hamza, 2015). These features of the positivist philosophy make it suitable as the present research uses observation of relationship between variables by collecting information from respondents who have experience with DT in the manufacturing sector. Secondly, quantitative methods were used to collect information that was coded and quantified and analysed statistically using descriptive and inferential analysis.

3.2 Research design

A descriptive correlational research design aims to discover relationships among variables and make predictions from present knowledge (Curtis, Comiskey, & Dempsey, 2016). It is used to determine if a change in one variable causes a change in another variable and is often useful when research aims to measure the relationship between a predictor and outcome variable in a population (Curtis *et al.,* 2016).

The design was useful as the study was interested in examining how technology, organisational, and environmental factors influence DT in the manufacturing sector. The independent variables were measured using several items which are assumed to contribute to DT adoption positively or negatively by collecting information from a selected population.

3.3 Population and study setting

3.3.1 Target population

The population was 1,173 Kenya Association of manufacturers (KAM) registered companies in 2022. A target population represents individuals a study intervention intends to examine and draw conclusions from. In this case, 725 firms in Nairobi region represented the target population.

Table 3.1: Target population

Region	Target Population
Coast	102
Nyanza/Western	37
South Rift	45
North Rift	29
Lower Eastern	107
Central	128
Nairobi	725
Total	**1,173**

Source: Kenya Association of Manufacturers (2022)

3.3.2 Sampling frame and size

Out of the 725 firms, a departmental manager was selected as the unit of observation. Using stratified random sampling which is implemented by categorising a population into subgroups to create a situation where different members exclusively belong to a group based on some criteria (Omona, 2013). In this case, the departmental managers were selected from the different manufacturing subsectors as shown in Table 3.2. Additionally, the Krecjie and Morgan (1970) sample size formula described was used to determine the sample size as 176 respondents. In each of the firms, a senior manager involved in strategy implementation was purposively and conveniently sampled

Table 3.2: Sample size

Industry	Percent	Sample Size
Food and beverages	21	43
Service and consultancy	12	25
Metal and allied	9	19
Chemical and allied	8	17
Paper and Board	8	17
Plastic and rubber	8	17
Textile and apparel	6	12
Building, mining, and construction	4	8
Automotive	3	6
Pharmaceutical and medical equipment	3	6
Timber, wood and furniture	2	4
Leather and furniture	1	2
Total		**176**

$$s = X^2NP - P \div d^2 (N - 1) + X^2 P (1-P)$$

$$176 = 3.841^2 * 727 * 0.5 - 0.5 \div 3.841^2 (725 - 1) + 3.841^2 0.5 (1-0.5$$

s = required sample size

X^2 = Degree of freedom at the desired confidence level (3.841).

N = the population size.

P = the population proportion (assumed to be .50 since this would provide the maximum sample size).

d = the degree of accuracy expressed as a proportion (.05).

3.4 Data collection instrument

The study used primary quantitative data that was collected via a structured questionnaire (Appendix B) from the review of literature (Aldhaen, 2020; Zhu *et al.,* 2016; Fu & Lee, 2021; Eluekezi & Tuncay, 2021) that have examined DT adoption among manufacturing firms. The instrument had five sections: background information (manufacturing segment, firm size, firm age, respondent's job title, years of experience); technology factors (6 items); organisational factors (7 items); environmental factors (7 items); and DT (4 items).

3.5 Analysis of data

The procedure of achieveing meaning, structured, and order to a collected data is defined as data analysis; it is a creative, time consuming, fascinating, and ambigous

process. Data analysis is not a neat or does not continue in a linear trend. According to Creswell, (2007), the systematic process of evaluating and collecting verifiable and measurable data and is a statistical technique of analysing quantitative data. The first step of data analysis was re-checking that each returned instrument was completely filled and posed no threats to quality of information by missing or double responses. Fulfilling of this phase was followed to enter data into the Statistical Package for the Social Sciences (SPSS).

The analysis of data was done in two distinct procedures: descriptive and inferential statistical analysis. Descriptive statistics was done by employing frequency distributions, mean, and standard deviation. Inferential statistics began with checking for association using Pearson (*r*) correlation coefficient. This test is appropriate for when variables are measured using Likert scale items which fall under an interval scale. This was followed by multiple regression analysis which checks for the direction and size of predictor variables on the outcome variable in a linear relationship. This was done by regressing DT adoption against technological, organisational, and environmental factors so as to identify if these factors had a positive, negative, or no significant effect conducted at the 95 % confidence level. The proposed model was thus:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \varepsilon$$

Where;

Y = Adoption of Digital Transformation

β_0= Constant (coefficient of intercept)

X_1= Technological factors

X_2= Organisational factors

X_3= Environmental factors

$\beta_1 \ldots \beta_4$= Regression coefficients

ε = Error term

3.6 Reliability and validity

The concept of reliability also referrred to as consistency describes the extent to which and instrument is stable and how this tool can generate similar results under different settings. In this case, the instrument was deemed reliable by establishing its consistency using Cronbach's Alpha coefficient (or 'coefficient alpha'); a widely accepted approach

for determining consistency of Likert items used to measure a variable (Bujang, Omar & Baharum, 2018). Internal consistency is useful when several groups of items are used to measure various aspects of the same variable; it assesses how well the various items measure the same characteristic. Cronbach Alpha is interpreted as the closer the value reaches 1.0, a scale is explained as demonstrating greater internal consistency (Bujang *et al.,* 2018).

