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Adoption of 5G Technology in Business Management

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Abstract

The growth and advancement of the 5G technology and how it affects Business Management since it is progressively growing is a potential for improvement of the business, especially in growing cities like Karachi, Pakistan. The following is the research objective of this study: To prove the relationship between usability and the utilization of the new 5G technology by corporations. In response to the research question formulated for this study, this research applied the exploratory mixed method approach whereby data was collected from 104 purposively selected corporate employees using a structured questionnaire adapted from the current study's developed 5-point Likert scale. Datasets were analyzed using SPSS software, and binary logistic regression analysis was applied to the independent variable, 5G adoption, and the dependent variable, business results. The results showed a highly significant positive relationship, which was quantified by the overall odd ratio (Exp(B)) of 19, which correlates with organizations' understanding of the need for a transition to 5G and its usage. As evident from the above findings, the key benefits accrued from the introduction of 5G include improved business efficiency, enhanced customer relations, and a call for innovation. However, the study also showed that rationales, including high fixed costs, are implicated in infrastructures and that the business topology entails training the employees. To help curb the changes, it is suggested that training be developed and subsequent relations with the suppliers cemented as stabilizing factors. It is against this background that this research has looked to the enhancement of the awareness of the organization of 5G benefits by calling for a culture change that would put into practice and reward stewardship of the technology advantage that the marketplace is demanding more and more as it is getting pumped up and flavored by technological solutions in its competitive products. Future research is needed to explain the impact of the application of 5G in various sectors and different areas.

Keywords: 5G Technology, Business Management, Technology Adoption, Operational Efficiency

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Introduction

The pace of development in technology has continually transformed the face of business management. With every new generation of communication technology, a path to improved operational efficiencies and novel business models emerges. This is where 5G technology fits in, offering the most opportunity to be transformational since it suggests a quantum jump from existing standards: faster data speeds combined with lower latencies and improved overall connectivity than ever before. We believe that the new generation of mobile technology is not simply an evolution but a revolution poised to deliver radical changes, bringing disruption across sectors and redefining how businesses market and sell their products/services. This will impact both consumer activities.

Organizations adopt 5G technology to accrue benefits; however, factors affecting the adoption need to be studied. According to the Technology Acceptance Model (Davis, 1989), the two main determinants of whether the technology will be accepted are perceived usefulness and ease of use. Furthermore, organizational support, training, and the attitude towards the culture of technology contribute a great deal to determining whether or not the new systems will be successfully integrated. However, these are factors that become all the more relevant for developing countries such as Pakistan because such nations are faced with their unique set of socio-economic challenges in the deployment of new and emerging technologies, including 5G. In this view, there will be a need to understand the factors that may assist developing countries in overcoming challenges and exploiting opportunities that could come with 5G.

The establishment of 5G technology is likely to have broader implications for business management practices. It will improve communication and real-time data processing and enhance customer engagement by providing personalized services. Due to 5G-enabled applications, businesses will also be able to achieve supply chain optimization with increased efficiency and competitiveness. Such benefits pinpoint the value that 5G technology could provide in transforming business operations. (Rao & Prasad, 2018; Kadena & Rajnai, 2024). However, the road to acceptance of 5G technologies is not smooth. Heavy infrastructural costs, regulatory challenges, and specialized resource requirements can become substantial barriers, especially in the corporate sector in Karachi. Moreover, low awareness and understanding of 5G from the point of view of employees might become a hurdle to its implementation.

Rationale of the Study

5G technology is not a trend but a necessity that every business organization operating in the fast-paced environment of Karachi, Pakistan, must embrace. Because organizations are interested in increasing organizational productivity and

innovativeness, it becomes important to appreciate the relationships between 5G technology and business management. Thus, this study will be useful in bridging the existing literature gap and analyzing the effects of adopting 5G in the corporate sector of Karachi. Here in this city, the transformation towards digitalized solutions is happening at a rather fast pace.

