Exploring the Influence of Digitalized Project Management Practices in the Power Sector

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Abstract

The power sector is critical in the economy of any country and requires resilience, up-to-date technology, and efficient management practices to ensure successful project completion. In Pakistan, while the technical development of the power sector has progressed since the 1990s, the management domain has been relatively slow, resulting in poor planning decisions, delays in critical power projects, and project failures. The consequences of such mismanagement have had severe ramifications on the overall economy, including major power crises and significant monetary losses. As the world rapidly progresses in Information and Communication Technology (ICT), the digitalisation of project management practices has become essential for efficient and reliable power sector management. By identifying the significant issues and obstacles to digitalisation in the power sector, the study will help to devise solutions to improve project management practices. The research aims to provide insight into the potential benefits of digitalised project management in the power sector and highlight the need for futuristic vision, extensive electricity forecast, and a reliable management system to carry out projects successfully.

Keywords: Digitalisation; Power-information System; power-sector; project management; Information and Communication Technology

1. Introduction

In today's technological era, digitalisation is critical for organisational survival, and managing large-scale projects necessitates technological tools and standardised project management practices. The power sector in Pakistan has a history of poor management performance, requiring significant improvements to contribute positively to the country's economic growth. Research has shown that facilitating project managers' work can enhance organisational performance (Trzaska et al., 2021). Digital tools such as Project Management Information System (PMIS), Power Information System (PIS), and Decision Support System (DSS) are effective in managing power projects, improving internal efficiency, creating external opportunities, and managing disruptive changes.

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Digitalisation refers to the transformation of simple information into an advanced structure and is considered a significant emerging trend that is revolutionising societies and businesses. The power sector has been slow in adapting to digitalisation, but digitalisation technologies can significantly facilitate the energy sector's transformation. Digital tools such as Power Information Systems, Project Management Information Systems, and Decision Support Systems provide state-of-the-art platforms for data integration, aiding in management and imparting valuable insights for better planning. However, using these tools comes with great expense, and organisations must keep clear insights regarding the positive and negative impacts these technologies have imparted. Understanding the intended usage of digital technology and the advantages and hurdles to digitisation is critical for creating comprehensive strategies for accomplishing digital transformation in specific areas or nations. (Greeven et al. n.d.; Lappi, Aaltonen, and Kujala 2019; Światowiec-Szczepańska and Stępień 2022)
The literature on the digitalisation of project management in the power sector is scarce (Giraldo et al., 2021). Previous studies have mainly examined the macro-level effects of digital technologies on the power sector transition, such as integration and sustainability goals at the governance level (Światowiec-Szczepańska & Stępień, 2022). The impact of digital transformation on the sector has been less explored, creating a research gap. Digital technologies such as PMIS, PIS and DSS have significant implications for work practices, but their impact is often overlooked or underutilised. Therefore, an exploratory study is needed to understand how these technologies affect the power sector's performance. The objective is to explore the effects of digitalised project management practices in the power sector, highlight the opportunities created by digitalising project management practices, and address the challenges faced by the power sector while implementing and adopting digital project management tools. In this paper, the following research questions are considered:

RQ1: How can digitalisation in project management practices affect a power sector organisation?
RQ2: What opportunities does digitalisation create in the power sector?
RQ3: What challenges does the power sector face while implementing and adopting digital project management tools?

This study examines the need for digitalisation in the power sector to improve project efficiency and reduce delays. It contributes to existing literature by identifying key factors for successful digitalisation and their impact on Pakistan's power sector. The study uses the TechnologyOrganization-Environment (TOE) framework and provides a way forward for digitalising project management practices. It also

addresses gaps and helps project managers plan for successful technology adoption. This study significantly adds to the literature on digitalising project management practices.

2. Literature Review

Digitalisation uses digital technology and digitised data to enhance operations, increasing productivity, efficiency, and cost savings. It transforms human-driven processes into software-driven ones, and while it does not revolutionise existing business processes, it provides opportunities for organisations to gain a competitive edge and achieve sustainability.

This transformation enables businesses to adapt to their clients' needs, align with industry trends, and collaborate in value networks (Arredondo-Méndez et al., 2021).

Digitisation refers to the conversion of analogue to digital form. Technological advancements such as social media, mobile computing, big data analytics, cloud computing, IoT, CPS, CHS, and cyber-security are driving it (Chepkasova et al., 2016).

