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Impact of Selected Digital Technologies on Performance of Construction Projects in Kenya Case Study of Nairobi City County

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ABSTRACT*: The adoption and uptake of technology in the construction industry in Kenya and more so Nairobi City County has gained interest among stakeholders due to increased competition in the industry. However, the challenges and performance of these technologies and innovations remain vague and are not clearly understood due to its low adoption in the country. Despite research in developed nations showing that technology adoption enhances delivery time, reduces project costs as well as improve quality of construction projects, these parameters still remain to be key challenges in the Kenyan construction industry. Therefore, the main objective of the study was to establish the impact of selected digital technologies on performance of construction projects in Kenya: Case study of Nairobi City County. The study was guided by two specific objectives which are; to assess the impact of selected digital technologies on improving design and management of construction projects in Nairobi City County; to establish the impact of selected digital technologies on quality of construction projects in Nairobi City County. The literature of the study is based on Moore's (1999) technology adoption life cycle theory and Rogers (1962) diffusion of innovation theory. A descriptive survey research design was applied for this study. The target population were construction stakeholders in the construction industry who include; Architects, Project managers, Engineers and Quantity surveyors. The construction projects sampled were mega projects that have a budget of Ksh. 500,000 million and above. The researcher used purposive sampling method to select 50 construction projects where two questionnaires were administered in each site. The desired sample size comprised of 100 respondents. Data was obtained through review of relevant project documents, structured questionnaires and physical site observations. Data was analysed using descriptive statistics with the aid of Statistical Package for Social Sciences (SPSS). The findings of this study revealed that digital technologies have a high positive impact on improving design and management of construction projects as well as improvement in project quality. This implies that digital technologies have a positive impact on construction projects by enhancing quality and reduction of construction period. From the regression model it was noted that the variables included were only able to explain 90.0% of the variation performance of project as depicted by the adjusted R-Square. This study therefore recommends application of the findings to improve performance in the construction industry in Nairobi County and in Kenya at large.

***Keywords*: Digital Technology, Project design and management, Project quality.**

1.0 INTRODUCTION

Nowadays, the technologies being used in manufacturing processes as well as construction industries are evolving but at a difference phase (Khatatbeh, 2016). Some of the reasons for the difference growth phase could be established in the core functionalities among the various industries. Case studies of technology implementation and evidence have shown that the application of modern technologies in construction industry, for instance, has been found to accrue a lot of benefits such as waste reduction, providing design flexibility and constructability, saving time and cost, as well as saving manpower. Similarly, there are numerous benchmark studies that show the tangible and intangible benefits of using technology in constructions projects.
The Construction Industry Institute, construction technology is defined as the collection of innovative tools, machinery, modifications, software, etc. used during the construction projects that enables advancement in field construction methods, including semi-automated and automated construction equipment (Kendall, 2020). Today, new technologies in construction are being developed at a breakneck pace. What seemed like future technology years back such as connected equipment and tools, telematics, mobile apps, autonomous heavy equipment, drones, robots, augmented and virtual reality, and 3D printed buildings are in use today and being deployed on jobsites across the world.

Over the past decade, the influences of technology on construction have varied in regards to the type of construction project which is being executed, but generally, the variations have been immensely improved. The construction industry constantly changes because of various factors such as new designs, new materials, and new approaches (Sutton, 2018). Therefore, product and process innovation has been on an increasing trend in the construction industry. Nowadays, construction technology is more innovative and sophisticated due to the introductions of computers and other complex machineries with an aim to reduce challenges while improving design and quality. The use of computers to design houses, the use of prefabricated building parts, and the use of green technology to create eco-friendly buildings are just some of the technologies that are used in the current era of the construction industry (Sherman, 2019).

