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The Impact of Digital Transformation on the Efficiency and Productivity at Telecom Sector in the Kingdom of Saudi Arabia

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أثر التحول الرقمي على الكفاءة والإنتاجية في قطاع الاتصالات في المملكة العربية السعودية

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Abstract:

Digital transformation has emerged as a critical driver of organizational change, significantly altering the landscape of numerous industries worldwide. This research aims to investigate the impact of digital transformation on the productivity and efficiency of the telecom sector in the Kingdom of Saudi Arabia (KSA). The telecom sector, being a cornerstone of modern communication and information dissemination, presents a unique opportunity to examine how digital advancements can optimize operational workflows, enhance service delivery, and foster innovation.

Preliminary findings suggest that digital transformation initiatives, such as the implementation of advanced data analytics, automation, cloud computing, and artificial intelligence, have significantly improved operational efficiency and productivity. These technologies enable telecom companies to streamline processes, reduce downtime, and offer more personalized services to customers. Moreover, the study explores the role of government policies and strategic frameworks, such as Saudi Vision 2030, in facilitating the digital transformation of the telecom sector.

The research also highlights potential barriers to digital transformation, including resistance to change, cybersecurity concerns, and the need for continuous skill development among the workforce. By addressing these challenges, telecom companies in KSA can fully harness the benefits of digital transformation, ensuring sustainable growth and competitive advantage in a rapidly evolving global market.

In addition, this research provides valuable insights into the transformative impact of digital technologies on the productivity and efficiency of the telecom sector in KSA, offering practical recommendations for stakeholders to optimize their digital strategies and achieve long-term success.

The study employs data will be gathered through surveys from key telecom operators in KSA, focusing on seven factors as following;

- | | |
|---|--|
| 1- Understanding Digital Transformation | 2- Digital Tools and Technologies |
| 3- Efficiency Productivity& Accuracy | 4- Work Quality and Output |
| 5-Collaboration and Communication: | 6- Employee Satisfaction and Future Perspectives |

Qualitative data have been collected via survey based on 150 sample out of 1000 number of total community including directors, managers, engineers, general employees in telecommunication sector to gain a comprehensive understanding of the challenges and opportunities presented by digital transformation

The survey has revealed that there was a significant positive impact of the digital transformation on the efficiency as well the survey shows that employing the digital transformation tools in work does increase the productivity significantly.

المخلص:

برز التحول الرقمي كمحرك حاسم للتغيير التنظيمي، مما أدى إلى تغيير كبير في مشهد العديد من الصناعات في جميع أنحاء العالم. يهدف هذا البحث إلى التحقيق في تأثير التحول الرقمي على إنتاجية وكفاءة قطاع الاتصالات في المملكة العربية السعودية. يمثل قطاع الاتصالات، باعتباره حجر الزاوية في الاتصالات الحديثة ونشر المعلومات، فرصة فريدة لفحص كيف يمكن للتقدم الرقمي تحسين سير العمل التشغيلي، وتعزيز تقديم الخدمات، وتعزيز الابتكار.

تشير النتائج الأولية إلى أن مبادرات التحول الرقمي، مثل تنفيذ تحليلات البيانات المتقدمة، والأتمتة، والحوسبة السحابية، والذكاء الاصطناعي، قد حسنت بشكل كبير من الكفاءة التشغيلية والإنتاجية. تمكن هذه التقنيات شركات الاتصالات من تبسيط العمليات، والحد من وقت التوقف، وتقديم خدمات أكثر تخصيصاً للعملاء. علاوة على ذلك، تستكشف الدراسة دور السياسات الحكومية والأطر الاستراتيجية، مثل رؤية السعودية 2030، في تسهيل التحول الرقمي لقطاع الاتصالات.

يسلط البحث الضوء أيضاً على الحواجز المحتملة أمام التحول الرقمي، بما في ذلك مقاومة التغيير، ومخاوف الأمن السيبراني، والحاجة إلى التطوير المستمر للمهارات بين القوى العاملة. ومن خلال معالجة هذه التحديات، يمكن لشركات الاتصالات في المملكة العربية السعودية الاستفادة الكاملة من فوائد التحول الرقمي، وضمان النمو المستدام والميزة التنافسية في سوق عالمية سريعة التطور.

بالإضافة إلى ذلك، يوفر هذا البحث رؤية قيمة حول التأثير التحويلي للتكنولوجيات الرقمية على إنتاجية وكفاءة قطاع الاتصالات في المملكة العربية السعودية، ويقدم توصيات عملية لأصحاب المصلحة لتحسين استراتيجياتهم الرقمية وتحقيق النجاح على المدى الطويل.

وتستخدم الدراسة البيانات التي سيتم جمعها من خلال استطلاعات من مشغلي الاتصالات الرئيسيين في المملكة العربية السعودية، مع التركيز على سبعة عوامل على النحو التالي؛

- 1- فهم التحول الرقمي
- 2- الأدوات والتقنيات الرقمية
- 3- الكفاءة والإنتاجية والدقة
- 4 - جودة العمل والإنتاجية
- 5- التعاون والتواصل
- 6 - رضا الموظفين ووجهات النظر المستقبلية

تم جمع البيانات النوعية من خلال استطلاع رأي على أساس 150 عينة من أصل 1000 من إجمالي المجتمع بما في ذلك المديرين والمديرين والمهندسين والموظفين العامين في قطاع الاتصالات للحصول على فهم شامل للتحديات والفرص التي يقدمها التحول الرقمي.

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- Bader Al-Ahmadi Senior Engineer in Zain Telecom Company

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Keywords: Digital Transformation, Productivity, Efficiency, Telecom Sector, Kingdom of Saudi Arabia, Cloud Computing, Artificial Intelligence, Internet of Things, Organizational Performance.

Chapter 1

Introduction:

The Kingdom of Saudi Arabia (KSA) is undergoing a significant transformation as part of its Vision 2030 initiative, aiming to diversify its economy and reduce its dependence on oil. One of the key pillars of this vision is digital transformation, which is revolutionizing various sectors, including the telecom industry. Digital transformation encompasses the adoption of digital technologies to improve processes, enhance customer experiences, and create new business models. In the telecom sector, this transformation is crucial as it enables companies to stay competitive, meet the growing demand for advanced services, and improve operational efficiency.

Digital transformation in the telecom sector in KSA involves the integration of technologies such as 5G, artificial intelligence (AI), the Internet of Things (IoT), cloud computing, and big data analytics. These technologies are not only enhancing the efficiency of telecom operations but also driving productivity by enabling faster and more reliable communication services. The implementation of 5G, for instance, is expected to significantly improve network speed and connectivity, facilitating the deployment of IoT devices and smart city projects.

The impact of digital transformation on productivity and efficiency in KSA's telecom sector is profound. It leads to the automation of routine tasks, reducing the need for manual intervention and minimizing errors. Advanced data analytics provide telecom companies with insights into customer behavior, network performance, and operational inefficiencies, allowing for more informed decision-making. Moreover, digital transformation enhances customer engagement through personalized services and improved service delivery, leading to increased customer satisfaction and loyalty.

As the telecom sector in KSA continues to embrace digital transformation, it is poised to play a pivotal role in the country's economic growth and development. The sector's advancements will not only contribute to the achievement of Vision 2030's goals but also position KSA as a regional leader in digital innovation and technology-driven efficiency. This research aims to explore the specific impacts of digital transformation on productivity and efficiency in the telecom sector, providing valuable insights into the ongoing evolution and future prospects of the industry in KSA.

This research focuses on the telecom sector, a critical backbone of modern digital infrastructure, examining how digital transformation initiatives have influenced productivity and efficiency within this domain. By leveraging advanced technologies such as AI, IoT, big data analytics, and cloud computing, telecom companies in KSA are not only streamlining their operations but also delivering innovative services that cater to an increasingly digital-savvy population. This study aims to provide a comprehensive analysis of the digital transformation landscape in KSA's telecom sector, identifying key trends, challenges, and the resultant impact on overall productivity and operational efficiency.

In the Kingdom of Saudi Arabia, it was recently introduced for the first time in 2018 and found this system has many advantages for both employees and employer as well such as work life balance, reduce the labor attendance rate, reduce vacation days, reduce the sickness rate and increase the productivity (Maren Tream, 2020).

With the availability of advanced technologies, the work/non-work boundaries seem have diminished with the passage of time (Lewis et al., 2009). The implementation of flexibility of working in Europe in both private and public sectors has led to balance between work and family responsibility thus the staffs have more suitable time to care about their families (De Roure, 1995).

With the rapid growth in digital transformation in the world of industry, Europe is facing a serious challenge, facing risk and opportunity to keep pace with this development in digital transformation in industrial manufacturing will occur gross value worth 1.25 trillion euros meanwhile they will incurred the loss of 605 billion euros in foregone value added if not consider the development in digital transformation. (Berger, R. 2015).