Problem Statement

This is mainly because all firms are struggling to grasp such aspects as the Usability of 5G or how one can integrate it; this is because there are no deliverables on the investment done in 5G. This research shows that there is little published academic literature available for analysis of empirical research on 5G technology and its application concerning business management in Karachi's corporate sector. Thus, this study strives to fill this gap and establish the important determinants in influencing the management of the business by adopting the 5G technology. It also vowed that there is a need to research the generated knowledge in this field.

Research Questions

1. How do corporate employees perceive the impact of 5G technology on business management practices?

Research Objectives

- To evaluate the perceived impacts of 5G Technology on Business Management.

Theoretical Framework

This research is theoretically underpinned by the Technology Acceptance Model (TAM), which argues that the ease of use and usefulness of technology greatly determine its use. (Davis, 1989). Using this conceptual framework, the research examines how such perceptions develop in the willingness of corporate employees in Karachi to adopt 5G. Other factors that will be examined as potential variables that would influence the adoption process include organizational support, technological infrastructure, and employee training.

Conceptual Framework

The theoretical framework for this research is founded on the Technology Acceptance Model. It demonstrates the foundation upon which it expounds the factors that would impact the acceptance of 5G technology in business management. As the framework already had, previous research has pointed out that perceived usefulness and ease of use are the key predictors for technology acceptance. These are, in effect, supposed to be the external variables, such as organizational support, technological infrastructure, and employee training, among others, that are supposed to affect these very perceptions. This research is conducted to assert how such relationships contribute to the overall decision-making process regarding the adoption of 5G technology at the corporate level in Karachi.

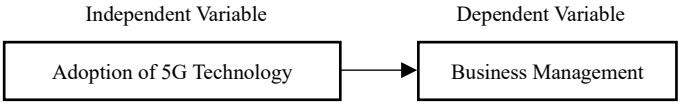


Figure 01: Conceptual Framework

Hypothesis

H1: There exists a significant relationship between the perceived usefulness of 5G technology and its adoption in business management.

Significance of the Study

This study holds enough value for many players. This will ensure that corporate leaders and decision-makers understand what factors impact 5G implementation so investments can be placed with an attitude of operational efficiency. Such employee insights will possibly lead to the development of even better training programs and other support systems to make it smoother for the employees to adapt to newer technologies. In addition, such findings will contribute to the current academic literature on technology adoption within emerging markets in the context of Karachi, Pakistan. Hopefully, therefore, we have been concentrating on developing broad discussions on technological developments within business management that would also comprise those particular challenges and opportunities posed by the adoption of 5G.

Literature Review

Rapid implementation of 5G technology is observed in business management. This technology has the potential to change the very nature of corporate operations. This review focuses on highlighting key findings from

existing literature to attempt to expound on the implications of 5G adoption, especially in the corporate landscape of Karachi, Pakistan.

Importance of 5G Technology

This technology is being appreciated due to its high speed, smallest latency, and huge capacity compared to previous generations. Such characteristics have also allowed it to innovate in other fields, including telecommunications, health, logistics, and many others, that boost operational effectiveness in the new business approach. (Elayoubi, et al., 2017). Notably, 5G is able to connect thousands of devices at the same time, thus enabling organizations to adopt an IoT solution that enhances their data analytics and real-time decision-making processes. (Khuntia, Singh, & Sahoo, 2021).

Factors Influencing Adoption

Theories of Technology Two factors determine the adoption of any new technological device: perceived usefulness and perceived ease of use, which the Technology Acceptance Model produces (Davis, 1989). Organizations that perceive any benefit from the adoption of new technology are more likely to invest and integrate such systems. (Venkatesh & Bala, 2008). Besides, factors such as organizational support and training greatly influence the success of using technology. (Maranguni & Grani, 2015). Some of the barriers to readiness in Pakistan include infrastructure shortfalls, cultural attitudes, and other economic situations toward the uptake of sophisticated technologies such as 5G.

Impact on Business Management

The influence in business management comes about through the arrival of 5G, which is said to revolutionize management practices in the business world because the innovation of products and services will enhance communication and customer engagement. For instance, applications of 5G make it possible for companies to synchronize their operation procedures. Through that, they can properly manage their chains of supply, hence saving, but still managing to be competitive financially.

