International Journal of Economic, Finance and Business Statistics(IJEFBS)
Vol. 1, No. 2, 2023 : 89-96

The Key Barrier to Digital Transformation in Pakistan's Construction Sector

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A R T I C L E I N F O

Keywords: Digital Tools, Project Management Software, IoT

Received : 20, October
Revised : 17, November
Accepted: 18, December

A B S T R A C T

Digitalization has become a global trend and the Pakistani construction industry is no exception. Digitalization has faced many challenges over the years. The objective of this study is to uncover the obstacles preventing the adoption of digitalization within the Pakistani construction industry. Additionally, it aims to analyze the advantages that digitalization offers in enhancing productivity within this sector. The results show that the main barriers to digitalization are barriers related to the use of technology, the high cost of technology, lack of energy, ease of replacement, and unavailability of digital equipment. Stakeholders' awareness of the benefits of digitalization needs to be increased.

INTRODUCTION

Digitalization is recognized globally for its ability to increase project efficiency, and effectiveness and bring new opportunities. The construction industry always performs important and difficult tasks to meet social needs (Aghimien et al., 2018). Project performance often falls short of stakeholder expectations, sometimes damaging business reputation and trust. Businesses have recently begun to question their status quo strategies due to pressures from both supply and demand. Digitalization has greatly helped rethink the construction industry. As a result, the industry is rapidly adopting new technologies that enable the transition to better business models, value chains, and production processes (Ezeokoli et al., 2016)

Usman and Said (2014) note that the construction industry is characterized by its heterogeneity, necessitating collaboration among numerous entities, companies, consultants, and individuals to share information across various phases of large projects. Similar to other sectors, the construction industry is experiencing significant transformations due to the emergence of disruptive technologies, as highlighted by Osunsanmi et al. (2018), which are garnering global interest.

The future of the construction industry faces challenges, intense competition, and uncertainties regarding the impacts of climate change, resource availability, and construction disruptions (Ezeokoli et al., 2016). Due to changes in the business owner's needs and the number of locations, a new approach to design and construction is needed, requiring a new way to help develop the business (Philip and Thompson, 2014). The digital transformation of the construction industry did not start with the Covid-19 crisis. Digital technology has emerged in the business world in the last decade. On the other hand, this crisis has highlighted the importance of using this tool in difficult areas where quick decisions are required for survival and development.

Put simply, digitization involves transforming analog data into digital form, involving the incorporation of new technologies and enhanced consumer behaviors (Blayse and Manley, 2004). The construction sector, owing to its intricacy and a scarcity of skilled labor, is in the initial phases of digitalization. Embracing digitalization is crucial for this industry as it enhances efficiency and project delivery. Given the complexities involved, technology has gradually made its way into the construction field (Moshood et al., 2020).

The influence of digitalization on the construction sector has been substantial, fostering industry growth by curbing project delays, minimizing accidents, and bolstering the economic value of construction endeavors (Usman and Said, 2014). Ibem and Laryea's research (2014) indicates that leveraging digital technology paves the way for environmentally beneficial green and smart buildings. This transformative process entails integrating digital tools to enhance processes and boost efficiency. Moreover, digitalization plays a role in overseeing construction sites, saving time and resources while safeguarding the environment from pollution (Osunsanmi et al., 2018).

Despite the manifold benefits of various digitalization methods and tools, numerous factors, such as productivity, human behavior, and existing gaps,

influence the adoption of digitalization. This article aims to pinpoint the challenges hindering the uptake of digitalization within the construction industry and to delineate the advantages that digitalization offers to the Pakistani construction sector.

Pakistani Construction Industry and Digitalization

The Pakistani construction industry has been an important part of Pakistan's economy as it contributes to the country's global economy. Despite the success, the industry still faces many challenges such as local shortage of skilled workers, poor energy, lack of equipment, and unfair practices in the industry (Usman and Said, 2014). The construction industry includes many activities, including the construction of commercial buildings, underground structures, private residences, and other important structures such as bridges, dams, overpasses, and roads. Besides remodeling, the business also deals with home renovations and construction. This makes it very important for the development of the country and the economy of Pakistan as a developing country (Moshood et al., 2020).

Businesses need to keep up with other developments, which makes digitalization very important. Adegoke (2022) emphasized the need to adopt digitalization to improve efficiency and increase efficiency in the construction industry. He defined digitalization as the use of digital devices such as mobile phones and tablets to improve business and construction. Yusuf et al. (2021) highlighted the challenges facing digitalization in Pakistan, including technological backwardness, limited financial capacity, lack of government support, lack of public-private partnerships, cyber threats, lack of management support, and fear of unemployment. Additionally, Ezeokoli et al. (2016) noted the importance of coordinating and managing resources and teams to focus on digital services, the lack of digital skills and good talents, the lack of collaboration and integration and change management, etc. determined.

Pakistani construction industry needs to take advantage of digitalization to increase efficiency and productivity. Digitalization aims to make work easier and more stable.