Due to economic changes, we need to focus on innovation and the readiness of the public and private sectors to enter the world of digital transformation in a way that enhances the capabilities of those institutions to advance the country's economy. Therefore, it was necessary to identify the most important factors and influences that play a role in making this experience of digital transformation successful, so a research questionnaire was conducted. A poll of 200 Saudi citizens from different regions within the Kingdom of Saudi Arabia. The research study was conducted in various health institutions/education/ministries. The questionnaire was supported by conducting an interview with 10 security experts in line with the country's vision 2030. (Alharbi, A. S. 2019, March).

The aims of this study is to provide a comprehensive analysis of the digital transformation landscape in KSA's telecom sector, identifying key trends, challenges, and the resultant impact on overall productivity and operational efficiency.

1.1 Research Statement:

The Kingdom of Saudi Arabia is in the midst of a comprehensive digital transformation driven by its Vision 2030 initiative, aimed at diversifying the economy and improving efficiency across various sectors, including telecommunications. Despite significant investments in digital technologies, the actual impact on productivity and efficiency within the telecom sector remains under-explored. This research seeks to address the gap by investigating how digital transformation initiatives influence operational efficiency, service delivery, and overall productivity in the telecom industry in KSA. Identifying the critical success factors and barriers to effective digital transformation will provide valuable insights for policymakers, industry leaders, and stakeholders aiming to optimize the benefits of technological advancements in this crucial sector.

The telecommunications sector in the Kingdom of Saudi Arabia faces significant challenges in maintaining productivity and efficiency amidst rapid technological advancements and growing global competition. Despite substantial investments in digital technologies, there is a need to comprehensively understand how these technologies impact operational processes and decision-making frameworks. This research seeks to address the gap in empirical evidence regarding the effectiveness of digital transformation initiatives in enhancing productivity and efficiency within the sector. By identifying the key drivers and barriers to successful digital integration, the study aims to provide actionable insights for telecom companies to optimize their digital strategies, ensuring sustained competitive advantage and alignment with the economic objectives of Vision 2030. (Alojail, M., Alshehri, J., & Khan, S. B. 2023).

Digital transformation is here to stay. With the emergence of new digital innovations and diverse and rich data sources, only those organizations that can adapt faster and make better, quicker decisions will become more competitive.(Carroll, N., Hassan, N. R., Junglas, I., Hess, T., & Morgan, L. (2023).)

1.2 Research Importance:

The telecom sector in Saudi Arabia is pivotal in the nation's economic and technological landscape, acting as a catalyst for digital innovation and connectivity.

The internationalization of companies is increasingly dependent on their digitalization. Since companies have begun to dematerialize borders and reduce costs through the use of e-commerce, they have also changed the way business is done, says Gregory.(C. S., Durão, N., Moreira, F., & Veloso, B. (2022).)

Understanding the impact of digital transformation in this sector is crucial for several reasons:

1. **Economic Growth:** Telecom services drive business operations, enhance communication, and enable e-commerce, which collectively contribute to the country's GDP.
2. **Vision 2030 Alignment:** Saudi Arabia's Vision 2030 emphasizes digital transformation to diversify the economy, reduce dependency on oil, and improve public services.
3. **Competitive Advantage:** By adopting digital technologies, telecom companies can enhance their service offerings, improve customer satisfaction, and stay ahead in a competitive market.
4. **Operational Efficiency:** Digital transformation can streamline operations, reduce costs, and improve productivity, which is essential for maintaining profitability in a fast-evolving industry.

1.3 Research Purposes:

The main purposes of this research is to study and examine the Impact of Digital Transformation on the Efficiency and Productivity at Telecom Sector in the Kingdom of Saudi Arabia by discussing the following factors:

1. To analyze the extent of digital transformation adoption in the telecom sector in KSA.
2. To evaluate the impact of digital transformation on operational productivity and efficiency.
3. To identify the challenges and barriers faced by telecom companies in implementing digital transformation.
4. To propose strategies for overcoming these challenges and maximizing the benefits of digital transformation.

1.4 Research Questions:

In this study we will focusing on the major axis's of Impact of Digital Transformation on the Efficiency and Productivity at Telecom Sector in the Kingdom of Saudi Arabia and ill discussing this through four main questions as listed below;

1. How does digital transformation influence Efficiency Productivity& Accuracy in telecom companies?
2. What impact does digital transformation have on the Work Quality and Output of telecom companies in KSA?
3. How does digital transformation impacting Collaboration and Communication between coworkers of telecom companies in KSA?
4. How does digital transformation impacting Employee Satisfaction of telecom companies in KSA?
5. How does digital transformation impacting Future Perspectives of telecom companies in KSA?

1.5 Research Hypothesis :

We can summarize the Hypothesis of our study into four Hypothesis (H1 - H4)
as a following;

- H1: Digital transformation positively impacts the productivity of telecom companies in Saudi Arabia.
- H2: Digital transformation significantly improves the operational efficiency of telecom companies.
- H3: There are significant challenges and barriers to the implementation of digital transformation in the telecom sector.
- H4: Effective strategies can mitigate the challenges of digital transformation and enhance its positive impacts.

1.6 Theoretical Model in Preparing Research:

Methodology:

This research employs a mixed-methods approach, distributing surveys to employees and managers within telecom companies. These surveys will gather qualitative insights into the challenges and enablers of digital transformation as identified by both companies and stakeholders. Additionally, the study will assess the acceptability and capability of telecom company employees to use digital tools in their work, instead of traditional methods as well how much they trusted in its result and how its reflected on productivity and efficacy of works

Chapter 2

Introduction:

Digital transformation has become a pivotal force reshaping industries across the globe, with the telecom sector being no exception. As a catalyst for change, digital transformation encompasses the integration of digital technologies into all areas of a business, fundamentally altering how companies operate and deliver value to their customers. In the Kingdom of Saudi Arabia, the telecom sector stands at the forefront of this revolution, driven by the nation's ambitious Vision 2030 initiative, which aims to diversify the economy and reduce dependence on oil.

The lecture review on "The Impact of Digital Transformation on the Efficiency and Productivity in the Telecom Sector in the Kingdom of Saudi Arabia" delves into the multifaceted ways digital transformation is revolutionizing this critical industry. It examines how the adoption of cutting-edge technologies, such as 5G, artificial intelligence (AI), big data analytics, and the Internet of Things (IoT), is not only enhancing operational efficiency but also driving productivity to unprecedented levels.

This review will explore key case studies and empirical data to provide a comprehensive understanding of the benefits and challenges associated with digital transformation in general. By analyzing these elements, the lecture aims to shed light on the strategic initiatives undertaken by companies to navigate this transformative journey, the impact on workforce dynamics, employees and customer experience, and overall market competitiveness.

Understanding the interplay between digital transformation and the telecom sector's efficiency and productivity is crucial for stakeholders, policymakers, and business leaders. It offers valuable insights into how digital innovation can be harnessed to foster sustainable growth, improve service delivery, and position the Kingdom of Saudi Arabia as a regional leader in the digital economy. This lecture review serves as a foundation for further discourse on the future trajectory of the telecom industry in an increasingly digitalized world.

In recent years, IT capabilities have undergone significant transformations due to the advent of intelligent systems, big data analytics, the Internet of Things, and the widespread use of mobile applications and sensors.. (Al-Jaafreh, A., & Fayoumi, A. (2017).) The Role of Big Data Analytics on Innovation: A Study from the Telecom Industry.

The findings suggest a notable correlation between data quality and strategic performance, as well as between technological competence and strategic performance. Additionally, big data analytics and Internet of Things capabilities serve as crucial mediators in the relationship between these independent and dependent variables. However, the reutilization of block chain capabilities does not significantly mediate the relationship between the independent and dependent variables. In recent years, IT capabilities have undergone significant transformation with the advent of intelligent systems, big data analytics, the Internet of Things, and the extensive adoption of mobile apps and sensors.(Bhatti, A., Malik, H., Kamal, A. Z., Aamir, A., Alaali, L. A., & Ullah, Z. (2021).)

2.1 Lecture Review:

Silakova, L., & Nikishina, A. (2021, October) the study examined the impact of digital transformation of loyalty systems on the success of telecommunications companies. The telecommunications industry has particularly high customer churn rates, ranging from 10% to 67% per year on average. As a result, the cost of acquiring a new customer is 4-10 times higher than keeping the asset. Therefore, the digital transformation of customer loyalty systems has become a tool for predicting customer behavior and providing relevant and timely offers, thus improving the user experience. The goal of this study is how to find a way to manage and monitor customer loyalty systems for telecommunications companies. Through digital transformation through business process management improvement measures based on the e-TOM model.

Fletcher, G., & Griffiths, M. (2020), During Pandemic lockdown a lot of institutional are forced to go through digital transformation to handle its tasks and operations remotely but this revealed the poor readiness. VUCA, a managerial catchall acronym for Volatility, Uncertainty, Complexity and Ambiguity is a litmus test for recognizing unpredictable external environments, Based on the capability to apply digital transformation during pandemic lockdown and its unsatisfied results the research is summarize the root of cause into 3 factors , firstly organizations must improve their digital maturity, secondly, less digitally mature organizations are more fragile and finally organizations with higher levels of digital maturity are generally more flexible.