Challenges in Adoption

Despite 5G technology's great abilities, there are challenges concerning its adoption that have to be negotiated. Potential obstacles in the Karachi corporate sector include massive investment in infrastructure, regulatory issues, and specialized skills (Hafeez, Shamsuddin, Nazeer, & Saeed, 2018). Not all organizations are convinced to invest in 5G since their already installed

technologies are helping them satisfy the current needs and requirements (Khelifi, Aziz, Farooq, Abid, & Bukhari, 2021).

Regional Perspectives

In Pakistan, the adoption of 5G technology is further aggravated by socio-economic factors. A research survey by (Khuntia, Singh, & Sahoo, 2021) There are reports that most corporate employees show an unwillingness to adopt 5G technologies, which will likely have adverse impacts on their deployment. Another one includes the cultural attitude towards technology; the same calls for organizations to remain innovative and always learn.

There are also positive case studies relative to South Korea's adoption of 5G technology within the telecommunications sector. Improved service delivery thereby ensures growth in operational efficiency and customer satisfaction. (Mendonca, Damasio, de Freitas, Oliveira, & Nicita, 2022).

Organisational Culture and Management of Change

Organizational culture is the way to use technology effectively. This further cements the requirement for a culture of being experimental and agile by companies, according to research by (Melitski, Gavin, & Gavin, 2010). For some firms, change management and employee engagement are among the prime focus areas that can put their workforce in the right place for the integration of 5G technology through investments made in training and innovation.

Comparative Analysis with Other Technologies

5G is a higher level in terms of data speed and the number of devices it can connect at one time compared to 4G technology. All these connectivities are important to bring about the betterment of smart technologies, which will result in generating better decision-making processes (Shrivastava, Verma, & others, 2021).

Economic Consequences

5G is to provide not only better efficacy but also economic growth in developing countries like Pakistan. The GSMA (2021) mentions that 5G would increase the GDP manifold because productivity in most sectors will increase, so consideration of this factor is an essential part of Karachi's economy.

Environmental Impacts

The environmental impact of 5G is also not negligible. According to Shehab et al. (2021), the deployment phase is resource-intensive, but 5G achieves energy efficiency in its operation, which, therefore, compensates for the resource intensity

of the deployment phase. Such alignment of technological advancement and corporate social responsibility is quite indispensable toward proper business operations within the context of sustainable businesses.

User Experience and Customer Engagement

The low-latency feature is said to produce a faster data speed; because of that, 5G technology can yield an improvement in user experience. This would also result in personal service for firms in Karachi, so that firms would remain relevant in the stiff competition posed by different sectors of firms in the market.

Research Methodology

This research design is an exploratory mixed-method design, combining qualitative and quantitative research techniques. The population of this study will be the corporate employees of Karachi, and the sample size will be 104 respondents. The research sample was selected through purposive sampling, which means respondents with relevant experience were selected. Data gathering was through a closed-type questionnaire utilizing a 5-point Likert scale, which ranged from "strongly disagree" to "strongly agree." Such a kind of scale allows much subtlety in responses. Further, it facilitates the assessment of the respondents' attitudes toward the adoption of 5G technology and its impacts on business management.

A pilot study was done using self-development questions to ascertain the reliability of the instrument. We used the feedback from 10 relevant experts to get a refined and more valid questionnaire. During all research processes, top priority has been given to ethical considerations: all of the respondents filled out the questionnaires voluntarily and confidentially. Finally, we used the SPSS package for data analysis. Frequency analysis was carried out to summarise the demographic data, while reliability statistics, including Cronbach's Alpha, were computed in order to test the internal consistency of the questionnaire. Further analysis was done using binary logistic regression and ANOVA to test hypotheses relating to the relationships between variables and the extent of 5 G's impact on business management outcomes.