The extent to which a scale measures what is intended to measure is referred to as validity. Taber (2018) explains that Cronbach's alpha statistic contributes to validity of an instrument by showing if the number of items as not enough or are highly correlated with each other to measure a variable. A high Cronbach alpha value represents an issue of some items being not useful as they measure similar things but in different items. Therefore, the threshold for accepting reliability will be that recommended by Said (2018) that values between 0.6 to 0.8 are acceptable.

3.7 Ethical considerations

There are several ethical principles upheld in this research: informed consent, confidentiality, anonymity, voluntary participation, and conducting research free from any risks or harm. In fulfilling these, an informed consent form (Appendix A) was attached to the instrument and respondents were required to provide consent by signing the form. This was followed by seeking ethical approval (Appendix D) from Strathmore University Institutional Ethics Review Committee (SU-IERC) and seeking a research permit (Appendix E) from the National Commission for Science, Technology, and Innovation (NACOSTI). The respondents were asked to indicate their email address on the questionnaire if they needed feedback on its findings. Additionally, the final report was submitted to the Strathmore Business School to be distributed at the Strathmore University repository and the library.

3.8 Chapter summary

The positivist philosophy was used as a descriptive research approach was taken; targeted population was described and sampled via a formula to 176 respondents. The questionnaire was introduced and its reliability and validity were determined by conducting a pilot study. The results of the pilot were presented in chapter four and the outcome was the tool was reliable and valid as it was designed.

CHAPTER FOUR
DATA ANALYSIS AND FINDINGS

4.1 Introduction

This chapter provides a presentation of the research data analysis and research findings. It consists of section on the response rate, reliability results, general company information and respondents' information. A section on descriptive statistics will show the mean and standard deviation statistics for each of the four variables followed by the correlation and multiple regression analysis findings.

4.2 Response rate

Out of 176 questionnaires administered, 113 were returned representing a 64.2% response rate as seen in Table 4.1. Some researchers and journals (Fincham, 2010; Meterko *et al.,* 2015) have minimum threshold of 60% and above. Therefore, the study adopted this minimum threshold of a response rate.

Table 4.1: Research response rate

Variables	Number	Percent
Questionnaires administered	176	100.0
Questionnaires returned	113	64.2

4.3 Reliability results

Table 4.2 shows a score of 0.7 which has been recommended by scholars (Said, 2018; Taber, 2018). The scales thus performed as: technological subscale of 6 items (a = .87), organizational factors subscale consisted of 7 items (a = .93), the environmental subscale of 7 items (a = .87), and DT subscale of 4 items (a = .88).

Table 4.2: Reliability statistics

Variables	Cronbach's Alpha	N of Items
Technological factors	0.866	6
Organizational factors	0.930	7
Environmental factors	0.872	7
Digital transformation	0.897	4

4.4 Company data

This subsection describes the sampled firms in terms of their manufacturing subsector and size.

4.4.1 Manufacturing subsector

Table 4.3 indicates that the food and beverages subsector had the largest share of respondents (69.9%). The other subsectors were represented as follows: energy sector (11.5%), Building, mining and Construction (6.2%), and Pharmaceuticals (4.4%). Newspaper Printing Production, Packaging, and cement subsectors were all represented at 2.7% respectively.

Table 4.3: Manufacturing subsectors

Sector	Frequency	Percent
Building, mining and Construction	7	6.2
Cement	3	2.7
Energy Sector	13	11.5
Food and beverages	79	69.9
Newspaper Printing Production	3	2.7
Packaging	3	2.7
Pharmaceuticals	5	4.4
Total	**113**	**100.0**

4.4.2 Firm size

In terms of firm size, the findings indicated 27.5% firms had 100-200 employees followed by those with 1-99 employees at 26.5%, those firms with 201 – 300 employees (13.3%), 301 – 400 employees (9.7%), and 100 – 200 employees (8.0%) as Table 4.4 shows.