Awadhi, J., Obeidat, B., & Alshurideh, M. (2021), they evaluate the links between customer perceived expectations, customer perceived experience, and customer satisfaction in the United Arab Emirates' digital solution in the telecommunications industry using data analysis strategy to sample 130 clients , The research discovered a strong correlation between customer expectation and customer experience and the degree of satisfaction of individuals in the United Arab Emirates due to their use of or engagement with digital solutions of the telecommunications sector, independent of generational differences.

Ahmad, A. H., Masri, R., Zeh, C. M., Shamsudin, M. F., & Fauzi, R. U. A. (2020), they evaluate the impact of digital anti-fraud measures on the occurrence of occupational fraud, specifically in telecommunication industry, it was designed as a case study specifically in telecommunication industry involving underpinning theories and models. The paper has identified in view of digital disruption; the presence of technology advancement reduces the fraud opportunity element.

Majumdar, S. K. (1997), they studied the impact of digital technology diffusion on the productivity of firms making up the local operating sector of the U.S. telecommunications industry for the years 1991 to 1993, they found the spread of digital technology within the U.S. local telephone network plays a significant and positive role in impacting productive efficiency of the firms making up the network.

Pretorius, D. A. (2019) , the aim of this study is to explore the factors that affect digital transformation in a telecommunications company in South Africa using the explorative research strategy and the come up by the successful digital transformation of companies depends on how Management drives digital transformation, and the benefits of new digital technologies should be carefully considered when planning to implement digital transformation.

Silakova, L., & Nikishina, A. (2021, October) , The aim of the study is to propose the approach to managing of the digital transformation of customer loyalty systems of telecommunications companies by the measures of the business process management improving based on e-TOM model. They come up that the effectiveness of the digital transformation of the telecom provider's customer loyalty system show an increase in the efficiency coefficient from 0.62 to 1.08.

Radukić, Snežana, Zoran Mastilo, and Zorana Kostić(2019). Describe the impacts of digital transformation in the telecommunications markets which are characterized by network externalities. By showing disruptive effects of digital transformation age, the paper highlights challenges which were created by advancement of technological capabilities to discuss whether digital transformation could participate in customer satisfaction in telecommunications markets.

Pretorius, D. A. (2019). From this research, it was concluded, inter alia, that successful digital transformation of companies depends on how management leads digital transformation, and the benefits of new digital technologies should be carefully considered when planning to implement digital transformation. Therefore, the aim of this study was to explore the factors that influence digital transformation in a telecommunications company in South Africa, 'What are the factors that influence digital transformation in a telecommunications company in South Africa?' To answer this question, a study was conducted in one of the telecommunications companies in South Africa.

Aldiab, A., Chowdhury, H., Kootsookos, A., Alam, F., Alluhaybi, A., & Aloufi, H. (2022, November). The high-speed and reliable internet infrastructures are prerequisites for eLearning education, including virtual laboratories, remote-controlled laboratories, virtual reality (VR), and augmented reality (AR). Therefore, eLearning tools in the education process require efficient internet connection infrastructure in metropolitan areas and rural areas. This paper reviews the current telecommunication infrastructure in Saudi Arabia to highlight the minimum required standard for eLearning infrastructures.

Al-Ruithe, M., & Benkhelifa, E. (2017, October). Digital transformation in Saudi Arabia is one of the core elements to achieve the goals of Saudi Vision 2030. This paper puts the Kingdom of Saudi Arabia Vision 2030 for digital transformation under a test. The results of the study reveal that despite the wide recognition of the importance of data governance, especially for cloud computing, there is a consensus that this area is really in its infancy and almost absent from the Saudi organizations.

Trenerry, B., Chng, S., Wang, Y., Suhaila, Z. S., Lim, S. S., Lu, H. Y., & Oh, P. H. (2021). The increasing demand for digital transformation will negatively affect creative employees with multiple practical, scientific, and administrative skills, as technology tools have begun to replace them and they no longer need them, and thus it will lead to a decline in interest in developing their personal skills. This is one of the most important challenges that organizations and governments face, and this indicates that most companies You will face an increasing decline in skills in the coming years

Quasim, M. T. (2021). The Internet of Things (IoT) is opening up new opportunities and challenges for Saudi Arabia to enhance its economic growth. The country's recent digital reforms encompass artificial intelligence (AI), blockchain, smart solutions, and related technologies.

Saudi Arabia is prepared to embrace IoT, with data-driven innovations already established in areas such as energy, education, environmental management, security, traffic, healthcare, and open data. The adoption of IoT will enable Saudi Arabia's economy to become truly self-sufficient. A survey revealed that a significant majority (66%) of medium-to-large organizations

in Saudi Arabia believe that Industrial IoT (IIoT) technologies will be crucial within the next five years. IoT will serve as a key driver for economic diversification, ultimately leading to job creation for the Saudi population. It is clear that IoT technology will play a vital role in Saudi Arabia's transformation efforts, as outlined in Vision 2030.

AlGhazzawi, . N. A., & Katooa, N. E. (2019). Saudi businesses depend on efficient data management to operate within their internal and external supply (value) chains, requiring constant monitoring and updates to legacy data systems. This study delves into the experiences of six diverse Saudi firms through case studies: an air transport data system, vertical integration of global firms' subsidiaries, a value chain system, and entrepreneurs leveraging cloud opportunities and how these firms integrated cloud technologies with their existing or new business models. The case studies were conducted after the implementation of cloud data projects to qualitatively evaluate the expectations of firm owners and executives regarding their initiatives. The overall findings revealed that firms experienced improved integration with upstream international suppliers, better cost control, and new business model advantages when operating online. Among the cases, two retailers and an intermediary/retail stationer expanded to online sales platforms using their new cloud-based data resources. The largest firm utilized its industry leadership to develop online data integration within its value chains. The remaining firms approached the transition more cautiously.

Dahlan, K. R., Badawi, A. A., & Megahed, A. (2022). To continue being a driver of prosperity, the Kingdom is heavily investing in these sectors and advancing toward Industry 5.0 technologies with a vision that extends beyond just efficiency and productivity.

Unlike Industry 4.0 (i4.0), Industry 5.0 (i5.0) focuses on research and innovation aimed at creating a human-centric and sustainable industry. Numerous Saudi organizations are pursuing educational partnerships through agreements with academic institutions to facilitate the transition from i4.0 to i5.0. Leading the charge are King Abdullah University of Science and Technology (KAUST) and King Abdulaziz University, which have active collaborations with international academic institutions and various government research bodies to support and execute research projects beneficial to the industrial sector. These efforts aim to build a knowledge-based economy through scientific research. Additionally, the Saudi government has entered into an agreement with the World Economic Forum (WEF) to establish an in-Kingdom branch of WEF's Centre for the Fourth Industrial Revolution, making it the fifth of its kind globally. This collaboration, managed by King Abdulaziz City for Science and Technology (KACST), is designed to develop strategies, plans, and applications for Industry 4.0 within the nation. It includes initiatives for awareness and governance that promote the adoption of technology and best practices both regionally and globally, positioning Saudi Arabia as a key player in the global 4th Industrial Revolution network alongside countries like India and China. The center also serves as a platform for additional cooperation opportunities with other government agencies and institutions, focusing on developing solutions and supporting capacity building, skill advancement, and other competencies related to Industry 4.0.

AlBar, A. M., & Hoque, M. R. (2019). Small and medium enterprises (SMEs) can significantly impact the national economy in developing nations. The integration of information and communication technology (ICT) has allowed local SMEs to engage in the global market. Despite this, there is limited research on the challenges SMEs face when adopting ICTs, particularly in rural regions of Middle Eastern developing countries like Saudi Arabia. This study utilized the extended technology-organization-environment framework, incorporating personal innovativeness, to explore the factors influencing ICT adoption among SMEs in Saudi Arabia's rural areas. The findings revealed that factors such as relative advantages, top management support, culture, regulatory environment, owner/manager innovativeness, and ICT knowledge were strongly linked to ICT adoption. In contrast, factors like compatibility, complexity, and competitive environment did not show a significant correlation with ICT adoption among SMEs in the region.

2.2 Theoretical Framework of the Study:

This theoretical framework outlines the critical elements and relationships that need to be examined to understand the impact of digital transformation on productivity and efficiency in the telecom sector in KSA. By integrating multiple theories, this framework provides a comprehensive approach to investigating how digital transformation drives organizational performance improvements.

Definition and Scope: Digital transformation refers to the integration of digital technology into all areas of a business, fundamentally changing how it operates and delivers value to customers.

Key Components: Technology adoption, digital culture, process innovation, and business model transformation.

- Increased efficiency, improved customer experience, enhanced decision-making, and innovation.
- Relevance: How telecom companies in KSA develop dynamic capabilities to adapt to digital innovations.
- Focus: Balancing technical and social aspects to optimize productivity and efficiency in telecom companies undergoing digital transformation.
- Application: Evaluating the impact of digital transformation initiatives on various dimensions of telecom company performance in KSA.