Digitalisation significantly impacts society, influencing how we live, work, travel, and play. However, organisations face challenges adapting to this change due to the lack of knowledge or trained personnel. Although public administration services have made progress in digital adaptation, the full potential of digitalisation remains untapped (Alvarenga et al., 2020). Governments continuously seek innovative digital solutions to transform the decision-making process in social, economic, and political areas (Alvarenga et al., 2020).

2.1 Digitalised Project Management

The fourth Industrial Revolution, or Industry 4.0, has brought new technologies that change the dynamics of organisations. Three general strategies can be implemented to generate competitive advantages: low prices, distinctiveness, or concentration (Arredondo-Méndez et al., 2021). Scholars believe that digitisation is not only about technology, hardware, or software but is inextricably tied to the organisation and how people do their everyday jobs. Actual value can only be realised if people and procedures are coordinated (Bartczak, 2021; Alvarenga et al., 2020). Technology may work as a catalyst for organisational transformation, but it should be planned and actively managed. Failure results from a lack of awareness of the interconnection between IT and the enterprise (Zimnukhova et al., 2019). The organisational consequences of digitalisation are often misunderstood, and the need to align people, processes, organisational structures, and culture is overlooked (Capuşneănu et al., 2021).

Managing digitalisation initiatives is still a new subject, with a few studies focusing on it. Digital transformation beyond technology deployment can impact business models, requiring an integrated framework (Irfan et al., 2020).

Organisations typically undertake projects to develop a product or service. Yim et al. (2017) categorise projects into compliance, operational, and strategic. Digitalisation initiatives fall under the strategic category. Successful implementation of strategic projects, such as digitalisation, requires project management concepts and practices. Guiding principles include stakeholder involvement, cross-functional working, and customisation of standard procedures and methodologies (BSI, 2010). Implementing digitalisation requires project management deliverables, including project planning, risk management, and stakeholder communication (Greeven et al., n.d., 2019). The fourth Industrial Revolution brought new technologies that required organisational change for successful management. Digital platforms, such as Enterprise Resource Planning (ERP), are revolutionising the managerial perspective of organisations. ERPs provide benefits such as single entry of information, force, customisation, and sophisticated queries (Coloma Bedón and Cadena Piedrahita). Understanding and forecasting digital trends is critical for policymakers, government executives, academics, and anyone involved in digital transformation (Lee et al., 2018).

2.2 Tools for Digitalized Project Management

The following is a general overview of project management tools and software, along with their features (Micale et al., 2021).

Feature	Sub-Feature	Software
1. Activity planning	1.1 Critical Path Method (CPM)	Asana; MS Project; Podio
	1.2 Work Breakdown Structure	Asana; MS Project; Wrike
	1.3 Gantt chart	MS Project; Wrike
	1.4 Milestones	Basecamp; Asana; MS Project
	1.5 Intelligent Programs	Liquid Planner

2. Resource planning	2.1 Allocation of Resources	
	2.2 Balancing of Resources	Asana; MS Project; Liquid Planner
	2.3 Critical Chain Project Method	MS Project; Liquid Planner; Wrike
		MS Project (ProChain)
	2.4 Cost Management	MS Project; Podio; Liquid planner
	2.5 Calendar	Trello; Asana; MS Project; Podio
	2.6 Resource Chart	Asana; MS Project; Podio
	2.7 Resource Breakdown Structure	Asana; MS Project; Huddle; Podio
	2.8 Stakeholders Directory	
3. Control	3.1 Performance Tracking	
	3.2 Budget Control	Trello; MS Project; Podio
	3.3 Time Control	MS Project; Liquid Planner
	3.4 Travel Cost	Trello; Asana; MS Project; Podio; Liquid planner; Wrike
	3.5 Quality Management and validate	
4. Risk Analysis	4.1 Program Evaluation & Review Technique	
	4.2 Simulation	MS Project
	4.3 Risk Management	
	4.4 Issue Management	
	4.5 Incident management	

5. Reporting	5.1 Document Management	Asana; MS Project; Liquid Planner;
	5.2 Report	Wrike
	5.3 Import/export data	Asana; MS Project
	5.4 Version Tracking	MS Project; Huddle; Wrike
	5.5 Archiving project information	Asana
6. Communication management	6.1 Communication	Trello; Basecamp; Asana; MS Project;
	6.2 E-mail	Huddle; Podio
	6.3 Chat	Trello
	6.4 Communication Group	Trello; Basecamp; Asana; Podio
	6.5 Forum	Podio
	6.6 Messages Outside the System	Podio
	6.7 Video & Audio	
7. Utility	7.1 Todo list	Trello; Basecamp; MS Project; Podio
	7.2 Filters	Asana; MS Project; Podio; Wrike
	7.3 Customised fields	Trello; Asana; MS Project; Podio;
	7.4 Contacts list	Wrike
	7.5 Procurement management	Trello; Basecamp; Asana; MS Project;
	7.6 External tools integrations	Huddle; Podio; Liquid Planner;