Table 4.4: Sampled manufacturing firm sizes

Number of employees	Frequency	Percent
1-99 employees	30	26.5
100-200 employees	31	27.5
201-300 employees	15	13.3
301-400 employees	11	9.7
400 + employees	26	23.0
Total	**113**	**100**

4.4.3 Firm age

The majority were in operation for more than 10 years (80.5%) with those with 6–10 years represented at 11.5% while the least represented firms accounted for 8.0% in the as shown in Table 4.5. The high number of firms in the industry for more than 10 years

provides validity and credibility as these firms have undergone digital changes in their environment and would have important insight into digital transformation.

Table 4.5: Sample manufacturing firm's age

Age in years	Frequency	Percent
6-10 years	13	11.5
Less than 3 years	9	8
More than 10 Years	91	80.5
Total	**113**	**100.0**

4.5 Respondent Information

The study sought respondents' information on their designation and working experience in the organisation. These are presented in this section of the data analysis and presentation.

4.4.5 Respondent office

More respondents were technical/engineering managers representing 56.6 %. Other designations reported in the sample were: operations and production (17.7%), supply chain (6.2%), quality assurance (5.3%), sales (4.4%), Information technology (3.5%), finance and human resources (2.7%), respectively and the least represented category was automation engineers (0.9%) as Table 4.6 shows.

Table 4.6: Respondent designation

Responsibility	Frequency	Percent
Automation Engineer	1	0.9
Finance	3	2.7
Human Resources	3	2.7
Information Technology	4	3.5
Operations/Production	20	17.7
Quality Assurance	6	5.3
Sales	5	4.4
Supply chain	7	6.2
Technical/Engineering	64	56.6
Total	**113**	**100.0**

4.4.6 Working experience.

In terms of their working experience, nearly half (37.2%) had 11 – 15 years' experience followed by 31.9 % had 6 – 10 years, 17.7% had 16 – 20 years' experience as seen in Table 4.7. Those with 1 – 5 years represented 8.8% while those with 20 and more years' experience represented 4.4%).

Table 4.7: Working experience in designation

Experience	Frequency	Percent
1 – 5 years	10	8.8
6 – 10 years	36	31.9
11 – 15 years	42	37.2
16 – 20 years	20	17.7
20 + years	5	4.4
Total	**113**	**100.0**

4.4 Descriptive statistics

The Likert scale data was analyzed by means of mean and standard deviation. The section presents the digital transformation, technological factors, organizational factors, and environmental factors descriptive summaries.

4.4.1 Digital transformation

There were four statements/items measuring DT. The results indicate the highest ranked item associated with DT was convenience (M = 4.42, SD = 0.666) followed by usefulness (M = 4.38, SD = 0.698), better (M = 4.33, SD = 0.737), and reliable (M = 4.30, SD = 0.755) respectively as seen in Table 4.8. The overall implication from these findings is that respondents were in agreement that DT would afford convenience, usefulness, better than existing technology, and its reliability.

Table 4.8: Descriptive summary for digital transformation

Digital transformation	N	Mean	Std. Deviation
Digital technology is likely to be more useful than existing technology	113	4.38	0.698
Using digital technology will be more convenient than using existing technology	113	4.42	0.666
Digital technology is more reliable compared to existing technology	113	4.30	0.755
Digital technology will be better compared to existing technology	113	4.33	0.737

4.4.2 Technological factors

Six statements/items were used to measure the technological components that may promote or hinder DT among manufacturing firms in Table 4.9. There was agreement among respondents that their existing system had the capability to capture data for the

right user (*M* = 4.42, *SD* = 0.666). The respondents also agreed that the organization system was flexible to adapt to the new information needs provided by DT (*M* = 4.37, *SD* = 0.781). The findings revealed that respondents' agreement that manufacturing firms had adequate technological infrastructure to support DT (*M* = 4.19, *SD* = 0.0.754). Additionally, respondents agreed that present information technology (IT) met the information needs in different aspects and alternatives (*M* = 4.04, *SD* = 0.828). There was moderate agreement among respondents that employees would be able to transition into digitized workflows easily (*M* = 3.73, *SD* = 0.695) and the IT in organisations had the ability to provide real-time data without any delay (*M* = 3.99, *SD* = 0.762).