Categories of Digital Technologies

Ibem et al. (2018) categorized digital technologies into five main groups: Software for cost estimation, word processing, and architectural and engineering design is included in the first category. The realm of digitally capturing project data constitutes the second category of technological tools. The third category involves processing, storing, and presenting this data utilizing robust infrastructure and communication technologies. It encompasses databases and repositories for structured information concerning building materials, machinery, and equipment. At the forefront are sophisticated technologies like intelligent machines that enable seamless communication, collaboration, and integration among information, individuals, processes, and business operations.

METHODOLOGY

This study adopted a research design in which a closed-ended survey was used to collect data. This survey was given to selected professionals from the Pakistani construction industry. The main source of development in Pakistan and it is believed that this success can be replicated in Pakistan. These professionals include familiar architects, builders, engineers, quantity surveyors, and project managers. The research instrument consists of two parts that explain the background of the interviewees and the purpose of the study. Participants were asked to answer each question on a five-point Likert scale; where 1 = Strongly Disagree/Disagree and 5 = Strongly Agree/Criticize. A total of 150 surveys were allocated to stratified random sampling and 124 surveys were in good condition. This indicates a response rate of 82.12%, which is considered acceptable. The data were further analyzed using mean scores and percentages and the results are presented.

Table 1. Mean Scores And Percentages

Number of surveys that were completed	Number of completed questionnaires	Percentage response rate
150	124	82.12%

RESEARCH RESULT

From the demographic data collected from participants, the breakdown is as follows: 25% are researchers, 15% are designers, 34% are engineers, 16% are founders, and 10% are project managers.35 percent of survey respondents work in construction companies, 25 percent in consulting firms, and 40 percent in government institutions. Most survey respondents have at least 10 years of experience. Considering the qualifications of the participants, 71.43% of the participants are legal entities in their own business and 28.57% are litigation members. In terms of years of qualified employment (1 to 5 years, 50.48%; 6 to 10 years, 25.71%; 11 to 15 years, 23.81%), the total, average age of the respondents is 6.67 years. Most of the respondents have many years of experience in creating the information they can provide for the study.

Barriers to the Digitalization of the Construction Industry

Table 2. Barriers to Digitalization of the Construction Industry

Identified barriers	Mean Score	Rank
Resistance to technology by stakeholders	4.32	1
High cost of digital technology	4.28	2
Inadequate power supply	4.21	3
Difficulties in adapting to change	4.12	4
Inadequate digital facilities	4.08	5
Fear of employees losing their job	4.06	6
Culture/structure of the organization	4.02	7
Data insecurity	3.98	8

Limited availability of the right digital skills and capabilities	3.86	9
The complexity of the construction industry	3.82	10
Lack of awareness of digitalization	3.56	11
Shortage of trained personnel	3.56	12
Lack of collaboration	3.52	13
Lack of support from the government	3.46	14
Technology challenges	3.44	15
Lack of strategy and competing priorities	3.42	16

Table 1 shows the identified challenges towards digitalization in the Pakistani construction industry. The analysis showed that respondents for the protection of technology ranked first with an average score of 4.32; followed by the high value of technology with an average score of 4.28; lack of electricity with an average score of 4.21; And it is difficult to adapt to change. The average score is 4.12, ranking second, third and fourth. The digital field is not enough; it ranks fifth with an average score of 4.08, and fear of unemployment ranks sixth with 4.06 points. The lowest parameter is the lack of strategy and the importance of competition with an average score of 3.42, followed by competition with an average score of 3.44, and lack of support from the government with an average score of 3.46.

Benefits of Digitalization

Table 3. Benefits of Digitalization

Identified benefits	Mean Score	Rank
Shorten completion time	4.44	1
Improves collaboration	4.32	2
Increases Productivity at low cost	4.28	3
Increases speed of work	4.22	4
Reduces the burden of data storage	4.12	5
Improves budget management	4.08	6
Reduces construction error	4.02	7
Better workflow	3.92	8
Improves communication	3.82	9
Simpler working methods	3.65	10
Increases document quality	3.58	11
Speed of response time	3.56	12
Better safety	3.52	13

Table 2 shows the benefits of digitalization in the construction industry. As seen in the table, shortening the completion time with an average of 4.44 points, followed by improving cooperation with an average of 4.32 points, increasing production at low cost with an average of 4.28 points, and increasing operational speed with an average of 4.28 points. The lowest rankings were

better security, faster response time, and better data, with average scores of 3.52, 3.56, and 3.58, respectively.

DISCUSSION

Studies show that Pakistani architecture's adaptation to digitalization is still low due to big data. Obstacles to digitalization are thought to be related to technological resistance, high cost of technology, insufficient resources, poor adaptation, inadequate facilities, fear of unemployment Corporate culture/structure, information insecurity, limited digital skills and abilities, and complex business infrastructure. lack of digital literacy, lack of employee training, lack of collaboration, lack of government support, technological competition, and lack of prioritization and competition. This also shows that knowledge is not easy, fear of technology, high cost of technology resistance to new technologies, lack of electricity, etc. It is also consistent with the research conducted by (Ikuabe et al., 2020). It is also consistent with the study conducted by (Ezeokoli et al., 2016) on the digital transformation of the Pakistani construction industry, which revealed a lack of knowledge, lack of digital skills, and labor shortage in the Pakistani construction industry.