Table 1: Tools for Project Management

2.3 Project Management in the Power Sector

"The global energy sector is now undergoing several changes. Three key, interrelated trends propel the energy transition to an ecologically friendly, low-emission energy system:

Decarbonisation, digitisation, and decentralisation (the "three Ds"). (Imran et al. 2021)."

"The digitisation of the power sector has the potential to accelerate this shift dramatically. Practitioners, politicians, and the academic community see digitalisation as a critical factor for the energy sector's rapid, efficient, and balanced development, which will aid in achieving all of the energy triangle's priorities, such as sustainable development, energy stability (security), and sector competitiveness (efficiency, economic performance) (Światowiec-Szczepańska & Stępień, 2022). Understanding the intended usage of digital technology and the advantages and hurdles to digitisation is critical for creating goals, guidelines, and comprehensive strategies for accomplishing digital transformation in specific areas or nations. Potential risks and bottlenecks should be identified at the corporate, social, and national levels to devise solutions to overcome hurdles to effective digitalisation and energy transformation." (Lappi et al. 2019)

2.3.1 Objectives and benefits of power sector digitalisation

"The energy sector's digitalisation results are challenging to categorise due to their complexity and interconnection. Weigel and Fischedick classified digitalisation benefits in the energy sector as follows:

1. system stability;
2. environmental protection;
3. energy demand reduction;
4. revenue enhancement;
5. cost reduction, and
6. customer satisfaction, based on a thorough literature review.

The following table summarises the primary applications and advantages of the most prominent digital technologies in the energy sector. As they span many specific digital applications, the six subcategories (smart grid and system efficiency, smart market and adaptability integration, predictive analytics and prediction, process efficiency, smart home, trust and transparency) account for many advantages."

Main Benefits of Digital Transformation	**Applications in Energy Industry**	**Types of Digital Technology Most Used in the Energy Industry**

		Blockchain Artificial neural networks (ANN),
1. System security and stability and cost reduction 2. Environmental protection	Smart grid and optimised operations	Artificial intelligence (AI) Robotic process automation Machine learning Big data Cloud computing Internet of Things (IoT)
1. System security and stability and cost reduction 2. Environmental protection	Smart market and flexibility integration	Artificial neural networks (ANN) Artificial intelligence (AI) Blockchain Big data Cloud computing
1. System security and stability 2. Cost reduction	Anomaly detection and prediction	Artificial neural networks (ANN), Artificial intelligence (AI) Robotic process automation (RPA) Machine learning Big data Cloud computing
1. Cost reduction	Process efficiency	Artificial neural networks (ANN) Artificial intelligence (AI) Robotic process automation Blockchain

		Machine learning Big data Cloud computing Internet of Things (IoT) Artificial intelligence (AI) Blockchain Big data Cloud computing
1. Environmental protection 2. Customer satisfaction	Smart home	
1. Customer satisfaction 2. System security and stability	Trust and transparency	Blockchain Big data Cloud computing

Table 2: Energy Sector and Digitalization

"Many firms in the power industry understand the promise of digital technology and see the need to "go digital" as a means of gaining immediate economic benefits. These are largely concerned with the prospect of increased income by creating new products, services, and access to new consumers. Another major motive is to better meet the requirements and expectations of consumers, which will create a competitive edge. Customers have always desired low-cost, easy access to power. In recent years, customers and consumers in industrialised nations have raised their expectations of this item. Climate-friendly energy, as well as openness about its usage and pricing, are becoming increasingly vital. (Micale et al. 2021)"

"Digital applications, such as 'smart meters' or 'smart homes' in general, can assist in satisfying the promises of lower prices, improved transparency, and increasing usage of renewable energy. The 'smart home' idea enables daily energy consumption monitoring and billing, displaying the use of particular household equipment and visualising the data. This increases openness and allows for the identification of possible energy savings. Using neural networks in such systems aids in adapting to customer

behaviours. These technologies improve customer satisfaction while lowering expenses, as most contacts may be handled through online consumer portals." (Kraus et al. 2022)."