Table 4.9: Descriptive summary for technological factors

Statements	N	Mean	Std. Deviation
The organisation has a flexible system which can adjust to new information needs and the company using the system	113	4.37	0.781
The company's system has the capability to capture data for the right user	113	4.42	0.666
The company's information technology has the ability to provide real-time data without delay	113	3.99	0.762
The company's information technology serves information needs to cover different aspects and alternatives	113	4.04	0.828
The company has an adequate technological infrastructure to support adoption of digital transformation	113	4.19	0.754
The company employees can transition to digitized workflows under a digital transformation easily	113	3.73	0.695

4.4.3 Organizational factors

The organisational factors were represented by seven statements/items and respondents ranking of these items are shown in Table 4.10. From the findings, agreement was shown in terms of top management support for adoption of DT (*M* = 4.26, *SD* = 1.016). There was similar agreement among respondents on organisational structures providing a foundation to promote DT (*M* = 4.04, *SD* = 0.876) and a favourable organisational

culture (*M* = 4.04, *SD* = 0.828) towards digital transformation. The respondents agreed that departmental collaborations to enhance DT were present in their organisation (*M* = 4.02, *SD* = 0.732). There was agreement that strong IT governance was present in manufacturing firms to acquire new technology (*M* = 4.00, *SD* = 0.964). The respondents were in moderate agreement that manufacturing firms has the qualified staff to adopt DT (*M* = 3.64, *SD* = 0.877). There was moderate agreement on rewards innovation to promote adoption of DT in manufacturing companies (*M* = 3.64, *SD* = 0.877).

Table 4.10: Descriptive summary for organizational factors

Organizational factors	N	Mean	Std. Deviation
There is top management support for adoption of a digital transformation strategy	113	4.26	1.016
There is a strong IT governance effort to acquire new technology in the company	113	4.00	0.964
The organizational structure provides a foundation from which to promote digital transformation	113	4.04	0.876
There is a favourable organizational culture towards adoption of digital transformation	113	4.04	0.626
There are departmental collaborations within the company to enhance digital transformation	113	4.02	0.732
The organization rewards innovation to promote adoption of a digital transformation strategy	113	3.62	1.096
The organisation has the needed employee qualifications for adopting digital transformation	113	3.64	0.877

4.4.4 Environmental factors

There were seven statements/items used to measure environmental factors and respondents ranking are presented in Table 4.11. The major finding from these factors was respondents' agreement that their organisation had the capacity to maintain international and local standards in **DT** (*M* = 4.25, *SD* = 0.774). The respondents were in moderate agreement with the other items. There was moderate agreement that organizations had an online presence (*M* = 3.84, *SD* = 1.115).

Table 4.11: Descriptive summary for environmental factors

Environmental factors	N	Mean	Std. Deviation
The organisation has an online presence that reaches out and connects with their digital savvy stakeholders	113	3.84	1.115
The company is able to transform external resources into the unique capabilities to create value	113	3.67	0.901
The organization has the capacity to maintain international and local standards in adopting a digital transformation	113	4.25	0.774
The organisation has relevant data transparent for customers to trace information back	113	3.76	0.631
There is a collaboration ecosystem present for manufacturing firms to adopt digital transformation	113	3.42	0.952
The competitive patterns in manufacturing sector influence company's digital transformation	113	3.81	0.882
There exist policies that promote the adoption of digital transformation	113	3.72	1.056

The competitive patterns in manufacturing influence **DT** (*M* = 3.81, *SD* = 0.882). The respondents moderately agreed that their companies had data transparency to trace information back to their stakeholders (*M* = 3.76, *SD* = 0.631). There was evidence although moderately, that manufacturing firms promoted adoption of **DT** (*M* = 3.72, *SD* = 1.056). The respondents were in moderate agreement that manufacturing firms were able to transform external resources to create value (*M* = 3.67, *SD* = 0.901). There was also moderate agreement that there was a collaborative ecosystem for **DT** among manufacturing firms (*M* = 3.42, *SD* = 0.952).

4.5 Correlation coefficient

A positive and significant association between technology factors ($r = 0.467$, $p < .05$), organizational factors ($r = 0.267$, $p < .05$), and environmental factors ($r = 0.308$, $p < .05$) and DT was found as 4.12 shows.

Table 4.12: Correlation coefficients

		Technology Factors	Organizational Factors	Environmental Factors
Technology Factors	Pearson Correlation	1		
	Sig. (2-tailed)	0.000		
	N	113		
Organizational Factors	Pearson Correlation	.698**	1	
	Sig. (2-tailed)	0.000		
	N	113	113	
Environmental Factors	Pearson Correlation	.694**	.730**	1
	Sig. (2-tailed)	0.000	0.000	
	N	113	113	113
Digital Transformation	Pearson Correlation	.467**	.267**	.308**
	Sig. (2-tailed)	0.000	0.004	0.001
	N	113	113	113

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

4.6 Multiple regression analysis

This section shows multiple regression output in a model summary, model significance, and coefficients subsections.

4.6.1 Model summary

The model summary statistics indicate a coefficient of determination (R^2) was 0.475 that implies the model explained 47.5 % of change in digital transformation in manufacturing companies as shown in Table 4.13.