A general motivation for the use of digital construction technology can be that more and more developers seek contractors who can construct faster and in a more productive manner from both simple to complex projects (Agenbag & Amoah, 2021). Therefore, it can be very beneficial to contractors to incorporate modern construction technologies into their construction processes. These technologies will help them in achieving goals set by developers. Digital technology, in this vein, can be described as electronic tools, systems, devices, and resources that generate, store, or process data (Chauhan et al., 2021). From the construction context, digitalisation refers to the transformation of traditional processes and paper-based practices associated with construction. It is the application of digital tools such as Internet of Things (IoTs), Building Information Modelling (BIM), 3D printing, drones, cloud/mobile computing and Augmented Reality (Sutton, 2018). Digitalisation has many advantages, such as enabling unified objects and individuals to participate in information sharing and achieve objectives collaboratively (Hermann et al., 2016).

In the construction context, the main aim of the adoption of digital technologies amongst construction firms, are improving communication between project stakeholders, construction automation, and data acquisition, visualisation, and analytics (Chen et al., 2021). The adoption of digital technologies can lead to significant changes in the construction process (Hall et al., 2018), impacting technological, cultural, and organizational contexts (Chen et al., 2021).

The Kenyan construction industry has witnessed a high rate of infrastructure projects lately ranging from the construction of roads, buildings, water infrastructure and power plants among others. There has been arising interest from foreign investors to invest in the Kenyan construction industry (Kenya National Bureau of Statistics, 2012). However, a proportionately high number of project dissatisfaction has been uncovered in a study by Gwaya (2014). Dissatisfaction of clients is a sign that projects are not of high quality and this brings about some negative repercussions such as poor contractor rating, contract violations and to some extend court cases.

Nairobi is the capital and largest city of Kenya situated at in South-Central Kenya, 140 Kilometers (87 miles) south of the Equator. The city and its surrounding area constitute the Nairobi City County, earmarked as the 47th County in Kenya. The total area of Nairobi is 696.1km^2 with a population estimated to be 5,454,000 in 2024. According to the Architectural Association of Kenya's (AAK) Built Environment Report (2023), Nairobi City County Government recorded the highest number of building applications, totalling 1,985 from January to November 2023 with a cumulative value for developments during this period amounting to Sh176 billion.

In Nairobi County, many construction projects fail to be completed in time resulting in cost overruns. This is evident due to the large number of projects that get completed after their set due date (National Construction Authority (NCA) report 2019). Moreover, Nairobi County has reported a high number of collapsing buildings in the last five years putting to question the quality of construction projects in the County as well as in the Country (NCA report, 2019). According to a research by the National Construction Authority of Kenya (2019), on failure and collapse of buildings in the construction industry in Kenya, established that the building collapse are predominantly found in cities and peri urban counties.

The Kenyan Government has had several initiatives aimed at identifying potential sources of innovative construction technologies in order to lower the pressure on conventional construction technologies and improve the quality of construction projects (Ministry of public works report, 2011). Some technologies adopted in the Construction industry in Kenya include use of 3D printing, Drones, use of semi-Autonomous and autonomous vehicles, wearable technology, and data analytics. However, it is not clear how adoption of these technologies has impacted the performance of construction projects in the country. This is due to the many cases reported of poor quality of constructions projects denoted by the increased number of collapsing building and poor-quality road projects. The aim of this research was therefore to establish the impact of selected digital technologies on performance of construction projects in Kenya.

1.3 Theoretical Foundation of the study

The technology adoption life cycle theory postulates that the circulation of new technologies across the groups of final users is assumed to trail on a normally distributed bell curve prototype (Coughlan, Dew & Gates, 2008). The lifecycle is an expected blueprint pursued by technical modernism beginning from the setting up and project growth to market dissemination and into market subrogation (Ahmad, 2011). The theory defines five classes of persons: the innovators, early adopters, early majority, the late majority, and the laggards. The innovators seek new technologies insistently (Ahmad, 2011) while early adopters acquire new invention ideas very early in their lifecycles and unlike the modernizers, they are not technicians (Coughlan, Dew & Gates, 2008). The early majorities contribute to be part of the early adopters' capacity of relating to technologies, except eventually, they are motivated by sharp realism senses (Vasseur, 2012). The late majority waits in anticipation of a thing to be an established in levels for their adoption to the technology and finally, the laggards; those who do not want everything dealing with new technologies because of dissimilar of motives that may be economic or individual motives (Tangkar & Arditi, 2004). The theory is relevance to this study as it explains the stages of adoption of technology in the

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construction industry. This theory provides a justification as to what informs contractors adopt technologies in their projects.