3. Research Methodology

This section outlines the research procedures, including the empirical data collection method to address the research questions. It covers the study type, data analysis and collection methodologies, sampling techniques, population and sample size, research ethics, instrument reliability, and other relevant aspects of the study.

3.1 Research approach and strategy

This study employed an inductive research approach suitable for the research project. Unlike a deductive approach that uses preconceived themes to explain empirical data, the inductive method determines themes from empirical data. Inductive reasoning is grounded on observation, and hypotheses are formulated based on the findings. (Anon 2011) This approach enables the researcher to change the study path after the research process has begun, and theories can be employed to develop research questions and objectives. The study design chosen was qualitative, as it allows for the gathering and evaluating non-numerical data to comprehend concepts, views, or experiences. The data generated from the interviews will be evaluated qualitatively using thematic analysis, which involves identifying objects of analytic interest in the data and labelling them with a coding label. The data gathered will be analysed to conclude. The study explores how the digitalisation of project management practices has impacted the power sector, using semi-structured interviews with employees from various multinational organisations conducting digitalisation. The study concluded that a qualitative research design is preferable as it provides in-depth and context-specific data needed to address the research questions.

3.2 Sampling

The study aims to gather data from 8 experts in the power sector of Pakistan, selected based on their designation as managers, to understand the digitalisation transition that occurred over the past decade. The experts were selected after a thorough analysis of major entities in the power sector and based on their experience of more than 10 years in the industry. Their vast knowledge and experience in the power sector are expected to provide sufficient data to answer the research questions. The interviews

were conducted with various stakeholders in the power sector, including representatives from generation, transmission, distribution, regulation, market operation, and utilities.

3.3 Tools for Qualitative Research Thematic Analysis

NVivo 12 was used for transcription, coding, and theme generation in this study. NVivo is a qualitative data analysis (QDA) software package that helps researchers organise, analyse, and find insights in unstructured or qualitative data, such as interviews, open-ended survey responses, journal articles, social media, and web content. NVivo is used by researchers in a variety of fields, including social sciences, forensics, tourism, criminology, and marketing.

4. Findings and Discussion

This section briefly describes data collection, data analysis, and the findings from the data analysis. The chapter begins by summarising the interview questions and the respondents' responses. Following the summary of findings, the analysis is offered, which includes the construction of core themes and subthemes, an examination of the findings, and the establishment of relationships between them.

4.1 Thematic Analysis

Data was collected via semi-structured interviews and was analysed using NVivo 12. The current study used thematic analysis to interpret and analyse the collected data, as mentioned in the preceding chapter. In this section, we present the six-phase thematic analysis approach, as Braun and Clarke outlined. The collected data from the previous step was analysed using this approach. The following subsections detail the phases of thematic analysis and their corresponding findings.

4.1.1 Familiarisation with Data

The initial stage of the research process involves a comprehensive review of the collected data to achieve familiarity with the research material. This phase necessitated a significant investment of time, as all interview transcripts were read repeatedly and with meticulous attention to detail to cultivate a profound comprehension of the data. The following observations were gleaned after several rounds of data review and analysis.

4.1.2 Problems faced in adopting digitalised project management

Digital transformation of project management practices in the power sector faces several challenges. Through interviews with various respondents, this study identified major obstacles to adopting digitalised project management. Respondents had different views on the topic, but common issues emerged. Some respondents highlighted a lack of awareness of the benefits of digitalisation. Others

stated that employees' acceptance of technology was the biggest obstacle. Poor utilisation of tools was identified as another significant problem that slows down the digitalisation process. Respondents also indicated that the organisation's governing structure and legal and strategic framework were crucial in digitalising project management practices. Fear and hesitation of employees to adopt change and ineffective change management were identified as additional obstacles.

4.1.3 Positive impacts of digitalising project management practices

Digitalising project management practices have significantly positively impacted the power sector. According to respondents, digitalisation has improved transparency between employees and managers, allowing for better communication, understanding, and accountability. The digitalisation process has also optimised the time to carry out tasks and improve resource management. Digital project management systems provide a platform for effective decision-making, considering all available data and mitigating risks. Task tracking and monitoring are easier with digital systems, improving task completion and resource management efficiency. Digital management tools have increased teams' efficiency by allowing better access to information and the capacity to delegate tasks effectively. Digitalisation has given the power sector a sophisticated platform to manage projects, improve accountability, and enhance decision-making capabilities.