Table 4.13: Model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.475[a]	0.225	0.204	0.56066

a Predictors: (Constant), Environmental Factors, Technology Factors, Organizational Factors

4.6.2 Model significance

Table 4.14 shows the analysis of variance (ANOVA) output which indicates the significance of a regression model. The result shows the model F (3, 112) = 10.574, p = .00) is significant in explaining DT in manufacturing firms.

Table 4.14: ANOVA[a]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	9.972	3	3.324	10.574	.000[b]
	Residual	34.263	109	0.314		
	Total	44.235	112			

a Dependent Variable: Digital Transformation
b Predictors: (Constant), Environmental Factors, Technology Factors, Organizational Factors

4.6.3 Coefficients

The findings indicate that technology factors (β = 0.577, p < .05) had a positive and significant effect while and environmental factors (β = 0.031, p > .05) had a positive but insignificant effect on DT as shown in Table 4.15. On the other hand, organizational factors (β = - 0.116, p > .05) had a negative and insignificant effect on digital transformation. Technological factors, based on these findings, are important for manufacturing firms to consider in their efforts to implement digital transformation.

Table 4.15: Coefficients[a]

	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	**Std. Error**	**Beta**		
(Constant)	2.318	0.391		5.929	0.000
Technology factors	0.577	0.136	0.537	4.227	0.000
Organizational factors	-0.116	0.12	-0.13	-0.973	0.333
Environmental factors	0.031	0.139	0.03	0.226	0.822

a Dependent Variable: Digital Transformation

4.7 Chapter summary

This chapter presented the findings beginning with the background information, descriptive findings for variables, correlation, and regression analysis. Tables were used to present the data. The chapter also presented the reliability findings.

CHAPTER FIVE
DISCUSSION OF RESULTS

5.1 Introduction

The chapter discussed the results per its research objectives. The chapter also presented a summary of the study. The discussion is done by comparing and contrasting findings with the reviewed literature where it supports or refutes these studies.

5.2 Summary of findings

This study assessed the influence of technological, organisational, and environmental factors on DT in Kenya's manufacturing firms in the Nairobi region. The study was anchored on the technology organisation and environment (TOE) Framework and Diffusion of Innovation (DOI) theory. A positivist research philosophy fits with the study's objective and is thus adopted. A descriptive correlational design is used as the study aims to describe the association between factors that may influence digital transformation. The target population was 725 firms from which a sample size of 176 was selected as the units of analysis. In each of the 176 firms, a senior manager involved in strategy implementation was purposively and conveniently sampled. The data was gathered using a Likert scale-based questionnaire that was checked for validity and reliability in a pilot study from which the internal consistency of items was assessed. Descriptive and inferential statistics were ran using the Statistical Package for the Social Sciences (SPSS).

The output indicated that technology, organization, and environment factors together explained 47.5 % of change in DT adoption in manufacturing firms and this was significant at the 95 % confidence level. Independently, technological factors had a .577 positive and statistically significant effect on DT adoption. Organizational factors had a -0.116 negative and statistically insignificant effect on DT adoption. Lastly, environment factors had a 0.031 positive but insignificant effect on DTA among sampled firms. The study therefore concludes that increasing technological factors in manufacturing firms will contribute to an increase in DT adoption while organizational and environment factors do not have any effects on DT adoption. study recommends for manufacturing firms to focus on using technology that has relative advantage over its predecessor.

5.3 Discussion of findings

5.3.1 Technological factors and digital transformation adoption

First, there was a positive effect of technological factors on digital transformation. This outcome supports previous research that has confirmed this relationship to exist in the manufacturing sector. Eluekezi and Tuncay (2021) found that technological factors were critical in contributing to successful DT in manufacturing firms. Phiet (2024) findings showed a significant effect of technology on DT indicating higher levels of DT were connected with higher levels of technological capacity. Technology is undoubtedly a critical component of DT as existing technologies of a company are significant in the adoption process because they establish a broad restriction on the breadth and pace of technological change that a company can undertake.

The results go against evidence from other research that has shown technological factors may not directly have an effect on the DT of a company. For instance, Ramesh (2019) found that technological factors such as readiness and acceptability while present in an organisation may not always lead to digitally transform. Despite most organisations being technologically ready, 70% or higher failure rate of DT was observed.

There was moderate agreement that employees were capable of transitioning into digitized workflows under a DT easily. This suggests that there was a digital mindset among manufacturing firms. A digital mindset is associated with showing interest in new technologies, challenging processes or working models that influence DT adoption. However, there is evidence from Utami and Jayadi (2023) that having a digital mindset does not always guarantee a firm will pursue a DT strategy.

5.3.1 Organisational factors and digital transformation adoption

Second, there is no relationship between organizational factors and DT adoption in manufacturing firms implying that factors such as leadership, organisational structure and culture did not promote or hinder digital transformation. This result goes against other researchers who have reported evidence of organisational factors having a positive effect on DT going against previous studies that determined importance of organisational factors for successful adoption of DT in manufacturing firms.