Chapter 3

Research Methodology

Introduction:

In this research descript method was used by doing a survey over a sample of telecommunication sectors employees in Madinah region with the aid of SPSS technology analytical tool. Surveys Structured questionnaires will be distributed to employees, managers, and IT professionals in various telecom companies in Saudi Arabia and will include questions on digital tools and technologies used, changes in work processes, productivity metrics, and efficiency improvements.

3.1 Research Design:

The research adopts a methodology design approaches. Aspect involves the use of surveys to collect data from telecom companies, while the aspect includes to gain in-depth insights into digital transformation practices and challenges

3.2 Population of the Study:

The population of the study comprises all telecom companies operating in Saudi Arabia, including both major players and smaller service providers.

3.3 Sample Size Determination:

The sample size is determined using a combination of stratified sampling and purposive sampling techniques. A sample of 30 telecom companies is selected to ensure representation from different segments of the industry. The sample size is calculated using statistical methods to ensure it is sufficient to provide reliable and valid results.

3.4 Data Collection Procedures:

1. **Survey Questionnaire:** A structured questionnaire is developed and distributed to key personnel in the telecom companies, such as IT managers, digital transformation officers, and operational managers.
2. **Case Studies:** Detailed case studies of selected telecom companies that have undergone significant digital transformation are compiled.
3. **Secondary Data:** Relevant secondary data from industry reports, company documents, and academic literature are also utilized.

3.5 Study Determinations:

- The study aims to determine: The extent to which digital transformation has been adopted in the telecom sector .
- The specific technologies and practices that have the most significant impact on productivity and efficiency.
- The primary barriers to successful digital transformation.
- The correlation between digital transformation efforts and organizational performance metrics.

3.6 Method of Analysis:

Statistical analysis will be performed on survey data using software SPSS.

3.7 Research Limitation:

- **Objective Boundaries;**

The research sample will target deliberately a range of A total of 200 survey respondents will be targeted to ensure a representative sample from different telecom companies. Where the total original community are (1000) employees.

- **Temporal Limits;**

The survey was conducted from July 2024 to August 2024.

- **Spatial Limits;**

The study was conducted at the telecommunications sector in Madinah Region.

Research Finding??

Research Recommendations??

Chapter 4

Practical Study

Results and Recommendations

4.1 Sample Characters:

The study sample consists of 202 from Saudi Arabian telecom employees.

Table 4.1: Demographic Characteristics

Variables	Categories	N	%
Gender	Male	201	99.5
	Female	1	0.5
Age	20 - 30 Years	15	7.4
	30 - 40 Years	103	51.0
	40 -50 Years	72	35.6
	Above 50 Years	12	5.9
Edccation Level	Bachelor	147	72.8
	Diploma	19	9.4
	Masters	28	13.9
	PhD	1	.5
	Other	7	3.5

Working Experience	Less than 5 Years	6	3.0
	5 - 10 Years	38	18.8
	10 -15 Years	66	32.7
	Above than 15 Years	92	45.5
Filed of Experience	IT	16	7.9
	Telecommunications	163	80.7
	Others	23	11.4
Job Title	Chief	4	2.0
	Director	12	5.9
	Junior Engineer	11	5.4
	Manager	56	27.7
	Technicon	7	3.5
	Senior Engineer	79	39.1
	Other	33	16.3
Total		202	100.0

The results showed there were 202 participants all of them except one was male while there was one female. The majority aged from 30 – 40 years with a ratio of 51%, 20.3% aged 40-50 years, 7.4% from 20 – 30 years, 5.9% above 50 years. The most common educational level was bachelor with 72.8%, 13.9% master, 9.4% diploma, 0.5% PhD, while 3.5% had other educational level. For the working experience 3% of the study sample has an experience less than 5 years, 18.8% from 5-10 years, 32.7% from 10-15 years, and 45.5% above than 15 years. 80.7% from the participants works at telecommunications field, 7.9% in the IT field, while 11.4% in other fields. Finally, the job title divided as 39.1% was senior engineer, 27.7% was managers, 2% was chiefs, 5.9% was director, 5.4% was junior engineer, 3.5% was Technician, 16.3% from other job titles.