The diffusion of innovation (DOI) model described diffusion as a means by which new technology is communicated via some specific delivery channels over time (Rogers, 1962). Innovation is the knowledge that is deemed to be new by organizations or individual (Dube & Gumbo, 2017). The conduits of information delivery comprise of how information relating to the new invention streams from the foundation to the recipient and time relates to the innovation acceptance rate or the duration used by various people to accept the new technology. The social-system is a group of interconnected elements affianced in a collective crisis solving to achieve similar goals (Besharati et al., 2017). The theory postulates that acceptance rate is the comparative promptness through which a new idea is accepted by community members and is usually determined by the amounts of persons that implement that technology within a particular time (Dube & Gumbo, 2017). According to DOI theory project acceptance is a verdict of full implementation of technology because it is the best strategy presentable to address construction challenges in Kenya.

2.0 LITERATURE REVIEW

Technical innovation refers to an iterative action initiated through the insight of prospect for a technology-rooted discovery primarily to start, expansion, construction, commercialization, and advertising of innovations (Laryea & Ibem, 2014). The technical inventions consist of the applied scientifically new commodities and the processes of delivery with considerable technical enhancements to the goods and also services (Ozorhon, Abbott & Aouad, 2010). This makes use of new ideas and methods of providing goods and services at lesser costs or superior qualities (Ramilo, 2014). Technological improvement entails making use of technological outlooks for the processes of product innovation (Davis et al., 2016).

Given this information, there is a big opportunity for players in the construction industry to adopt technology innovations to increase automation and improve performance in construction projects. There are a variety of technology and innovations available in the construction industry, some are being used whereas are not. However, the application of these technologies varies from one nation to the other. Some of these have been evolving for a long time whereas some are relatively new to the world. Example of the most common technologies that are in used in the construction industry include: 3D printing (3DP), artificial intelligence (AI), augmented reality (AR) and mixed reality (MR), building information modelling (BIM), drones, mobile technology (MT), Data analytics (DA), wearables, semi-Autonomous and autonomous vehicles, robotics and virtual prototyping (VP).

In general, digital technology adoption is conducted to stay competitive in the market (Shibeika and Harty, 2015). More specifically, the adoption of digital technologies is conducted to improve responsiveness, efficiency, and collaboration (Lavikka et al., 2018) in managing business processes such as production, logistics, marketing, and procurement of materials and services (Ibem and Laryea, 2014).

3D Printing, also known as additive manufacturing, has been presented to deliver innovative projects in the construction industry. It is a method of building that involves the sequential layering of materials, usually metallic, concrete or plastics, to create a geometric components or entire structures. It can also be used to create prototypes. Artificial intelligence (AI) is the ability of a computer to perform tasks in a similar way that human's do, providing a similar level of intelligence to complete these tasks. Augmented reality (AR) which is an aspect of MR, offers a different way to experience construction projects. It is essentially a copied view of the real-world environment, whose elements are augmented or added with computer-generated inputs. Building information modelling (BIM) is a process with a smart three-dimensional model as a foundation. It provides construction (and architecture and engineering) professionals with tools and insights to be more effective during the planning, executing, controlling, and managing of structures, including buildings and infrastructure.