The benefits of digitalization are considered to be reducing execution time, improving collaboration, increasing production at low cost, increasing operational speed, reducing data storage, improving financial management, reducing construction, better efficiency, improving communication, ease of operation, and increasing efficiency competence. Quality data, response time, and better security. This is also confirmed by research by (Aghimien et al., 2018) where saving time, increasing productivity and increasing work speed are the main benefits of digitalization. There is a need to increase awareness of digitalization among professionals to benefit from the benefits of digitalization.

CONCLUSIONS AND RECOMMENDATIONS

The article delves into the hurdles faced by digitalization in Pakistan's construction sector while exploring the advantages associated with technology adoption within the industry. Digitalization has become an important part of life today and brings with it many advantages such as efficiency, accessibility, and connectivity. Issues such as lack of information, high cost of digitization, and inadequate electronic equipment are considered the biggest challenges facing all projects in Pakistan. In Pakistan's construction industry, using new technologies can make things faster and better. When the government and private companies team up, it's a big deal and can make a difference. Such cooperation can significantly mitigate the substantial costs linked to digitalization, fostering a more effective and feasible implementation of technological advancements within the sector. To create a shared, equitable, and secure digital future, all stakeholders, including policymakers, the private sector, and civil society, need to be involved and individuals need to work together to solve these problems. By overcoming these challenges, we can realize the full potential of digitalization to foster long-term economic growth and development in Pakistan's construction industry. Additionally, the

government needs to help improve energy efficiency issues as it is important for digital usage.

ADVANCED RESEARCH

The Pakistani construction industry faces several barriers to the adoption of digitalization, including technological limitations, high costs, energy constraints, resistance to change, and limited availability of digital equipment. However, embracing digitalization offers significant advantages, such as enhanced productivity, improved accuracy and quality, and data-driven decision making. To overcome these barriers, stakeholders need to increase their awareness of the benefits of digitalization and invest in the necessary infrastructure and training. By doing so, the Pakistani construction industry can unlock the full potential of digitalization and thrive in the digital era.

REFERENCES

Adegoke B (2022). *Expert highlights the importance of digitization in the built sector*. The Punch newspaper dated 16th May, 2022 retrieved on 20th January, 2023.

Aghimien D, Aigbavboa C, Oke A.E & Koloko N (2018). *Digitalization in Construction Industry: Construction Professionals Perspective*. Streamlining Information Transfer between Construction and Structural Engineering. ISEC Press. ISBN: 978-0-9960437-7-9.

Blaise A.M & Manley K (2004). Key influences on construction innovation. *Construction Innovation*. 4 143-154.

Carlile P.R. (2004). Transferring, translating and transforming: An integrative framework for managing knowledge across boundaries. *Organization Science.* 15, 555-568

Ezeokoli F.O, Okolie K.O, Okoye P.U & Belonwu C.C (2016). Digital Transformation in the Nigeria Construction Industry: The Professionals' View. *World Journal of Computer Application and Technology* 4(3): 23-30.

Ibem E. O. & Laryea S (2014). Survey of Digital Technologies in Procurement of Construction Projects. *Automation in Construction*. 46, 11-21.

Ikuabe, M., Aghimien, D. O., Aigbavboa, C., & Oke, A. E. (2020). *Inhibiting Factors to the Adoption of Digital Technologies in the South African Construction Industry*. 5th Research Conference of the Nigerian Institute of Quantity Surveyors.

Moshood, T. D., Nawanir, G., Sorooshian, S., Mahmud, F., & Adeleke, A. Q. (2020). Barriers and benefits of ICT adoption in the Nigerian construction industry. A comprehensive literature review. In *Applied System Innovation*. 3 (4) 1–19.

Osunsanmi, T. O., Aigbavboa, C. O., and Oke, A. E (2018) Construction 4.0: The Future of South Africa Construction Industry. *International Journal of Civil and Environmental Engineering,* 12, (3), 206-212.

Phillip D & Thompson N (2014). *Built Environment 2050: A Report on Our Digital Future*. Construction Industry Council.

Usman N & Said L (2014). Key Factors that affects Adoption of Technology in the Nigerian Construction Firms: A Theoretical Framework. *International Journal of Accounting and Business Management.* 2 (2). 26-38

Yusuf, S., Adindu, C., Badmus, A., & Muhammed, H. (2021). *Pandemic in the Nigeria Construction Industry through Digitalization of Operations and Processes*. 5th CU Construction Conference on Exploring Contemporary Issues and Challenges in the Construction Industry: (CCC2021), Coventry, United Kingdom, 17 March 2021