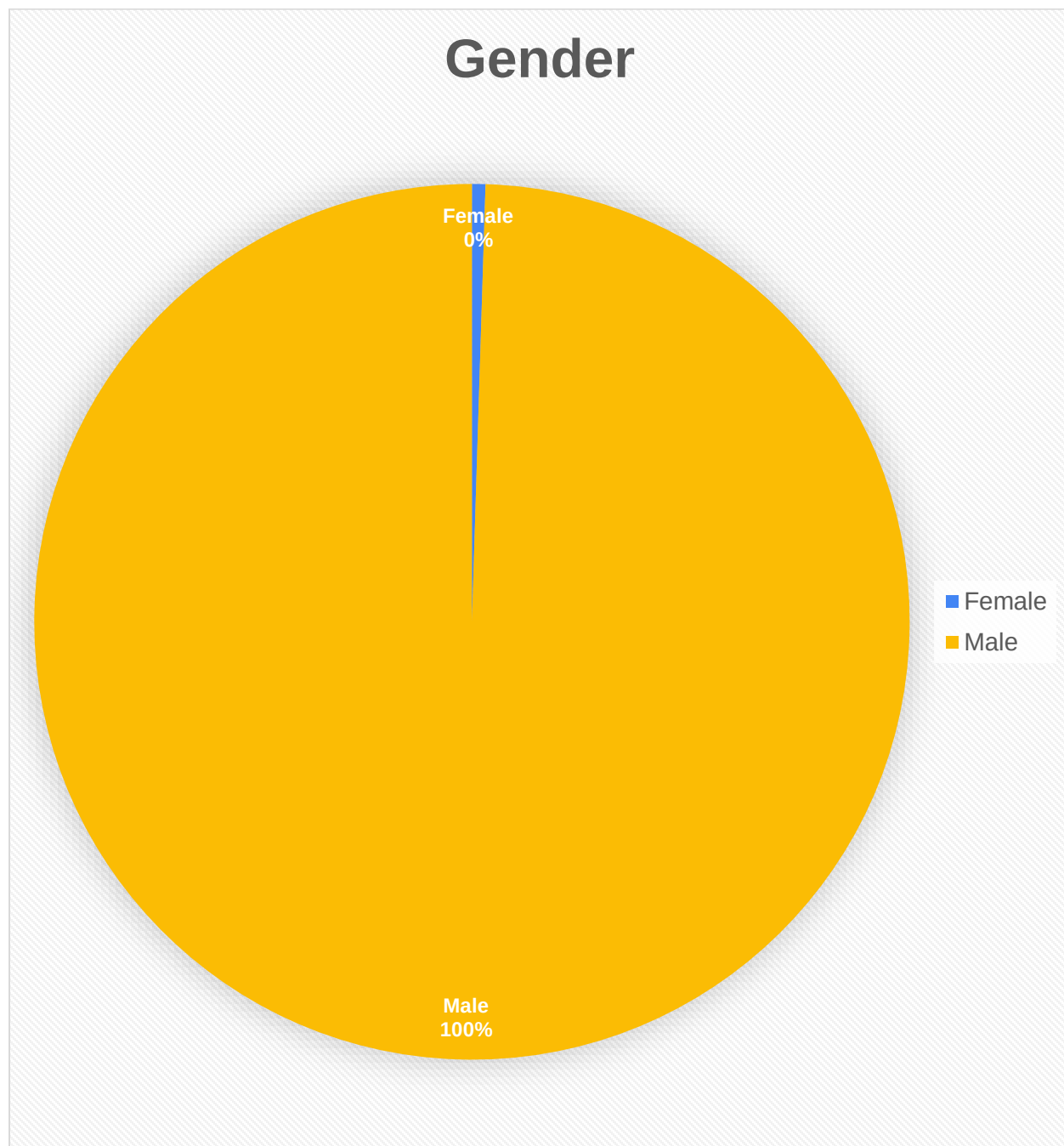


Figure 4.1 : Number of Participants per Gender

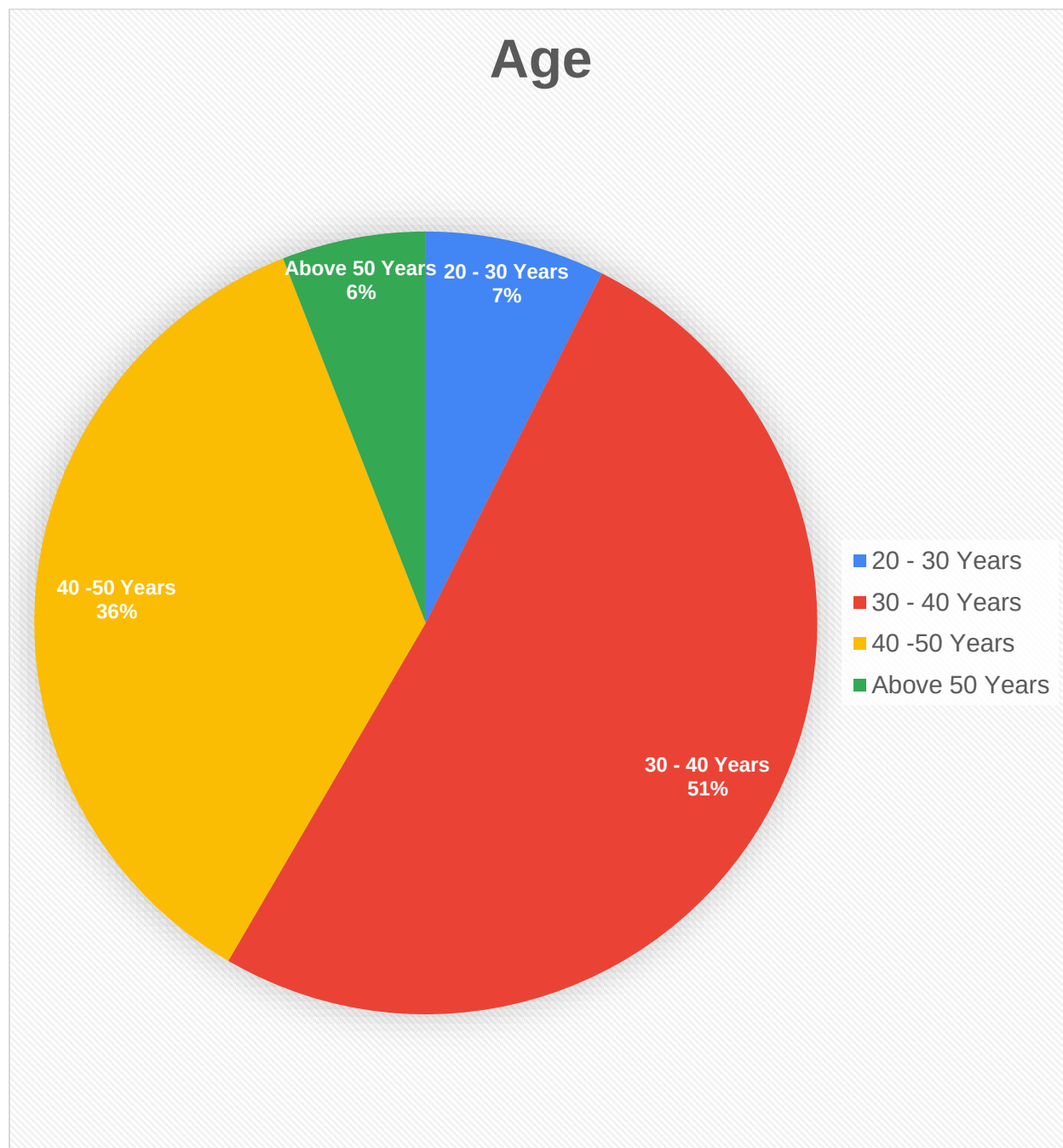


Figure 4.2 : Number of Participants per Age

Highest Level of Education

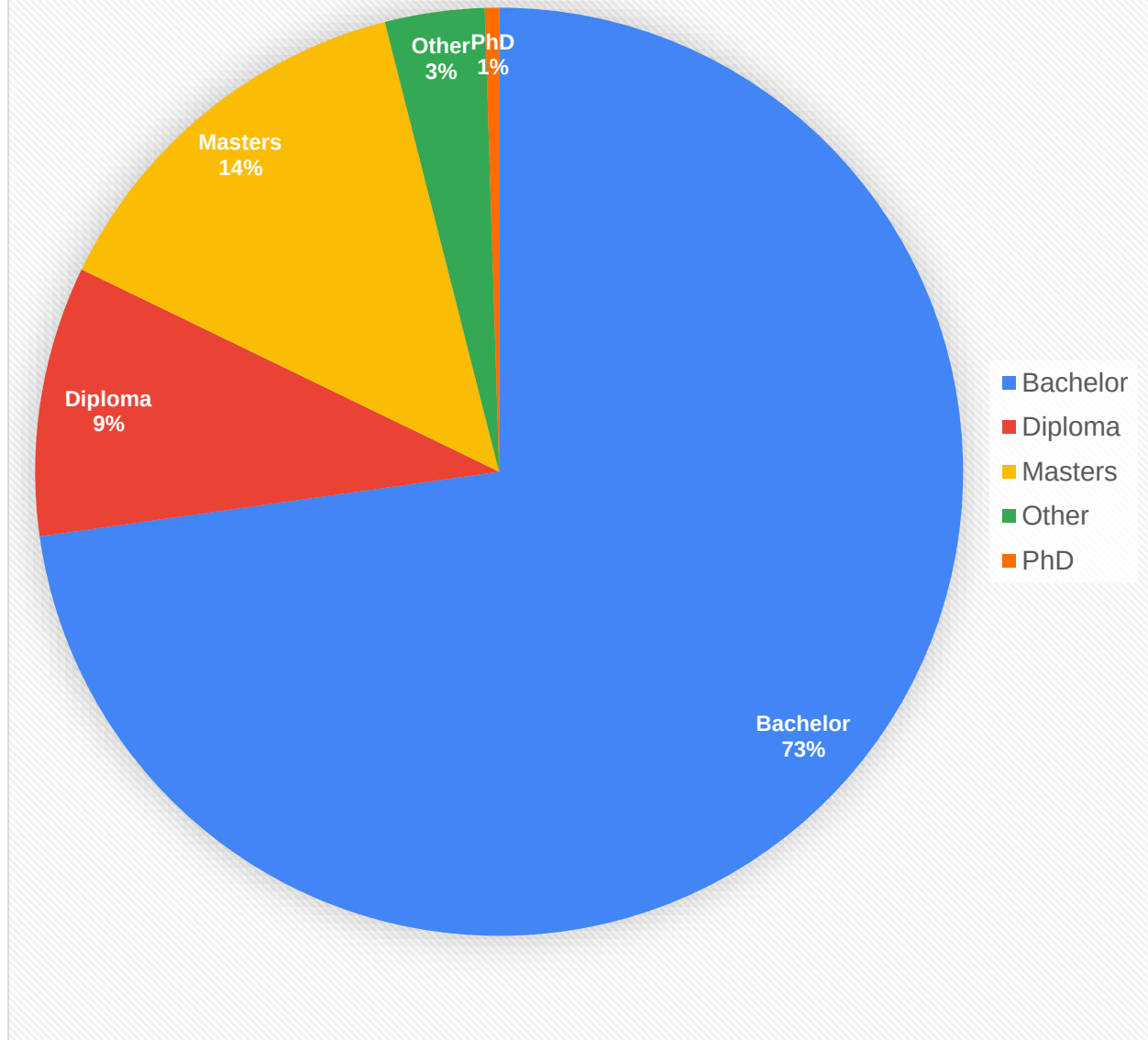


Figure 4.3 : Number of Participants per Education Level

Years of Experience

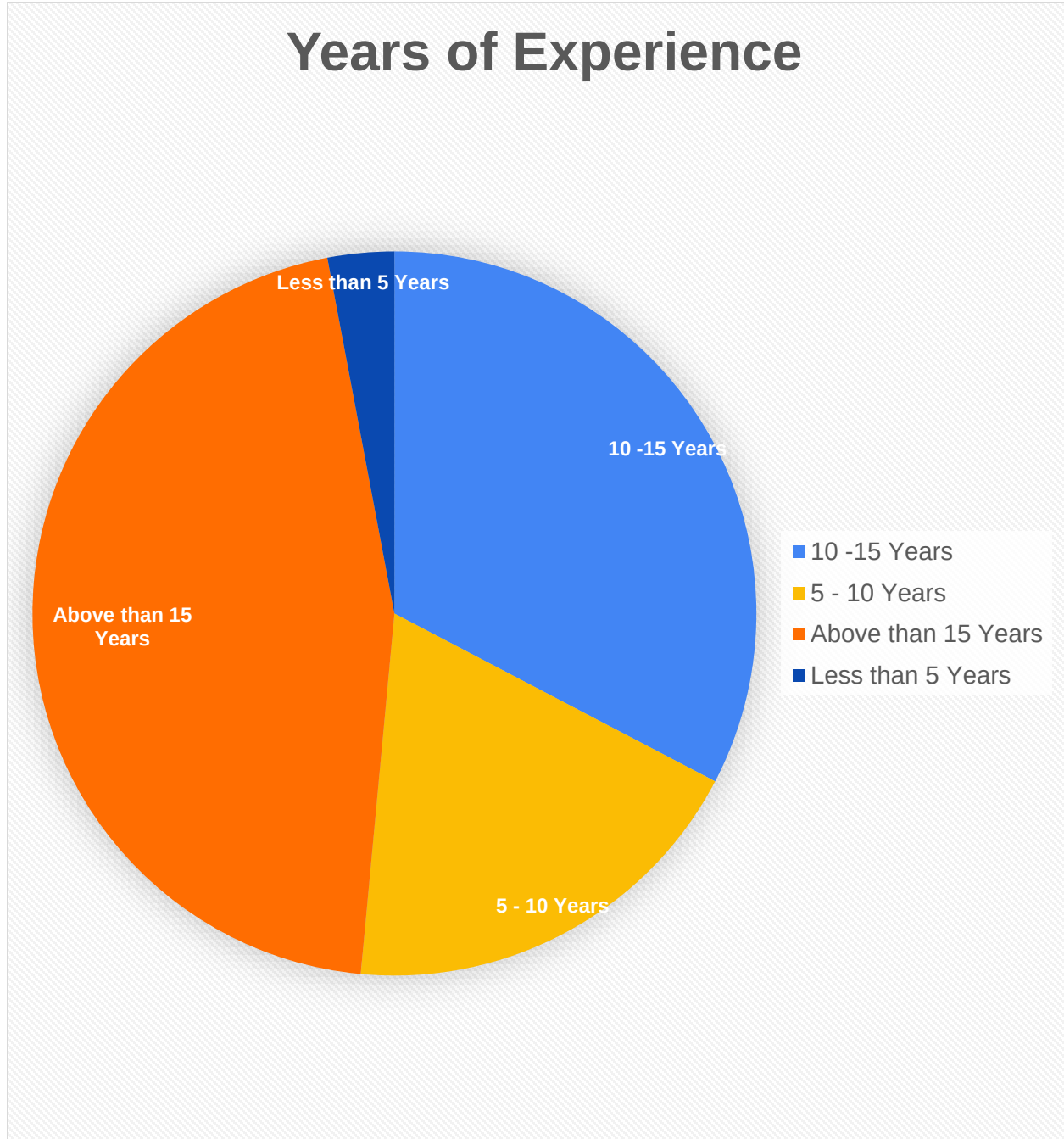


Figure 4.4 : Number of Participants per Working Experience