Mobile technology (MT) is available in construction projects as a collaborative software that is available for use in any geographical location. This is highlighted by the ability to send data from any location back to a central database. MT also highlights the ability for several users to communicate and collaborate via mobile devices simultaneously. Virtual prototyping (VP) is a computer aided design process that allows construction teams to enhance design communication without producing a material sample. This can be done throughout the following phases: project information collection, three-dimensional model building, and process simulation (Aneesh & Vasudev, 2014).

Data analytics (DA) can provide real-time safety information, help managers project accurate timelines, improve energy efficiency, reduce costs, monitor performance, and improve workflows. Information is the key to improving any process. Analytics can enhance efficiency, quality, and safety simply by providing managers and workers with cold hard data. Predictive analytics is about making risk management much more accessible. Wearable technology is becoming more and more popular with people of all ages. From fitness trackers to smartwatches, wearable technology helps people stay healthy, organized, and in control of their lives. However, the benefits of wearable technology are not just limited to individuals. It has a wider scope in businesses, especially the construction industry. The construction industry benefits from using wearable technology, especially after the advent of construction software solutions.

Skibniewski (2017) noted that intelligent building and the use of construction technology have been very beneficial to the construction industry in the last decade. Construction technology and intelligent building have considerable impacts on any building's energy profile. According to Skibniewski (2017), it is very important to start using construction technology more when designing and building. Construction technology can also be very helpful in reaching

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objectives set by different stakeholders in the construction industry.

Kang (2013) conducted a study on "Interaction Effects of Information Technologies and Best Practices on Construction Project Performance'. Sequentially, improved work procedures lead to augmented project performance. Through the use of an overall sample of 133 projects from the Construction Industry Institute Benchmarking and Metrics database, the research examined the associations among technology usage as well as integration, superlative practices, project performance evaluated with cost, schedule, as well as rework metrics. The data was also used to evaluate the opposite communication between technology usage, work procedures as measured by superlative performs, and enactment. The results indicated that there are beneficial associations between technology usage and performance, somewhat more important beneficial associations between best practice usage and performance, and numerous important correlations among IT use and the application of Best practices. Interaction influences the joint use of IT and best practices against performance are evaluated, finding many positive associations, though restricted data availability averts robust statistical assessment. Generally, the research showed that there is proof that the profits of information technologies in construction are found through alterations in work procedures (Kang et al., 2013).

3.0 RESEARCH METHODS

The research was conducted in various construction sites in Nairobi County. Construction projects included road construction projects and buildings projects being undertaken by various contractors. A descriptive survey research design was applied for this study. The target population comprised various construction stakeholders who include; Architects, Project managers, Engineers and Quantity surveyors. The construction projects sampled were mega projects that have a budget of Ksh 500,000 million and above. The study used stratified sampling method to group the respondents into various strata depending on each profession. Simple random technique was applied to select the sample size of 100 respondents. According to NCA annual report (2021) and Cyton report (2021), there are over 200 construction sites in Nairobi annually. Due to the lack of the exact number of construction sites, the researcher used purposive sampling method to select 50 construction projects where two questionnaires were administered in each site. The desired sample size was 100 respondents.

Data was obtained through review of relevant project documents, structured questionnaires and physical site observations. A structured research questionnaire was developed based on the specified objectives of the study. Data collected was analysed using descriptive statistics and presented using statistical tools such as mean as a measure of central tendency, frequencies and percentages, since they are very useful for showing and summarizing data when any complex models are needed. Statistical Package for Social Sciences (SPSS) version 20.0 package software aided the descriptive analysis.

The Regression Model below was used to estimate the relationship between the dependent and independent variables.

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \varepsilon \quad \text{(eq.1)}$$

Where:

Y = Project performance (dependent variable)

β_0 = intercept term

β_i = the various coefficients of the independent variables

X_1 = Design and management, X_2 = project quality,

and ε = error term

4.0 RESULTS AND DISCUSSIONS

This section comprises the analysis, presentation of the data, and interpretation of the results of this study. It is necessary to analyse the data collected to answer the research questions to complete this study properly and meet the research objectives.