These researchers include Fu and Lee (2021) that established management support and resource readiness as organisational factors contributed to DT adoption in the manufacturing sector. Patil and Rashidi (2023) study confirmed that DT adoption was promoted by receiving support from leaders, having adequate skills, creating knowledge, continuous improvement, and staff engagement as organizational factors.

Culture as a component of organisational factors has also been reported to be important in DT adoption (Tuukkanen, Wolgsjö, & Rusu, 2022). Nevertheless, there is evidence to indicate that organizational culture may not be a prerequisite for DT adoption among manufacturing firms. For instance, Lucas and Goh (2009) cited in Hartl and Hess (2017) explain that culture of an organisation can be a source of disinterest that hinders change such as in the Kodak process of digitalization.

5.3.3 Environmental factors and digital transformation adoption

Third, there is no effect of environmental factors on adoption of DT among the sampled manufacturing firms was found. This goes against previous research that found positive effects of environmental factors on adoption of DT. These include Wang and Su (2021) that found institutional environment such as tax reductions, legal protection, and government subsidies) had a significant effect on DT adoption. Vogel *et al.* (2018) agree that supportive legal frameworks may drive or hinder technology use as these regulations create the sustainability or environmental standards for DT. In another study, Ta and Lin (2023) noted that the government has an important function in assisting firms to adopt DT by its allocation of funds and resources towards digital platforms.

Notwithstanding, the non-significant relationship between environment factors and DT adoption in manufacturing firms has also been evident from other studies. This implies that this study's findings agree with this research. For example, Suhaimi, Mustapha, and Shaik (2023) regression results showed that environmental factors were insignificant in explaining a DT outcome. Xiao (2022) concluded that environmental factors had no significant effects on DT adoption in manufacturing while Skog (2019) provided examples showing how companies are innovating with digital technology and this culminates in the launch of new services and products, but still face difficulties to adapt to the changing digital environments over time.

5.4 Conclusion

5.4.1 Technology factors and digital transformation

The results showed that technology factors contribute to DT in manufacturing firms positively. The study therefore concludes that increasing technological factors in manufacturing firms will contribute to an increase in DT adoption among manufacturing firms in Nairobi region.

5.4.2 Organizational factors and digital transformation

The findings revealed a negative but non-significant effect of organisational factors on DT in manufacturing firms. Therefore, it is this study's conclusion that organisational factors do not have an effect on DT adoption in manufacturing firms in Nairobi region.

5.4.3 Environmental Factors and Digital Transformation

The findings indicated positive but non-significant effects of environmental factors and digital transformation adoption in the sample. Therefore, this study concludes that environmental factors do not have any effects on adoption of digital transformation among manufacturing firms in Nairobi region.

5.5 Recommendations

5.5.1 Technology factors and digital transformation

The study recommends for manufacturing firms to focus on using technology that shows relative advantage over its present technology. Doing so, this allows the companies to spend less on learning of the new technology, experience less chances of incompatibility of the new and old technology, can be adopted in trial and scaled when its benefits are observable and realized.

5.5.2 Organizational factors and digital transformation

The study recommends that managers in manufacturing make efforts to foster a culture of acceptance towards digital transformation. This can be achieved by managers providing continuous sensitization of emerging digital technologies that are trending in the sector and seek the opinions of staff on how these can be integrated into the organisation.

5.5.3 Environmental factors and digital transformation

Manufacturing firms should be aware of their environment and design DT strategies sequentially by prioritizing the creation of capabilities to be able to swiftly respond to

digital opportunities due to high competition and dynamism in the sector. Yet, companies that are in less digitally intense subsectors of manufacturing should focus on attaining complementary resources and fostering change commitments. Moreover, the ever-changing environment means that managers and leaders must be flexible and adaptable so as to make changes in reaction to market conditions and new knowledge.

5.6 Limitations of the study

Several limitations were evident in the study. Its sample was limited to manufacturing firms in the Nairobi region and therefore its results are not generalizable to all manufacturing firms in the country. Additionally, the response rate was not adequately representative of all the manufacturing subsectors and future research should undertake proportionate sampling so as to select a representative sample of all its subsectors.

The quantitative data collection and analysis means that responses and findings were limited to statistical analysis. Additionally, there are personal experiences of managers with DT in their companies and this was not shared and there would be need for future research to find out respondents' stories on DT in manufacturing companies. Lastly, the study did not compare regions but focused on Nairobi region alone. However, the findings of this study can be generalised in other regions of Kenya.