Filed of Experience

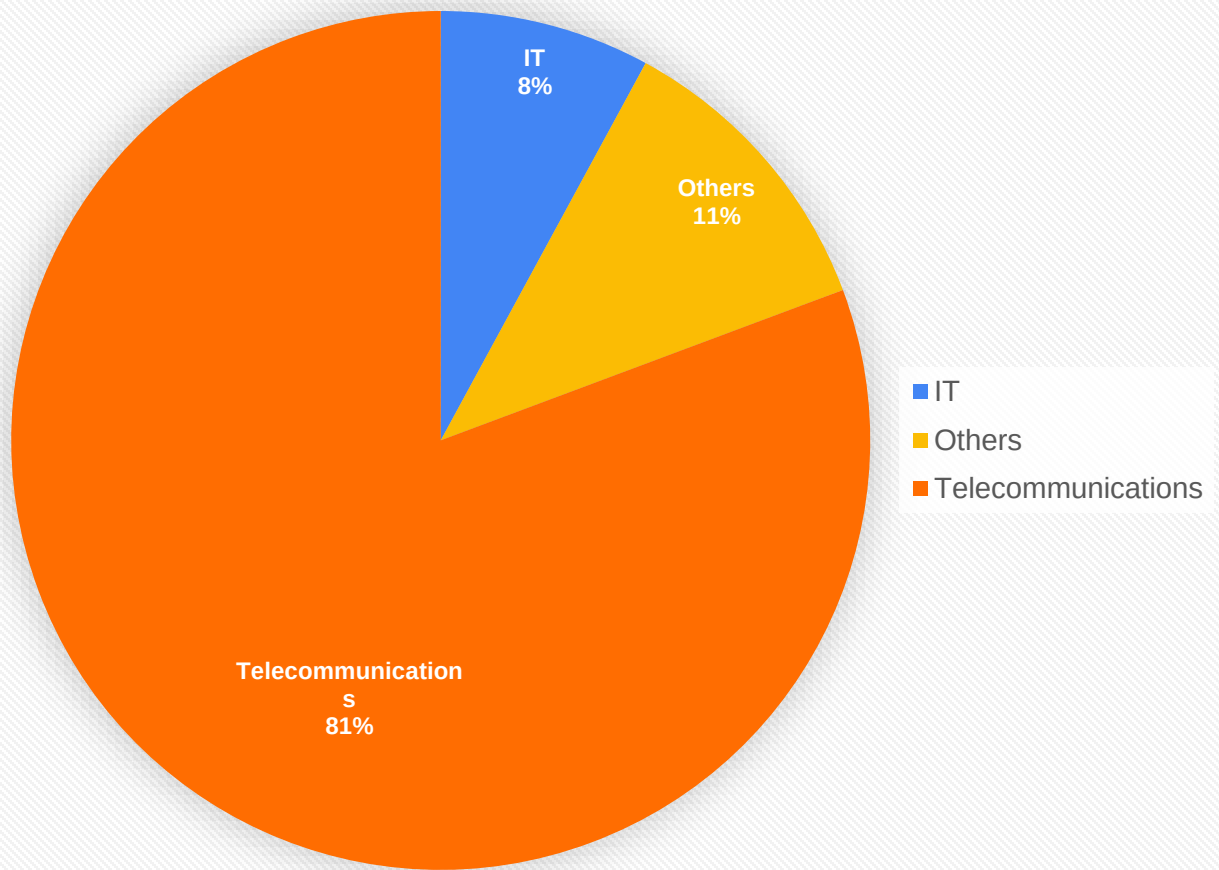


Figure 4.5 : Number of Participants per Filed of Experience

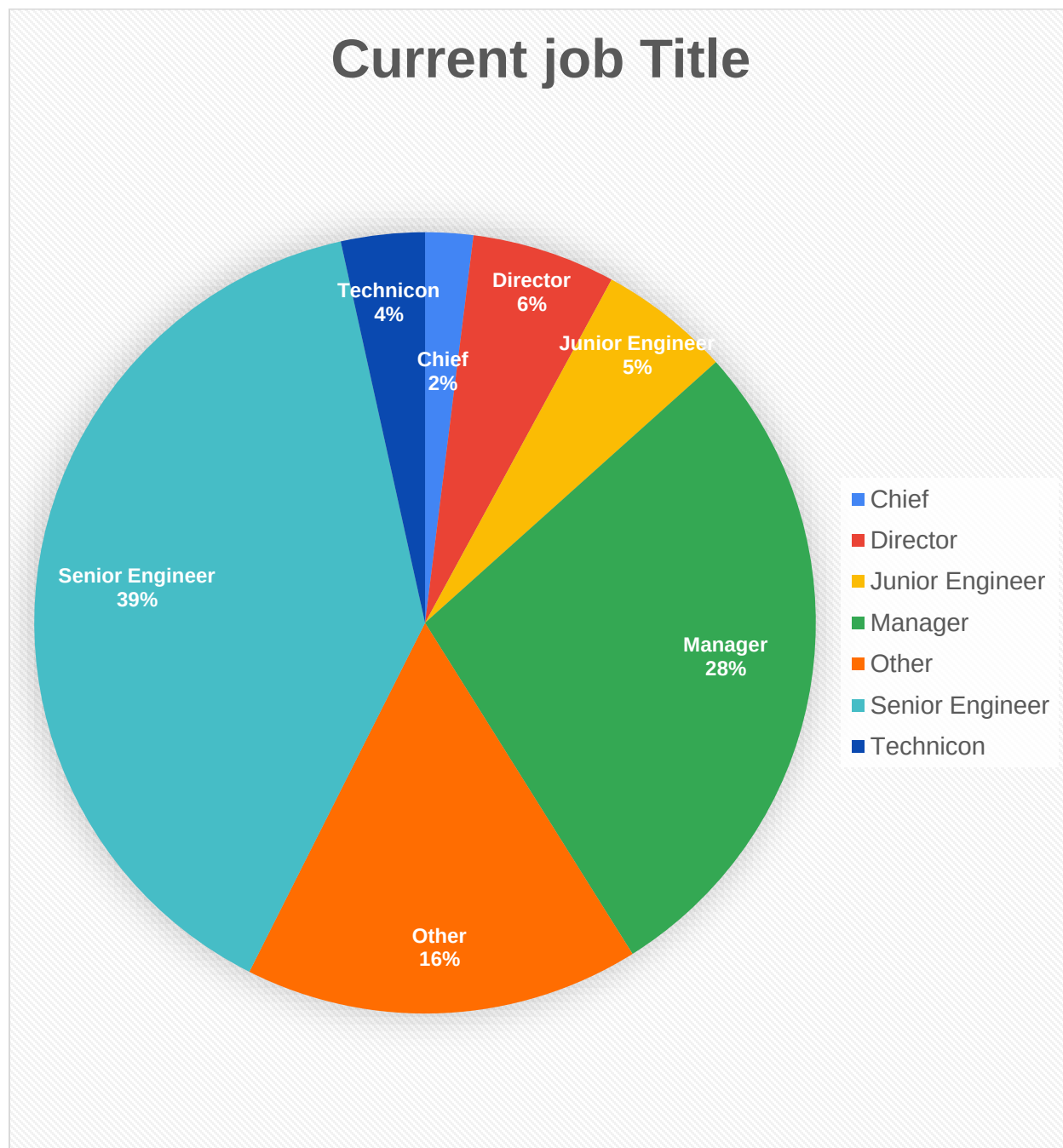


Figure 4.6 : Number of Participants per Job Title

4.2 Reliability:

The researcher verified the reliability of the study's questionnaire using the internal consistency by Alpha Cronbach's equation, the results showed in table.

