



Institutional Governance and Smart Resource Management in Faisalabad's Industrial Sector

Ayesha Noreen^{1,*}, Uzma Noureen², Zain ul Abidin²

¹Institute of Business Management Sciences, University of Agriculture Faisalabad, Faisalabad, Pakistan

²Faisalabad Business School, National Textile University, Faisalabad, Pakistan

* ayesha_noreen@uaf.edu.pk

ARTICLE INFO

Keywords:

Smart Governance
Institutional Reform
Resource
Management
Technology
Integration
Citizen Participation
Industrial
Governance

Received: 21
November 2025

Received in revised
form: 26 December
2025

Accepted:
27 December 2025

Available online: 06
January 2026

ABSTRACT

Smart cities signal a clear shift in how urban and industrial spaces are governed, managed, and maintained, with digital innovation and participatory approaches at the center of decision-making. This paper examines how institutional governance can enable the adoption of smart city principles in the industrial sector of Faisalabad. The study draws on a structured review of peer-reviewed literature indexed in Scopus, Web of Science, and Google Scholar published between 2020 and 2025, supplemented by relevant government and NGO reports. After applying defined inclusion and exclusion criteria, a thematic analysis was conducted to synthesize key insights.

The paper contributes to the literature by integrating Institutional Theory with Smart Governance Theory to explain how governance arrangements shape the effectiveness of digital technologies in industrial cities within developing economies. Findings highlight that technology-driven governance and active stakeholder engagement are critical for efficient resource management and sustainable industrial growth. Three coordination mechanisms emerge as central to improving governance outcomes: strong institutional coordination, digital transparency, and effective public-private partnerships.

Faisalabad's industrial base, particularly its textile and export-oriented sectors, shows strong potential for transformation through smart resource management, including IoT-based monitoring, data-driven energy management, and digital waste systems. However, the study also identifies persistent institutional barriers, such as bureaucratic rigidity, weak data-sharing mechanisms, and limited inter-agency collaboration. Addressing these challenges requires integrated smart governance frameworks that align technological advancement with inclusive and accountable decision-making. Overall, the study adds context-specific evidence to global debates on smart governance, with relevance for developing economies where digital readiness and governance reforms are still evolving.

1. Introduction

Agriculture The concept of fast urbanization and industrialization in the developing economies like Pakistan has posed urgent issues to institutional governance and sustainable management of resources. The last twenty years have witnessed the increasing housing, transportation, and industrial infrastructure demands in cities in the Global South, which resulted in elaborate governance pressures and environmental deterioration. Indicatively, in Pakistan, urbanization has been associated with the expansion in the use of energy in transportation and households, which leads to environmental degradation. In this regard, smart cities have become a revolutionized model, which incorporates the application of information and communication

technology (ICT) in the management of the state to enhance the provision of services, transparency, and sustainability. Nevertheless, as the research underlines, the development of smart cities in the context of developing countries does not only demand the introduction of technology, but it also involves far-reaching institutional change (Maulana et al., 2025; Kaponda, 2025).

Smart cities are not, however, merely a matter of technological progress, but a matter of institutional change - of redesigning the administrative framework, policies, and citizen engagement, to allow smarter and more inclusive decision-making. This entails a redesign of the governance models, development of the interoperable data systems, and the establishment of

collaboration among the stakeholders. The empirical evidence indicates that institutional innovation, including the reform of legal frameworks, the reorganization of the public agencies, and the greater involvement of the stakeholders, plays a crucial role in strengthening smart-city governance and makes it more satisfactory to the stakeholders (Bokhari and Myeong, 2024; I-Gov et al., 2024).

Equally, studies point out that smart administration is advantageous with mission-driven methods and entrepreneurial ecosystems that is evident in the long-term experiments in Japan (Kitagawa, 2025).

Faisalabad as a Case Context

The city of Faisalabad is commonly referred to as the Manchester of Pakistan and it will provide a good example to test the intertwining of institutional governance and technology with the sustainability of industries. It is a significant contributor to the national economy of Pakistan, especially its textile industry; the Faisalabad Master Plan 2021-2041 indicates that textiles and other manufacturing industries are still the focus of the industrial sector (Faisalabad Development Authority, 2021).