5.7 Recommendations

5.7.1 Research recommendations

The data on DT was limited to the views and perceptions of managers in their companies. This data was subjective, therefore, there is a need for studies that use secondary or objective data from an index that can measure or determine extent of DT adoption in the manufacturing sector. Additionally, organizational factors such as size, managerial structure, governance, and ownership can be derived from secondary data and can be used to determine its effect on DT adoption in future.

There was no relationship found between organizational and environmental factors; therefore, it is recommended for further research between these variables and DT adoption in the manufacturing sector. Such studies should use existing models such as the PESTEL (political, economic, social, technological, environmental, and legal) framework to determine how environmental factors hinder and contribute to DT adoption among manufacturing firms in Kenya. Additionally, there are several

organizational theories that can be used to identify what factors hinder or contribute to DT adoption in future research.

5.7.2 Policy recommendations

There are existing policies that support the DT of industry in Kenya. These include: The draft Science, Technology, and Innovation Policy (2020-2030) and the 2019 National Information, Communications and Technology (ICT) Policy that cite the importance of digital technologies for the manufacturing sector. Therefore, there is a greater need for enforcement of legislation and implementation of existing policies that aim to enhance DT of manufacturing firms in Kenya.

There is a need for policy that takes into account the emerging digital technologies such artificial intelligence (AI), machine learning (ML), three-dimensional (3D) printing, and robotics to provide guidelines by which these technologies can be leveraged in the manufacturing sector and provision of an environment that supports adoption of companies to use these technologies.

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APPENDICES

APPENDIX A: QUESTIONNAIRE

Section A: Background information

1. Manufacturing sub sector

Food and beverages	[ ]
Floriculture	[ ]
Textile and apparel sector	[ ]
Leather and footwear	[ ]
Paper	[ ]
Plastics and rubber	[ ]
Building, mining and Construction	[ ]

2. Firm size

1-99 employees	[ ]
100-200 employees	[ ]
201-300 employees	[ ]
301-400 employees	[ ]
400 employees and above	[ ]

3. Firm age

Less than 3 years	[ ]
3–5 years	[ ]
6-10 years	[ ]
More than 10 Years	[ ]

4. Respondent's job title

Chief information officer	[ ]
Operations manager	[ ]
Customer relations manager	[ ]
Technical/Engineering manager	[ ]

5. Years of experience

Less than 1 year	[ ]
1 – 5 years	[ ]
6 – 10 years	[ ]
11 – 15 years	[ ]
16 – 20 years	[ ]

20 years and above [ ]

Section B: Technological factors

The statements listed below are technological factors associated with digital transformation in manufacturing organisations. Using a scale from 1 to 5, please indicate to what extent these statements match with your organization digital transformation strategy where 1 indicates To a great extent, 2 - To a large extent, 3 – Somewhat, 4 – Little, 5 - Not at all

Statements		**1**	**2**	**3**	**4**	**5**
6	The organisation has a flexible system which can adjust to new information needs and the company using the system					
7	The company's system has the capability to capture data for the right user					
8	The company's information technology has the ability to provide real-time data without delay					
9	The company's information technology serves information needs to cover different aspects and alternatives					
10	The company has an adequate technological infrastructure to support adoption of digital transformation					
11	The company employees can transition to digitized workflows under a digital transformation easily					

Section C: Organizational factors

The statements listed are organizational factors associated with digital transformation in manufacturing organizations. Using a scale from 1 to 5, please indicate to what extent these statements match with your organization digital organization strategy where 1 indicates To a great extent, 2 - To a large extent, 3 – Somewhat, 4 – Little, 5 - Not at all

Statements		**1**	**2**	**3**	**4**	**5**
12	There is top management support for adoption of a digital transformation strategy					
13	There is a strong IT governance effort to acquire new technology in the company					
14	The organizational structure provides a foundation from which to promote digital transformation					

15	There is a favourable organizational culture towards adoption of digital transformation					
16	There are departmental collaborations within the company to enhance digital transformation					
17	The organization rewards innovation to promote adoption of a digital transformation strategy					
18	The organisation has the needed employee qualifications for adopting digital transformation					

Section D: Environmental factors

The statements listed are environmental factors associated with digital transformation in organisations. Using a scale from 1 to 5, please indicate to what extent these statements match with your organization digital transformation strategy where 1 indicates To a great extent, 2 - To a large extent, 3 – Somewhat, 4 – Little, 5 - Not at all

Statements		**1**	**2**	**3**	**4**	**5**
19	The organisation has an online presence that reaches out and connects with their digital savvy stakeholders					
20	The company is able to transform external resources into the unique capabilities to create value					
21	The organization has the capacity to maintain international and local standards in adopting a digital transformation					
22	The organisation has relevant data transparent for customers to trace information back					
23	There is a collaboration ecosystem present for manufacturing firms to adopt digital transformation					
24	The competitive patterns in the manufacturing sector influence the company's digital transformation					
25	There exist policies that promote the adoption of digital transformation					

Section E: Digital transformation

The statements listed below are associated with digital transformation in manufacturing firms. Relative to other firms in your industry, please identify the degree to which your company uses digital technologies on a 1 to 5 scale (where indicates 1 = strongly disagree, 2 =disagree, 3=somewhat disagree, 4= agree 5 = strongly agree).