The secondary data were collected by reviewing previous related studies, which give the background against which the results of the primary data are interpreted. The assumptions of each statistical test were checked to ensure that they were appropriate for running the analyses. As such, this meticulous methodology will ensure that very robust answers to the research questions can be provided, with equally significant contributions to contemporary business practice and 5G technology.

Analysis and Interpretation

Table 01: Demographic and Educational Profile of the Sample Population.

Variable	Percentage
Age	
18-25	73.1
26-35	19.2
36 and Above	7.7
Total	100.0
Gender	
Male	53.8
Female	46.2
Total	100.0
Education	
Matric or Below	3.8
Intermediate	26.9
Graduation or Higher	69.2
Total	100.0
Job Position	
Entry Level	46.2
Middle Level	42.3
Senior Level	11.5
Total	100.0

Age Distribution: Figuring out the age distribution of the sample population, it can be elicited that 73 percent of the test sample is within the most productive ages. 1 % are within the age group of 18-25 years, suggesting that the company is popular among the youth. The following group consisted of 19 percent of the participants. 2% of the respondents, which is part of the total, chose the 26-35 age group. Only 7. Concerning the age of the respondents, 7% of the sample is people above 36 years of age.

Gender Distribution: The gender distribution is relatively balanced, with males constituting 53.8% of the sample and females making up 46.2%. This close ratio indicates a slight majority of males in the sample population.

Education Levels: The educational background of the respondents reveals that only 3.8% have an education level of matriculation or below, indicating that the majority of the sample is more educated. Those with an intermediate level of education make up 26.9% of the sample. The largest group, comprising 69.2%, has

attained graduation or higher education, indicating a highly educated sample overall.

Job Position: The respondents' job positions show that 46.2% are in entry-level positions, the largest category indicating that many individuals are at the beginning of their careers. 42.3% of the respondents hold middle-level positions, reflecting a substantial number of experienced professionals. Senior-level positions are occupied by 11.5% of the sample, suggesting fewer individuals in advanced roles.

Figure 02: Factors influencing the need for Adoption of 5G Technology in Business Management

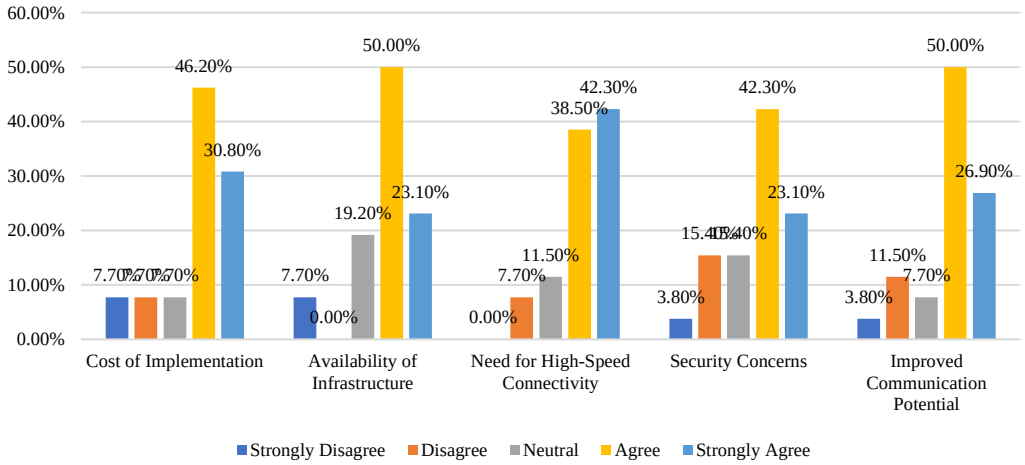


Figure 02 illustrates various factors related to the need for 5G technology in business, highlighting both challenges and benefits. The cost of implementation is a significant concern, with 46.20% of respondents agreeing and 30.80% strongly agreeing that it is a major factor. Availability of infrastructure is seen as a challenge, with 50.00% agreeing and 23.10% strongly agreeing, while 19.20% are neutral. The need for high-speed connectivity is strongly emphasized, with 42.30% strongly agreeing and 38.50% agreeing, showing a high demand for faster internet. Security concerns are notable, with 42.30% strongly agreeing and 23.10% agreeing, indicating worries about potential risks. Lastly, improved communication potential is widely acknowledged, with 50.00% strongly agreeing and 26.90% agreeing, reflecting the positive impact expected from 5G technology. The data suggests that while the implementation and infrastructure availability are significant challenges, the high-speed connectivity, security concerns, and improved communication potential are compelling reasons for businesses to adopt 5G technology.