4.1.4 Opportunities due to digitalisation

Digitalisation allows organisations to collaborate with external entities and gain more customers. In the power sector, collaboration typically occurs with other power sector entities, but cross-sectoral collaboration can also happen. Respondents reported that digitalising project management or other domains opens up new external opportunities for organisations. These opportunities include improved collaborations with other entities, increased customer engagement, and stakeholder requests to establish similar platforms. Additionally, digitalisation can lead to improved processes and standardisation of data exchange across entities, generating opportunities for cross-organisational partnerships. Other opportunities mentioned by respondents include digitalising project management practices in the power sector.

4.1.5 Risks and Negative Impacts

The adoption of digital technologies in organisations has both positive and negative impacts. This research study highlights some of the negative impacts or risks of digitalisation in Pakistan's power sector. One significant risk is the occurrence of disruptive changes in the organisation's operational environment, resulting in the obsolescence of current business practices. Another risk is the increased vulnerability to cyber threats due to the dependence on digital technologies. Financial risks are also

significant as organisations invest vast amounts of money in digitalisation, and the failure to utilise these technologies properly results in financial losses. Work-life imbalance is an underrated risk, leading to employee dissatisfaction and mental tension due to work being assigned, even during personal time. Respondents also mentioned other risks that could occur while digitalising project management practices. It is crucial to address these risks and develop effective risk mitigation strategies to maximise the benefits of digitalisation in the power sector.

4.1.6 Digital tools and facilitators

Digital tools and facilitators are crucial for promoting the digitalisation of project management practices in the power sector. Digital tools are software that supports project management practices throughout the project life cycle. These tools are used for planning, initiating, executing, monitoring, controlling, and closing projects. Multiple management, communication, and data analysis tools are used in the power sector, with some being procured from software development companies like Microsoft and Oracle. In contrast, others are developed in-house to reduce dependency on third parties. Respondents highlighted the importance of enterprise resource planning (ERP) for resource planning.

Facilitators, such as government initiatives and policies, are essential for promoting digitalisation in the power sector. Two key facilitators were identified: the National Electricity Policy and the National Electricity Plan. The National Electricity Policy, which strongly emphasises digitalisation, mandates that power sector entities improve their current processes and digitise them under policy guidelines. The policy also ensures transparency through a predictable policy framework, uniform application of the regulatory framework, elimination of institutional conflict of interest, automation and digitisation of processes, and adoption of best practices for disseminating authentic and timely information to all stakeholders. The National Electricity Plan, which is being implemented to achieve policy goals, highlights digitalisation as a key domain for improving the power sector and calls for establishing a digital project monitoring and evaluation system across the power sector.

4.2 Word Cloud and Themes

The word cloud extracted from NVivo 12 for the codes combined is given below:

Figure 1: Word Cloud

Further, the themes and subthemes were generated about the data gathered from interviews. The table below summarises the themes and subthemes generated from the data: **1. Digital Tools and Facilitators**

1.1 Facilitators

1.2 Tools

2. Obstacles

2.1 External Factors

2.2 Management Issues

2.3 Personal Obstacles

3. Opportunities

3.1 External opportunities

3.2 Internal Opportunities

4. Positive impacts

4.1 Impacts on Employees

4.2 Impacts on Processes

4.3 Organisational Impacts

5. Risks & Negative Impacts

5.1 Disruptive changes

5.2 Organisational Risks

5. Discussion

In this section, the finalised themes are explained briefly in relation to the research question, and it will be seen how these themes achieve the research objectives. Moreover, the relationship between these themes is generated with the theory of the Technology Organisation-Environment (TOE) framework, which was created by Tornatzky and Fleisher (1990). This will prove the research significance of how this study contributes to the TOE theory.

5.1 Relationship of Themes with the Technology-Organization-Environment (TOE) Framework

As described by Louis G. Tornatzky, "The technology-organisation-environment framework, also known as the TOE framework, is a theoretical framework that explains technology adoption in organisations and describes how the technological context, organisational context, and environmental context influence the process of adopting and implementing technological innovations." As the TOE framework is for organisation-level analysis, it is appropriate for this study.

Relationship in Technological Context

"The technical context encompasses all of the technologies relevant to the firm, including those presently in use at the business and those that are available in the marketplace but not currently in use. Existing technologies of a company are significant in the adoption process because they establish a broad restriction on the breadth and rate of technological change that a company may undertake." In the technological context, I 1 has a strong relationship as it encompasses the digital tools and technologies an organisation can adopt along with themes 4 and 5. Theme 4 and 5 are related because it is necessary to check out a technology's positive and negative impact before deploying.