Table 4.2: Reliability coefficients for the questionnaire

N	Domains	N. items	Cronbach's Alpha
1	Understanding Digital Transformation	4	0.874
2	Digital Tools and Technologies	5	0.901
3	Efficiency Productivity& Accuracy	3	0.950
4	Work Quality and Output	2	0.885
5	Collaboration and Communication	2	0.928
6	Employee Satisfaction	2	0.865
7	Future Perspectives	2	0.742

The results showed that the Cronbach's Alpha coefficients ranged between 0.742 and 0.950, which mean that the questionnaire has good reliability.

Table 4.3 : Mean range of Likert scale:

Mean range	Level
1.00-2.33	Low
2.34-3.66	Moderate
3.67-5.00	High

4.3 Primary Analyses:

The researcher calculates the means and standard deviations for each domain as follow.

1. Understanding Digital Transformation

Table: means and standard deviations for Understanding Digital Transformation domain

No	Items	Mean	SD	Level
1	How familiar are you with digital transformation in general?	3.73	1.128	high
2	How familiar are you with digital transformation initiatives in the KSA telecom sector?	3.50	1.156	moderate
3	How much do you believe that digital transformation tools can perform work accurately?	3.93	1.079	high
4	How much do you believe that digital transformation tools should replace traditional ways of working	3.87	1.152	high
5	Understanding Digital Transformation	3.76	0.962	high

The results showed that the level of understanding digital transformation level was high with a mean of 3.76, while the means of the items ranged between 3.50-3.93. The highest item mean was “How much do you believe that digital transformation tools can perform work accurately?”, with a mean of 3.93, the lowest item mean was “How familiar are you with digital transformation initiatives in the KSA telecom sector?” with a mean of 3.50.

4.4 Digital Tools and Technologies:

Table 4.4 : Means and standard deviations for digital tools and technologies domain

No	Items	Mean	SD	Level
1	How would you rate the implementation and usage of digital tools in your organization?	3.58	1.086	moderate
2	How interested is your organization in automation by shifting to perform tasks using digital tools?	3.88	1.113	high
3	How interested are you in performing your tasks with digital tools instead of the traditional way?	4.08	1.121	high
4	How much do you estimate your current usage of digital tools to accomplish your work?	3.54	1.013	moderate
5	How frequently do you currently use digital tools in your work?	3.66	1.045	moderate
6	digital tools and technologies	3.75	0.911	high

The results showed that the level of digital tools and technologies level was high with a mean of 3.75, while the means of the items ranged between 3.54 - 4.08. The highest item mean was “How interested are you in performing your tasks with digital tools instead of the traditional way?” with a mean of 4.08, the lowest item mean was “How much do you estimate your current usage of digital tools to accomplish your work?” with a mean of 3.54.

4.5 Efficiency Productivity& Accuracy:

Table 4.5 : means and standard deviations for efficiency productivity& accuracy domain

No	Items	Mean	SD	Level
1	How positively has digital transformation impacted your overall efficiency at work?	3.90	1.111	high
2	How positively has digital transformation impacted your overall productivity at work?	3.94	1.146	high
3	How confident are you in the results of digital transformation tools?	3.96	1.169	high
4	Efficiency productivity& accuracy	3.93	1.089	high

The results showed that the level of efficiency productivity& accuracy level was high with a mean of 3.93, while the means of the items ranged between 3.90-3.96. The highest item mean was “How confident are you in the results of digital transformation tools?”, with a mean of 3.96, the lowest item mean was “How positively has digital transformation impacted your overall efficiency at work?” with a mean of 3.90.

4.6 Work Quality and Output:

Table 4.6 : means and standard deviations for work quality and output domain

No	Items	Mean	SD	Level
1	How do you evaluate the improvement in quality in your work since you started using digital transformation initiatives?	3.88	1.083	high
2	To what extent do you think digital transformation tools contribute to speed up work completion?	4.10	1.130	high
3	work quality and output	3.99	1.049	high

The results showed that the level of work quality and output level was high with a mean of 3.99, while the means of the items ranged between 3.88-4.10. The highest item mean was “To what extent do you think digital transformation tools contribute to speed up work completion?”, with a mean of 4.10, the lowest item mean was “How do you evaluate the improvement in quality in your work since you started using digital transformation initiatives?” with a mean of 3.88.

4.7 Collaboration and Communication:

Table 4.7 : means and standard deviations for Collaboration and Communication domain

No	Items	Mean	SD	Level
1	How having digital tools influenced your ability to collaborate with colleagues?	3.72	1.085	high
2	How having digital tools impacted communication within your team and with other departments?	3.84	1.101	high
3	Collaboration and Communication	3.78	1.056	high

The results showed that the level of Collaboration and Communication level was high with a mean of 3.78, while the means of the items ranged between 3.72-3.84. The highest item mean was “How having digital tools impacted communication within your team and with other departments?”, with a mean of 3.84, the lowest item mean was “How having digital tools influenced your ability to collaborate with colleagues?” with a mean of 3.72.

4.8 Employee Satisfaction:

Table 4.8 : means and standard deviations for Employee Satisfaction domain

No	Items	Mean	SD	Level
1	How satisfied are you with the digital tools and technologies provided by your company?	3.68	1.124	high
2	How much does digital transformation help you feel engaged and motivated at work?	3.85	1.116	high
3	Employee Satisfaction	3.76	1.051	high

The results showed that the level of Employee Satisfaction level was high with a mean of 3.76, while the means of the items ranged between 3.68-3.85. The highest item mean was “How much does digital transformation help you feel engaged and motivated at work?”, with a mean of 3.85, the lowest item mean was “How satisfied are you with the digital tools and technologies provided by your company?” with a mean of 3.68.

4.9 Future Perspectives:

Table 4.9 : means and standard deviations for Future Perspectives domain

No	Items	Mean	SD	Level
1	To what extent do you believe digital transformation will continue to drive efficiency and productivity in the telecom sector?	4.15	1.155	high
2	To what extent do you think digital transformation tools can replace human labor at work?	3.44	1.158	moderate
3	Future Perspectives	3.79	1.031	high

The results showed that the level of Future Perspectives level was high with a mean of 3.79, while the means of the items ranged between 4.15-3.44. The highest item mean was “To what extent do you believe digital transformation will continue to drive efficiency and productivity in the telecom sector?”, with a mean of 4.15, the lowest item mean was “To what extent do you think digital transformation tools can replace human labor at work?” with a mean of 3.44.

4.10 Regression results:

1. How does digital transformation influence Efficiency Productivity& Accuracy in telecom companies?

To investigate the influence of digital transformation includes (Understanding Digital Transformation, digital tools and technologies) on Efficiency Productivity& Accuracy in telecom companies, multi-regression was calculated. Table shows the results.

Table 4.10 : Multi-regression test results for the influence of digital transformation includes on Efficiency Productivity& Accuracy in telecom companies

Variable	Model Summary		ANOVA		Coefficients		
	R	R ²	F	Sig.	Beta	t	Sig.
Understanding Digital Transformation	.826	.682	213.184	.000	.369	6.530	.000
digital tools and technologies					.523	9.269	.000

Table shows that the digital transformation includes (Understanding Digital Transformation, digital tools and technologies) explained 68.2% from Efficiency Productivity& Accuracy in telecom companies ($F= 213.184$, $p\text{-value}<0.05$). R value was .826. digital tools and technologies have the higher effect on Efficiency Productivity& Accuracy which Beta was .523, while Understanding Digital Transformation have lower effect on Efficiency Productivity & Accuracy which Beta was .369.

2. What impact does digital transformation have on the Work Quality and Output of telecom companies in KSA?

To investigate the impact of digital transformation includes (Understanding Digital Transformation, digital tools and technologies) on work quality and output in telecom companies, multi-regression was calculated. Table shows the results.

Table 4.11 : Multi-regression test results for the impact of digital transformation includes on work quality and output in telecom companies

Variable	Model Summary		ANOVA		Coefficients		
	R	R ²	F	Sig.	Beta	t	Sig.
Understanding Digital Transformation	.821	.674	205.616	.000	.344	6.015	.000
digital tools and technologies					.541	9.475	.000

Table shows that the digital transformation includes (Understanding Digital Transformation, digital tools and technologies) explained 67.4% from work quality and output in telecom companies ($F = 205.616$, $p\text{-value} < 0.05$). R value was .821. digital tools and technologies have the higher effect on Efficiency Productivity& Accuracy which Beta was .541, while work quality and output have lower effect on work quality and output which Beta was .344.

3. How does digital transformation impacting Collaboration and Communication between coworkers of telecom companies in KSA?

To investigate the impact of digital transformation includes (Understanding Digital Transformation, digital tools and technologies) on collaboration and communication between coworkers in telecom companies, multi-regression was calculated. Table shows the results.