Table 4.1: Response rate

Variable	Frequency	percentage
Returned	84	84
No response	16	16
Total	**100**	**100**

Table 4.1 above indicates that out of the 100 questionnaires administered, only 84 were returned. The overall response rate was found to be 84 %. This conforms to Babbie (2004) asserted that response rates of 50% is acceptable to analyses and publish, 60% is good and 70% is very good and based on this assertion 84% response rate was found to be adequate for the study. The interpretation was that the high response rate was essential to obtain sufficient observations for further analysis.

4.1 Descriptive statistics

The study conducted descriptive analysis of the data collected to explain the various constructs by use of mean and standard deviation. The results were as shown below;

Table 4.2: Effect of Selected Digital Technology on Improving Design and Management

Selected Technologies	Mean	Std. Deviation
3D printing improved design of construction projects	3.30	1.14
Data analytics	3.39	1.17
Building Information Modelling (BIM)	3.87	1.02
Wearable technology	3.79	0.99
Mobile technology	3.80	0.97
Virtual Reality	3.66	0.93
Augmented Reality	3.76	0.97

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The study sought to examine the respondent's level of agreement or disagreement on the various the selected technologies improve design and management of construction projects. Table 4.2, presents the relevant results which show that on a scale of 1 to 5 (where 1 = strongly disagree, 2 disagree, 3 moderate, 4 Agree and strongly agree = 5). The means were; 3D printing has improved design of construction projects 3.30, Data analytics 3.39, Building Information Modelling (BIM) 3.87, Wearable technology 3.79, Mobile technology 3.80, Virtual reality 3.66 and Augmented reality 3.76. The results show that the respondents moderately agree with the statements on technologies adopted improve design and management with an overall mean of 3.5. On the eight selected digital technologies, the research found that building information technology (BIM) contributed the most in (mean 3.87) improvement of design and management of projects. These imply that design and management is one of the most important elements of design and management method.

Table 4.3: Effect of Selected digital Technologies on project Quality

Selected Technologies	Mean	Std. Deviation
3D printing (3DP) has improved design of construction projects	3.13	1.333
Data analytics	3.20	1.249
Building Information Modelling (BIM)	3.14	1.381
Wearable technology	3.25	1.298
Mobile technology	3.17	1.325
Virtual Reality	3.11	1.264
Augmented Reality	2.97	1.270

The study sought to examine the respondent's level of agreement or disagreement on the various measures of Quality. Table 4.3, presents the relevant results which show that on a scale of 1 to 5 (where 1 = strongly disagree, 2 disagree, 3 moderate, 4 Agree and strongly agree = 5). The means were; 3D printing has improved quality of construction projects 3.13, Data analytics 3.20, Building Information Modelling (BIM) 3.14, Wearable technology3.25, Mobile Technology 3.17, Virtual Reality 3.11 and Augmented Reality 2.97. The results show that the respondents moderately agree with the statements that the selected technologies causes a moderate improvement on a Quality of construction projects.

Table 4.4: Performance of Construction Projects

statement	Mean	Std. Deviation
Technologies in the construction industry have improved design and management of construction projects	3.8333	0.97971
Application of digital technologies has enhanced efficiency in construction projects	3.7381	0.95840
Technology adoption has helped to manage cost and time in construction projects	3.7262	0.98606
Application of new technologies in constriction has improved quality of construction projects	3.8690	0.95413

The study sought to examine the respondent's level of agreement or disagreement on the various measures of performance of construction Projects. Table 4.4, presents the relevant results which show that on a scale of 1 to 5 (where 1 = strongly disagree, 2 disagree, 3 moderate, 4 Agree and strongly agree = 5).The means were; Technologies in the construction industry have improved design and management of construction projects 3.8333, Application of new technologies enhanced efficiency in construction projects 3.7381, Technology adoption has helped to manage cost and time in construction projects 3.7262 and Application of new technologies in constriction has improved quality of construction projects 3.8690. All the constructs recorded a mean above 3.5 implying that the respondents were in agreement that technology adoption improves performance of construction projects.