Relationship in Organisational Context

"The organisational context relates to the firm's features and resources, such as its size, high formalisation, organisational structure, managerial structure, human resources, number of spare resources, and employee links." In the organisational context, I 3 has a strong relationship. The firm features, number of resources, organisational structure, managerial structure, human resources, number of spare resources, and employee links can be related to opportunities, both internal and external.

Relationship in Environmental Context

According to Tornatzky and Fleisher, "The environmental context includes the structure of the industry, the presence or absence of technology service providers, and the regulatory environment." In the environmental context, theme 2 creates a strong linkage. The presence or absence of technology, governing structure, and regulatory environment can be considered obstacles to digitalisation. The contribution of the TOE framework is its relationship with the power sector and how technology is implemented in a power sector organisation. This contribution is made by relating themes and subthemes with the TOE framework, which further elaborates the TOE framework in terms of the selected themes in this study.

The figure provided above gives an overview of the TOE framework's relationship with the themes generated in this study.

6. Conclusion

This study explored the impacts of digitalising project management practices in the power sector. It found that digitalisation can have a significant impact on the power sector, both positive and negative. On the positive side, digitalisation can lead to improved efficiency, productivity, and transparency. It can also help to improve decision-making and reduce costs. On the negative side, digitalisation can lead to job losses, security risks, and data privacy concerns.

The study also found that digitalisation can create several opportunities in the power sector. These opportunities include:

Improved efficiency: Digitalization can improve the efficiency of power generation, transmission, and distribution, leading to lower costs and better customer service.

Increased productivity: Digitalization can help increase the productivity of power sector employees, leading to more output and less waste.

Enhanced transparency: Digitalisation can improve transparency in the power sector, which can help build trust between customers and the power sector.

Improved decision-making: Digitalisation can improve decision-making in the power sector, leading to better investment decisions and more efficient operations.

Reduced costs: Digitalization can help reduce costs in the power sector. This can be achieved through improved efficiency, increased productivity, and enhanced transparency.

The study also found that the power sector faces several challenges in implementing and adopting digital project management tools. These challenges include:

Lack of awareness: Power sector employees are not aware of the benefits of digitalisation, which can make it difficult to get buy-in for digital projects.

Lack of resources: The power sector often lacks the resources to implement and adopt digital project management tools. This can include financial resources, technical expertise, and human resources.

Security concerns: The use of digital project management tools in the power sector raises security concerns, including the risk of data breaches, cyberattacks, and unauthorised access to sensitive information.

Data privacy concerns: There are data privacy concerns about using digital project management tools in the power sector. These concerns include the risk of data being shared without consent, used for unauthorised purposes, or sold to third parties.

Overall, the study found that digitalisation can significantly impact the power sector, both positive and negative. It also found that digitalisation can create a number of opportunities in the power sector and that the power sector faces a number of challenges in implementing and adopting digital project management tools.

7. Practical Implications

The study gathered data for research and interview questions and extracted recommendations from experts to improve the power sector. The recommendations include the establishment of a robust governing structure that can withstand political volatility and other external factors, regular follow-ups from managers to ensure proper tool utilisation, conducting capacity building professional training and awareness campaigns to enhance staff skills and reduce resistance to change, and digitalisation of project management as part of the organisation's strategic objectives to increase team efficiency. Additionally, the research provides insights into the TOE framework, which organisations can use to identify obstacles and opportunities before implementing new technologies. Overall, the practical contribution of this thesis is to raise awareness of the current state and future potential of the power sector and encourage further research on management issues to address them gradually.

7.1 Limitations and Research Recommendations

The present study has several limitations. Firstly, due to practical constraints, obtaining data from every power sector entity was impossible, and hence, only a small pool of experts was selected. Secondly, the interviews were limited to managers only to avoid a hierarchical observation gap. This research provides a general overview of the impacts of digitalising project management without diving into project phases or knowledge areas of project management. Additionally, the research was limited to

major power sector entities in Pakistan, excluding low-tier entities. As a qualitative study, the results and conclusions can only serve as a reference point.

The sample size should be increased to extend this study, and participants from different hierarchical levels are recommended. Furthermore, case studies should be conducted to explore the impact of digitalisation on each department of the organisation. A quantitative approach could also be considered with a larger sample size to identify the success factors in digital transformation project implementation. Different organisations should be selected based on their geographical locations to vary the impact from location to location. Finally, the peer debriefing method should be used to avoid bias. In future research, it would be interesting to test and expand the suggested framework in different companies, industries, geographical positions, and company scales through both qualitative and quantitative methods to increase the reliability and validity of the framework.

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