Statements		**1**	**2**	**3**	**4**	**5**
26	Digital technology is likely to be more useful than existing technology					
27	Using digital technology will be more convenient than using existing technology					
28	Digital technology is more reliable compared to existing technology					
29	Digital technology will be better compared to existing technology					

Thank you for taking part in this survey. If you would like a summary of the findings, please include your email address below.

APPENDIX B: SAMPLE SIZE TABLE

Table for Determining Sample Size for a Given Population

N	S	N	S	N	S	N	S	N	S
10	10	100	80	280	162	800	260	2800	338
15	14	110	86	290	165	850	265	3000	341
20	19	120	92	300	169	900	269	3500	246
25	24	130	97	320	175	950	274	4000	351
30	28	140	103	340	181	1000	278	4500	351
35	32	150	108	360	186	1100	285	5000	357
40	36	160	113	380	181	1200	291	6000	361
45	40	180	118	400	196	1300	297	7000	364
50	44	190	123	420	201	1400	302	8000	367
55	48	200	127	440	205	1500	306	9000	368
60	52	210	132	460	210	1600	310	10000	373
65	56	220	136	480	214	1700	313	15000	375
70	59	230	140	500	217	1800	317	20000	377
75	63	240	144	550	225	1900	320	30000	379
80	66	250	148	600	234	2000	322	40000	380
85	70	260	152	650	242	2200	327	50000	381
90	73	270	155	700	248	2400	331	75000	382
95	76	270	159	750	256	2600	335	100000	384

Note: "N" is population size
"S" is sample size.

Source: Krejcie & Morgan, 1970

APPENDIX C: ETHICAL APPROVAL

Strathmore UNIVERSITY

7th November 2023

Mr Moi Kipkirui,
moi.kipkirui@strathmore.edu

Dear Mr Moi,

RE: Factors Influencing Adoption of Digital Transformation among Manufacturing Sector Firms in Nairobi County

This is to inform you that SU-ISERC has reviewed and **approved** your above **SU-masters** research proposal. Your application reference number is **SU-ISERC1865/23.** The approval period is from **7th November 2023 to 6th November 2024.**

This approval is subject to compliance with the following requirements:

i. Only approved documents including (informed consents, study instruments, MTA) will be used.
ii. All changes including (amendments, deviations, and violations) are submitted for review and approval by SU-ISERC.
iii. Death and life-threatening problems and serious adverse events or unexpected adverse events whether related or unrelated to the study must be reported to SU-ISERC within 72 hours of notification.
iv. Any changes anticipated or otherwise that may increase the risks or affected safety or welfare of study participants and others or affect the integrity of the research must be reported to SU-ISERC within 72 hours.
v. Clearance for the export of biological specimens must be obtained from relevant institutions.
vi. Submission of a request for renewal of approval at least 60 days prior to the expiry of the approval period. Attach a comprehensive progress report to support the renewal.
vii. Submission of an executive summary report within 90 days of completion of the study to SU-ISERC.

Before commencing your study, you will be expected to obtain a research license from National Commission for Science, Technology, and Innovation (NACOSTI) https://research-portal.nacosti.go.ke/ and obtain other clearances needed.

Yours sincerely,

Mr Ambrose Rachier,
Chairperson; SU-ISERC

STRATHMORE UNIVERSITY INSTITUTIONAL SCIENTIFIC AND ETHICAL REVIEW COMMITTEE
(SU-ISERC)
07-Nov-2023
Email:ethicsreview@strathmore.edu
P.O BOX 59857-00200
NAIROBI-KENYA

Ole Sangale Rd, Madaraka Estate. PO Box 59857-00200, Nairobi, Kenya. Tel +254 (0)703 034000
Email admissions@strathmore.edu www.strathmore.edu

APPENDIX D: RESEARCH PERMIT

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Ref No: **246597**

Date of Issue: **22/November/2023**

RESEARCH LICENSE

This is to Certify that Mr.. MOI Franklin KIPKIRUI of Strathmore University, has been licensed to conduct research as per the provision of the Science, Technology and Innovation Act, 2013 (Rev.2014) in Nairobi on the topic: Factors Influencing Adoption of Digital Transformation among Manufacturing Sector Firms in Nairobi County for the period ending : 22/November/2024.

License No: **NACOSTI/P/23/31533**

246597

Applicant Identification Number

Director General
NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Verification QR Code

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See overleaf for conditions