Figure 03: Perceived Impact of 5G Technology on Various Business Performance Indicators

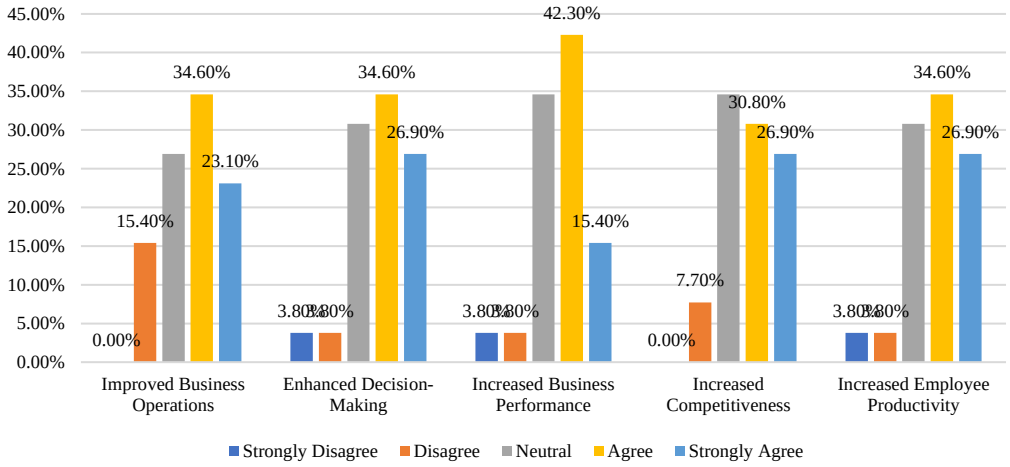


Figure 03 demonstrates the perceived impact of 5G technology on various business aspects. For improved business operations, 34.60% agree, 23.10% strongly agree, 15.40% are neutral, 15.40% strongly disagree, and 11.50% disagree. Regarding enhanced decision-making, 34.60% agree, 26.90% strongly agree, 23.10% are neutral, 11.50% disagree, and 3.80% strongly disagree. In terms of increased business performance, 42.30% strongly agree, 26.90% agree, 15.40% are neutral, 11.50% disagree, and 3.80% strongly disagree. For increased competitiveness, 30.80% agree, 26.90% are neutral, 19.20% strongly agree, 15.40% strongly disagree, and 7.70% disagree. Lastly, for increased employee productivity, 34.60% agree, 26.90% strongly agree, 26.90% are neutral, 7.70% disagree, and 3.80% strongly disagree. Overall, the data indicates a positive perception of 5G technology's impact on these business areas, with the highest agreement for increased business performance and the least agreement for increased competitiveness.