Table 4.12 : multi-regression test results for the impact of digital transformation includes on collaboration and communication between coworkers in telecom companies

Variable	Model Summary		ANOVA		Coefficients		
	R	R ²	F	Sig.	Beta	t	Sig.
Understanding Digital Transformation	.772	.597	147.102	.000	.302	4.752	.000
digital tools and technologies					.529	8.322	.000

Table shows that the digital transformation includes (Understanding Digital Transformation, digital tools and technologies) explained 59.7% from collaboration and communication between coworkers in telecom companies ($F = 147.102$, $p\text{-value} < 0.05$). R value was .772. Digital tools and technologies have the higher effect on collaboration and communication between coworkers which Beta was .529, while Understanding Digital Transformation have lower effect on collaboration and communication between coworkers which Beta was .302.3

4. How does digital transformation impacting Employee Satisfaction of telecom companies in KSA?

To investigate the impact of digital transformation includes (Understanding Digital Transformation, digital tools and technologies) on employee satisfaction in telecom companies, multi-regression was calculated. Table shows the results.

Table 4.13 : multi-regression test results for the impact of digital transformation includes on employee satisfaction in telecom companies

Variable	Model Summary		ANOVA		Coefficients		
	R	R ²	F	Sig.	Beta	t	Sig.
Understanding Digital Transformation	.794	.631	169.800	.000	.261	4.284	.000
digital tools and technologies					.588	9.675	.000

Table shows that the digital transformation includes (Understanding Digital Transformation, digital tools and technologies) explained 63.1% from employee satisfaction in telecom companies ($F= 169.800$, $p\text{-value}<0.05$). R value was .794. digital tools and technologies have the higher effect on employee satisfaction which Beta was .588, while Understanding Digital Transformation have lower effect on employee satisfaction which Beta was .261.

5. How does digital transformation impacting Future Perspectives of telecom companies in KSA?

To investigate the impact of digital transformation includes (Understanding Digital Transformation, digital tools and technologies) on employee satisfaction in telecom companies, multi-regression was calculated. Table shows the results

Table 4.14 : multi-regression test results for the impact of digital transformation includes on employee satisfaction in telecom companies

Variable	Model Summary		ANOVA		Coefficients		
	R	R ²	F	Sig.	Beta	t	Sig.
Understanding Digital Transformation	.738	.544	118.677	.000	.385	5.694	.000
digital tools and technologies					.414	6.123	.000

Table shows that the digital transformation includes (Understanding Digital Transformation, digital tools and technologies) explained 54.4% from employee satisfaction in telecom companies ($F= 118.677$, $p\text{-value}<0.05$). R value was .738. digital tools and technologies have the higher effect on employee satisfaction which Beta was .414, while Understanding Digital Transformation have lower effect on employee satisfaction which Beta was .385.

4.11 Conclusion:

Digital transformation can be effectively leveraged to boost productivity and efficiency in the telecom sector in the Kingdom of Saudi Arabia (KSA) through several strategic methods:

1. **Process Automation:** By adopting digital tools and technologies such as robotic process automation, telecom companies can streamline repetitive tasks like network maintenance, customer service workflows, and billing operations. Automation cuts down the time and resources required to complete these tasks, reduces the chance of human error, and allows employees to focus on more complex and high-value activities.
2. **Advanced Data Analytics:** The utilization of big data analytics, enabled by digital transformation, allows telecom firms to process and analyze large volumes of data generated by their networks and customers. T, allocate resources more efficiently, and offer personalized customer experiences, all of which enhance efficiency and productivity.
3. **Deployment of Next-Generation Networks:** The implementation of advanced networks, such as 5G, allows telecom companies to provide faster, more reliable services. The increased capacity and reduced latency of 5G networks enable the integration of new technologies like the Internet of Things (IoT) and edge computing, which further enhance operational efficiency by facilitating real-time data processing and more responsive service delivery.
4. **Innovation and Collaboration:** Digital platforms and tools enable greater collaboration within telecom companies and with external partners. companies can quickly respond to changing market conditions, introduce new services, and maintain competitiveness in a rapidly evolving industry

5. Support for Remote Operations: The adoption of digital communication and collaboration tools allows telecom companies to effectively support remote work, leading to cost savings on physical office space and resources, while also increasing employee productivity through more flexible working arrangements.

By strategically adopting these digital transformation initiatives, telecom companies in KSA can significantly enhance their productivity and efficiency, ensuring they remain competitive and well-positioned to meet the demands of the digital era.

4.11 Recommendations:

1. Efficiency, Productivity, & Precision

- **Automate Tasks:** Use RPA to reduce errors and boost productivity by automating routine tasks like data processing and billing.
- **AI for Decision-Making:** Leverage AI to enhance decision accuracy and operational efficiency with real-time data insights.
- **System Integration:** Streamline workflows across departments with integrated IT solutions.

2. Work Quality and Output

- **Advanced Tools:** Equip employees with cutting-edge analytics to improve data interpretation and work quality.
- **Continuous Monitoring:** Use IoT to monitor network performance, ensuring high service quality.
- **Digital Training:** Enhance employee skills through targeted digital training programs.

3. Collaboration and Communication

- **Unified Platforms:** Implement communication tools that integrate messaging, video, and file sharing for seamless teamwork.
- **Cloud Collaboration:** Utilize cloud-based tools for real-time project collaboration.
- **Virtual Workspaces:** Create online environments for continuous collaboration and feedback.

4. Employee Satisfaction

- **Flexible Work:** Support remote work and flexible schedules to improve work-life balance.
- **Wellness Programs:** Introduce digital wellness platforms to enhance employee well-being.
- **Feedback Systems:** Use digital tools to regularly gather and address employee feedback.

5. Future Outlook

- **Innovate:** Invest in digital R&D to stay ahead of technological trends.
- **Scalability:** Adopt scalable solutions for quick adaptation and growth.
- **Strategic Planning:** Integrate digital transformation into long-term strategies for sustainable success.

These summarized recommendations focus on enhancing efficiency, work quality, collaboration, employee satisfaction, and long-term growth through digital transformation.

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Appendix – Questionnaire:

I'm a master student in Mid-Ocean University - College of Management/Department of Business Administration.

I'm carrying out a study for The Impact of Digital Transformation on the Efficiency and Productivity at Telecom Sector in the Kingdom of Saudi Arabia, and I would be happy if you could help us answer the following survey questions

These survey questions will use rating scale of 1 to 5, with as 1 is the lowest order answer and 5 as the highest.

1. Demographic Information:

1) Gender

Male ☐

Female ☐

2) Age

Under 20 Years ☐

20-30 Years ☐

30-40 Years ☐

40-50 Years ☐

Above 50 years ☐

3) Highest level of Education

Student ☐

Diploma ☐

Bachelor ☐

Masters ☐

PhD ☐

Other ☐

4) Years of experience:

Less than 5 Years ☐

5-10 Years ☐

10-15 Years ☐

Above than15 Years ☐

5) Filed of experience:

Telecommunication ☐

IT ☐

Other ☐

6) Current job title:

Chief Director ☐

Manager ☐

Senior Engineer ☐

Junior Engineer ☐

Technician ☐

Other ☐

2. Understanding Digital Transformation:

a) How familiar are you with digital transformation in general?

1 2 3 4 5

b) How familiar are you with digital transformation initiatives in the KSA telecom sector?

1 2 3 4 5

c) How much do you believe that digital transformation tools can perform work accurately?

1 2 3 4 5

d) How much do you believe that digital transformation tools should replace traditional ways of working?

1 2 3 4 5

3. Digital Tools and Technologies:

a) How would you rate the implementation and usage of digital tools in your organization?

1 2 3 4 5

b) How interested is your organization in automation by shifting to perform tasks using digital tools?

1 2 3 4 5

c) How interested are you in performing your tasks with digital tools instead of the traditional way?

1 2 3 4 5

d) How much do you estimate your current usage of digital tools to accomplish your work?

1 2 3 4 5

e) How frequently do you currently use digital tools in your work?

1 2 3 4 5

4. Efficiency Productivity& Accuracy:

a) How positively has digital transformation impacted your overall efficiency at work?

1 2 3 4 5

b) How positively has digital transformation impacted your overall productivity at work?

1 2 3 4 5

c) How confident are you in the results of digital transformation tools?

1 2 3 4 5

2. Work Quality and Output:

- a) How do you evaluate the improvement in quality in your work since you started using digital transformation initiatives?

1 2 3 4 5

- b) To what extent do you think digital transformation tools contribute to speed up work completion?

1 2 3 4 5

6. Collaboration and Communication:

a) How having digital tools influenced your ability to collaborate with colleagues?

1 2 3 4 5

b) How having digital tools impacted communication within your team and with other departments?

1 2 3 4 5

7. Employee Satisfaction:

a) How satisfied are you with the digital tools and technologies provided by your company?

① ② ③ ④ ⑤

b) How much does digital transformation help you feel engaged and motivated at work?

① ② ③ ④ ⑤

8. Future Perspectives:

- a) To what extent do you believe digital transformation will continue to drive efficiency and productivity in the telecom sector?

1 2 3 4 5

- b) To what extent do you think digital transformation tools can replace human labor at work?

1 2 3 4 5