Table 4.5: Spearman's rho Correlation ranking of selected technologies on improving design and management of construction projects

Selected Technologies	Spearman's rho Correlation	p-value
3D printing has improved design of construction projects	0.586	0.000
Data analytics	0.595	0.000
Building Information Modelling (BIM)	0.923	0.000
Wearable technology	0.845	0.000
Mobile technology	0.845	0.000
Virtual Reality	0.649	0.000
Augmented Reality	0.763	0.000

The study sought to examine the Spearman's rho Correlation ranking of selected technologies on improving design and management of construction projects in Nairobi City County. Table 4.5, presents the relevant results which show that on a

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scale of -1 to +1. The correlation between Spearman's rho coefficients design and management and project performance were; 3D printing has improved design of construction projects 0.586, data analytics 0.595, Building Information Modelling (BIM) 0.923, wearable technology 0.845, Mobile technology 0.845, Virtual Reality 0.649 and Augmented Reality 0.763. All the constructs recorded a value of 0.5 and above. The correlation coefficient above 0.5 is termed to be strong relationship whereas any figure below 0.5 is said to be a weak relationship. From the findings in table 4.5 above all the selected technologies had a strong positive correction. This implying that the respondent were in agreement that technology adoption in construction projects has a strong positive effect on improving design and management of construction projects in Nairobi City County.

Table 4.6: Spearman's rho Correlation ranking of selected technologies on quality of construction projects

Selected Technologies	Spearman's rho Correlation	p-value
3D printing has improved design of construction projects	0.733	0.000
Data analytics	0.743	0.000
Building Information Modelling (BIM)	0.729	0.000
Wearable technology	0.836	0.000
Mobile technology	0.841	0.000
Virtual Reality	0.746	0.000
Augmented Reality	0.733	0.000

The study sought to examine the Spearman's rho Correlation ranking of selected technologies on quality of construction projects in Nairobi City County. Table 4.6, presents the relevant results which show that on a scale of -1 to +1. The correlation Spearman's rho coefficients between technologies and quality were; 3D printing has improved design of construction projects 0.733, data analytic 0.743, Building Information Modelling (BIM) 0.729, Wearable technology 0.836, mobile technology 0.841, Virtual Reality 0.746, Augmented Reality 0.733 and Augmented Reality 0.763. All the constructs recorded a value of 0.5 and above. The correlation coefficient above 0.5 is termed to be strong relationship whereas any figure below 0.5 is said to be a weak relationship. All the constructs recorded a value over and above 0.5 implying that there is a strong positive relationship between the selected technologies quality of construction projects in Nairobi City County.

4.3 Regression Results on improving design and management and quality of construction projects improve project performance

Table 4.7: Good-of-Fit Statistics

R	R Square	Adjusted R Square	Durbin-Watson
.949[a]	.901	.896	1.951

Table 4.7, presents the fitting statistics in terms of explanation power of design and quality improvement and performance of construction projects. The results show that she variables in this case the design and quality explains up to 90% overall performance of construction projects as depicted by the R Square.

Table 4.8 Analysis of Variance

Model	Sum of Squares	df	Mean Square	F	P-value
Regression	60.210	2	15.052	178.964	.000[b]
Residual	6.645	79	.084		
Total	66.854	83			

Table 4.8, presents the fitting statistics in terms of explanation power of the design and management and quality included. The results show that the variable explains up to the F-statistics value was 178.964. The associated p-value was found to be 0.000 which is significant.