Figure 04: Benefits of 5G Technology in Business

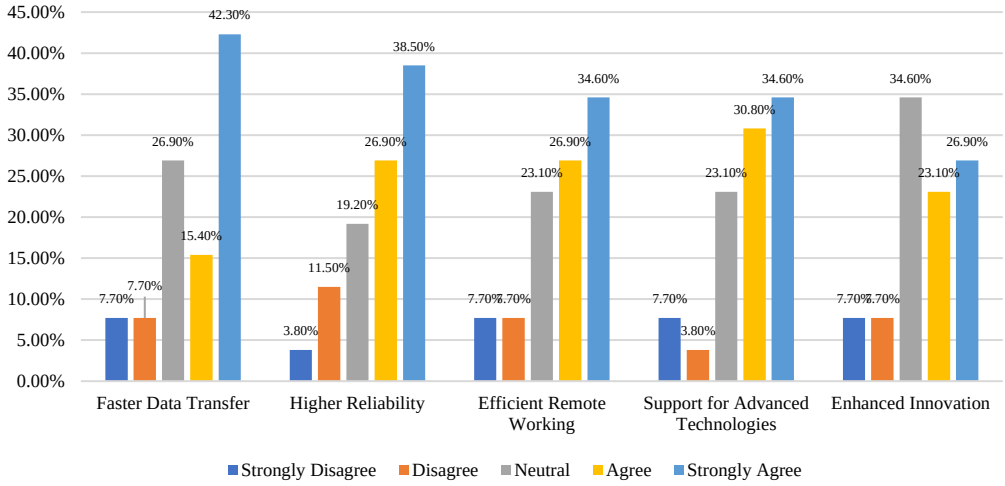


Figure 04 illustrates the perceived benefits of 5G technology in various business aspects. The majority of respondents believe that faster data transfer is a significant benefit, with 42.30% strongly agreeing and 26.90% agreeing. Higher reliability is also highly valued, with 38.50% strongly agreeing and 26.90% agreeing, though 19.20% remain neutral. Efficient remote working is seen positively, with 34.60% strongly agreeing and 26.90% agreeing, while 23.10% are neutral. The support for advanced technologies is another major benefit, with 34.60% strongly agreeing, 30.80% agreeing, and 23.10% neutral. Lastly, enhanced innovation is appreciated, with 34.60% strongly agreeing, 26.90% agreeing, and 23.10% neutral. Overall, the chart indicates that respondents view 5G technology as providing significant advantages in data transfer, reliability, remote working efficiency, support for advanced technologies, and innovation.

Figure 05: 5G Technology Adoption and Business Management Impact

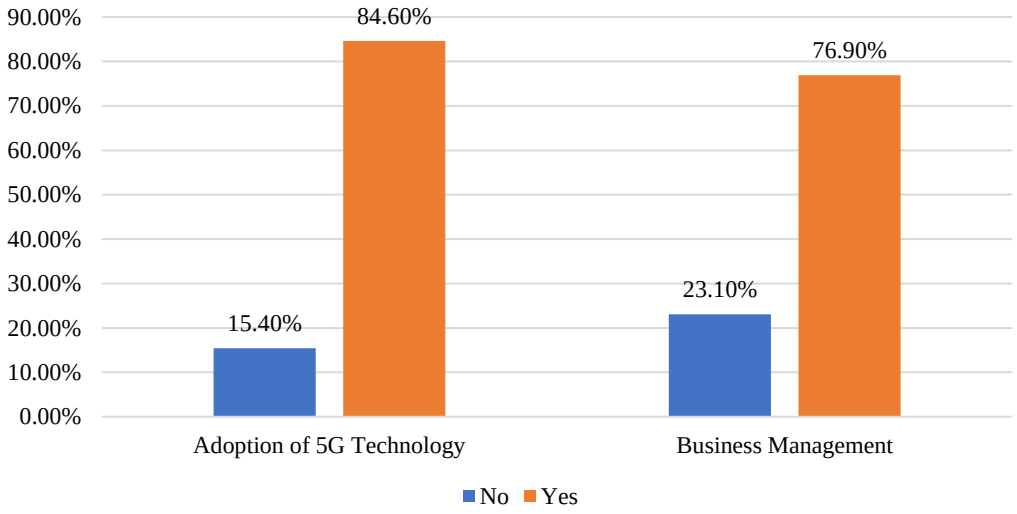


Figure 05 demonstrates the need for adopting 5G technology and its impact on business management. A significant majority, 84.60%, of respondents support the adoption of 5G technology, while only 15.40% are against it. This indicates a strong recognition of the necessity of 5G technology in modern business. In terms of business management, 76.90% of respondents believe that 5G technology positively impacts their operations, compared to 23.10% who do not see such benefits. This highlights the broad agreement on the positive effects of 5G technology, such as improved efficiency, enhanced communication, and increased innovation in business practices.