Table 4.9: Regression Coefficients

variables	coefficients	std. error	t-statistic	p-value
constant	0.358	.142	2.526	.014
Impact on Design and management	1.210	.119	10.205	.000
Impact on Quality	0.125	.053	2.358	.000

Performance of construction projects in Kenya (design & quality) due to adoption of digital technology = 0.358+ 1.210 Design + 0.125 Quality + e

From table 4.9, the regression coefficient of design and management was found to be 1.210. This value shows that holding other variables in the model constant, an increase in design and management by one unit causes performance of construction projects in Kenya to increase by 1.210 units. The positive effect showed that there was a positive association between design and management and performance of construction projects in Kenya. The coefficient was

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statistically significant with a t-statistic value of 10.205. The p-value, which indicated the probability of getting a t-statistic value bigger that than 10.205, was found to be 0.000. The regression coefficient of quality was found to be 0.125. This value shows that holding other variables in the model constant, an increase in quality by one unit causes performance of construction projects in Kenya to increase by 0.125 units. The positive effect showed that there was a positive association between quality and performance of construction projects in Kenya. The coefficient was statistically significant with a t-statistic value of 2.358. The p-value, which indicated the probability of getting a t-statistic value bigger that than 2.358, was found to be 0.000.

4.4 Overall on Digital technologies and construction performance

The overall regression model was conducted to show the relationship between the selected technologies and how they improve performance of construction projects

Table 4.10: Good-of-Fit Statistics

R	R Square	Adjusted R Square
.814	**.662**	**.658**

Table 4.10, presents the fitting statistics in terms of explanation power of the selected technologies Included. The results show that the variable explain up to 65.8 %.

Table 4.11: Analysis of Variance

Model	Sum of Squares	df	Mean Square	F	p-value
Regression	44.289	1	44.289	160.943	0.000
Residual	22.565	82	0.275		
Total	66.854	83			

Table 4.11, presents the fitting statistics in terms of explanation power of the selected technologies. The results show that the variable explains up to the F-statistics value was 160.943. The associated p-value was found to be 0.000 which is significant.

Table 4.12: Regression Coefficients

	Beta	Std. Error	t-statistic	p-value
Constant	1.166	.215	5.429	.000
Selected technologies	1.022	.081	12.686	.000

Performance of construction projects in Kenya = 1.166 + 1.022 Selected technologies + e

From Table 4.12, the regression coefficient of selected digital technologies was found to be -0.103. This value shows that holding other variables in the model constant, an increase in selected technologies by one unit causes performance of construction projects in Kenya to increase by 1.022 units. The positive effect showed that there is an overall positive association between selected digital technologies and performance of construction projects in Kenya. The coefficient was statistically significant with a t-statistic value of 12.686. The p-value, which indicated the probability of getting a t-statistic value bigger that than 1.022, was found to be 0.000.

5.0 CONCLUSION

The study concluded that the selected technologies; 3D printing, Data analytics, Wearable technologies, Mobile Technologies, Virtual Reality and Augmented Reality have a significant effect on overall performance of construction project. The study concluded that the various technologies when adopted would improve design and management of the projects, cause improvement on quality of the projects as well as the overall performance of construction projects. In terms of ranking, the study concluded that Building Information Modeling (BIM) has the highest impact on design and management, wearable technologies had the highest impact on quality. Hence the study concluded that the two technologies were frequently used in the various constructions as compared to the other technologies adopted in this study. The study general objective was to establish the impact of selected digital technologies on performance of construction projects in Kenya. Based on the findings the study concluded that the selected technologies had a significance positive impact on improving performance of construction projects in Nairobi City County.

6.0 RECOMMENDATION

The study findings indicated that various technologies adopted in the construction industry have a great impact on design and management as well as improvement of quality of construction projects. The finding of the study also indicated that project design and management and project quality were key determinant (measures) of performance of construction project. Therefore it is recommend that stakeholders in the construction industry to focus more on adoption of available technologies to improve design and management and quality of projects they are undertaking. The study further

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recommends adoption of technologies in construction as a remedy to the various challenges of poor workmanship resulting to collapse of buildings in Nairobi County and Kenya at large. Contractors in Nairobi should therefore come up with more innovative methods to improve design and management in construction projects.

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