Table 02: Reliability Statistics for Construct of Dependent and Independent Variable

Variables	N of Items	Cronbach's Alpha
Adoption of 5G Technology	5	0.899
Business Management	5	0.945

Table 02 indicates the internal consistency of two variables: Adoption of 5G Technology and Business Management. For the Adoption of 5G Technology, with 5 items, Cronbach's Alpha is 0.899, suggesting high reliability, meaning the items consistently measure the same underlying concept. Similarly, the Business Management variable, also comprising 5 items, has a Cronbach's Alpha of 0.945, indicating even higher internal consistency. Both values exceed the commonly accepted threshold of 0.7, demonstrating that the scales used for measuring these variables are reliable and suitable for analysis.

Table 03: Model Summary for Binary Logistic Regression Analysis

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	88.097a	0.208	0.315
a. Estimation terminated at iteration number 4 because parameter estimates changed by less than 0.001.			

The Model Summary presents key statistics for evaluating a logistic regression model. The "-2 Log likelihood" value of 88.097 indicates the likelihood of the data under the model; lower values suggest a better fit. The Cox & Snell R Square value of 0.208 provides an estimate of the proportion of variance explained by the model, indicating that around 20.8% of the variance in the outcome can be attributed to the predictors used. The Nagelkerke R Square, at 0.315, adjusts the Cox & Snell value, suggesting that approximately 31.5% of the variance is explained, providing a more interpretable measure of model fit. Notably, the estimation process concluded at iteration 4, indicating that changes in parameter estimates were minimal, suggesting the model has stabilized.

Table 04: Variables in the Equation for Binary Logistic Regression Analysis

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1a	Adoption of 5G Technology (1)	2.944	0.656	20.170	1	0.000	19.000
	Constant	-1.099	0.577	3.621	1	0.057	0.333
a. Variable (s) entered on step 1: Adoption of 5G Technology.							

The coefficient for the variable "Adoption of 5G Technology" is 2.944, indicating a strong positive relationship, while the constant value is -1.099, suggesting a baseline effect when 5G is not adopted. The significant Wald statistic and low p-value (0.000) for 5G adoption imply that it is a significant predictor of business management outcomes, with an odds ratio (Exp(B)) of 19.000, indicating that adopting 5G technology substantially increases the odds of a positive impact on business management practices.

Table 05: ANOVA for Business Management and Adoption of 5 Technology Respect to Job Position

		Sum of Squares	df	Mean Square	F	Sig.
Business Management	Between Groups	0.249	2	0.125	0.692	0.503
	Within Groups	18.212	101	0.180		
	Total	18.462	103			
Adoption of 5G Technology	Between Groups	1.872	2	0.936	8.102	0.001
	Within Groups	11.667	101	0.116		
	Total	13.538	103			

The ANOVA results show the effects of job position as an independent variable on two dependent variables: Business Management and Adoption of 5G Technology. For Business Management, the between-groups sum of squares is 0.249 with a mean square of 0.125, leading to an F-value of 0.692 and a p-value of 0.503. This indicates no significant difference in Business Management outcomes based on job position. In contrast, for the Adoption of 5G Technology, the between-groups sum of squares is 1.872, with a mean square of 0.936, resulting in an F-value of 8.102 and a significant p-value of 0.001. This suggests that job position significantly affects the adoption of 5G technology, indicating meaningful differences among the groups.

Discussion

The results of the study provide robust support for Hypothesis 1 (H1); thus, the study will establish that there is a relationship between the perceived usefulness of 5G technology and its application in business management. In the context of the above analysis, the statistic for the variable "Adoption of 5G Technology" is 2. 944, meaning that there is a significant positive relationship between them. This is in accordance with prior research that established that perceived usefulness is the most important determinant of the usage and acceptance of innovation. (Davis, 1989; Venkatesh & Bala, 2008)

The large Wald statistic and a small p-value of less than 0.000 indicated the importance of 5G adoption as the antecedent of business management outcomes. Since the chi-square test resulted in this statistical significance, it is virtually possible to argue that organizations that appreciate the utility of 5M technology are more inclined to adopt it in their operations, hence improving their performance and productivity. For instance, (Forge & Vu, 2020) Revealed that increased information exchange speed and decision time reduction could enhance organizational decision-making and operation effectiveness, escalation, which supported the perceived usefulness factor in the adoption sequence.

Furthermore, the calculated odds of being in the higher social class (Exp(B)) were 19. The evaluation of the value of 5G technology is given by the fact that it is 0.00, which boosts the chances of attaining management improvement goals by a significant margin among businesses. This is sage because organizations that adopt technology for their operations can expect to improve most of their operations, including customer engagement, supply chain, and innovation, among others. (Rao & Prasad, 2018). 5 G's capability in dealing with the topical real-time data analysis and connection makes use of IoT, which has become imperative in the machine business strategies (Elayoubi, et al., 2017).

Prior works also highlight that across the technology adoption process, the perceived usefulness is also found to shape continued usage of the technology after

the adoption has happened. (Maranguni & Grani, 2015). Thus, for enterprises, learning about its benefits, including the ability to simplify its adoption into organisational practices, 5G is an essential goal.

The proposed hypotheses have been proven: perceived usefulness has a positive influence on the decision to adopt 5G technology in business management. While organizations in Karachi and similar environments consider the adoption of 5G, understanding and promoting its possibilities will be extremely relevant to implementing its advantages.

Conclusion

The history of 5G technology in the aspect of business management To sum up the findings of the present studies, by having a correlation coefficient of 2, it is evident that there is a positive relationship between perceived usefulness and adoption of 5G technology. 944 and the odds ratio (Exp(B)) of 19. 000. Based on the above findings, it can be concluded that organizations that appreciate the benefits of 5G technology are much more likely to embark on the utilization of the 5G technology, hence improving organizational practices and performances. The fact that the Wald statistic is equal to 0. 000 strengthens the author's hypothesis and proves the role of perceived usefulness as one of the factors that influence the adoption of technology following the Technology Acceptance Model (Davis, 1989).

To the best of the author's knowledge, this research extends the literature by demonstrating how 5G technology can promote organizational improvement, customer experience, and innovation (Sufyan, Khan, Khashan, Mir, & Mir, 2023; Yrj, Ahokangas, & Matinmiakko-Blue, 2018). Organizations that apply efficient management improvements foster an understanding of 5 G's benefits and impacts, which ultimately aids them in gaining a better market standing amidst steep technological advances.

Companies, especially those operating within emerging markets such as Karachi, have to undertake sensitization and capacity enhancement programs on the importance of 5G networks. Thus, adopting 5G delivers potential barriers to new technologies and enables organizations to capitalize on the functions that 5G can bring, which leads to the improvement of economic development and increases the general level of productivity (Elayoubi et al., 2017).

Recommendations

To optimize the approaches of using 5G in business management, the companies need to underline the importance of creating proper education programs that would raise employee awareness of the benefits of applying 5G. The reinforcement of innovation and preparation for technological changes might be

achieved by conducting particular workshops and seminars with the employees. Also, there is a need for businesses, especially those with large volumes of data, to engage in strategic partnerships with the technology providers so that changes can be effected easily and incorporated into the structures without incurring many expenses. It is also suggested that organizations establish the ongoing evaluation of their operational requirements so that there is an understanding of where the impact of 5G could be the greatest and when good it should be invested in for the benefit of the company.

Limitations

There are a few limitations to this study, nevertheless. The study was conducted targeting only corporate organizations in Karachi that may not generalize the problems and challenges faced by the organizations in other regions or industries. The participants included in the study can be considered sufficient while still relatively small, and thus, the results of the study can only be applied to similar populations. Further, it can cause self-biases as the perception of the usefulness of the factors will differ from the experience of the people in the context of technology. About 5G technology, more research should be carried out in various organizations, and there is a need to perform empirical research with longitudinal data to understand the effects of utilizing 5G technology on the management practices of business organizations in the long run.

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