In Faisalabad, the institutional government is also divided. Various agencies, such as the Faisalabad Development Authority (FDA), Water and Sanitation Agency (WASA) and industrial estate authorities, have overlapping mandates and few coordination frameworks. Such disintegration undermines the implementation of policies and limits the introduction of intelligent technologies in managing available resources sustainably. There is also evidence that the digital modernization of the public-service performance still is underdeveloped which represents more general restrictions in governance in urban Pakistan (Khalid et al., 2025).

Smart Cities and Institutional Governance

Institutional governance is a term used to refer to formal structures, rules, and processes whereby decision-making among the public and the privates takes place. In the context of smart-cities, governance is moved out of the traditional hierarchies and the so-called networked governance, in which government, industries and citizens work together in collaborative systems, digital and interoperable (Bokhari and Myeong, 2024). This change is essential since the success of a smart city does not exist solely in technology, but in the institutional innovation: the changes in the legal system, institutional

structure, and mechanisms of participation are essential to capitalize on the digital transformation (Nadeem et al., 2025).

Institutional fragmentation is a significant challenge to smart city development in Pakistan. There are further reforms of decentralization and multilevel governance, which have not been consistent and frequently without significant coordination between government levels (Taj & Baker, 2018).

Technology and Resource Management

Digital technologies, including the Internet of Things (IoT), Geographic Information Systems (GIS), and artificial intelligence (AI), can provide significant opportunities to enhance the management of resources in industrial cities. Such devices can track the energy consumption, water utilization, and pollution in real-time, allowing making decisions more accurately and regulating the situation. Yet, those technologies cannot bring their maximum benefits without well-developed institutional frameworks (Hardi et al., 2025).

In Pakistan, the technology-driven governance is held back by bureaucracies, lack of capacity to share data, and poor interoperability. The study of AI and government-related administration shows that the introduction of AI may increase the efficiency of bureaucratic operations by automating them and offering better visibility (Ahmad, 2025). The interoperability is particularly relevant: the inability of the institutions to share the data results in the fragmentation of the governance and the lack of coherence in managing resources. The global experience demonstrates that cross-sectoral cooperation is an effective approach to enhancing smart-city governance and to better human-security results (Hardi et al., 2025).

Stakeholder and Citizen Involvement

Smart governance is all about citizen participation. Citizens are now able to report problems, provide data, and participate in the processes of planning, through their digital platforms, and make governments more transparent and responsive. A methodological review of smart-city applications determines the trend of popularizing mobile reporting devices and digital platforms of participation to enhance urban management throughout the world (Bastos et al., 2022).

The participation of citizens in Pakistan is however weak. In e-governance studies, the implementation of ICT tools in service delivery is observed to be limited in

terms of participatory activities by political, socio-cultural, and institutional environments (Atique, 2024).

Research Gap and Justification

Although most smart-city literature in the world has dealt with developed settings, including Singapore, Seoul, and Amsterdam, only a limited amount of empirical work on industrial cities in developing economies has been done. A systematic review of smart-city governance in developing nations also notes the general lack of research in the area focused on socio-institutional changes, like regulatory frameworks and citizen engagement (Tan & Taeihagh, 2020).

In Pakistan, smart governance is mostly being studied from the perspectives of infrastructure and e-governance tools, as opposed to more fundamentally embedded institutional architecture such as inter-agency coordination, capacity building and participatory governance. As an illustration, other studies on AI adoption in Pakistani bureaucracy focus on its efficiency benefit but mention their entrenched institutional bottlenecks that restrain the effectiveness of governance (Ahmad, Elahi, and Khan, 2025).

This gap is notable since the use of smart governance and its success is determined by institutional innovation (e.g., change in norms, structure, and processes) and technological innovation working together. The empirical studies elsewhere demonstrate that the relationships between e-governance and stakeholder satisfaction are moderated by institutional and technological innovations (Bokhari and Myeong, 2024; Myeong and Bokhari, 2023).

Research Objectives

The paper is dealing with three main objectives:

1. To determine the institutional governance mechanisms (i.e., the inter-agency coordination, formal rules, capacity building) that facilitate the smart city development and the sustainability of industrial activities in Faisalabad.
2. To examine the role of technology and data systems (e.g., online platforms, real-time monitoring) in enhanced management of industrial resources in the city.
3. To assess the stakeholder and citizen involvement (industry actors, local residents, and civil society) as a contributor to a higher level of legitimacy,

transparency, and effectiveness of the governance processes.

These are the objectives that correspond to the overarching goal of evidence-based policymaking that entails the use of secondary data sources (policy documents, scholarly literature, industrial reports) in order to promote methodological rigor without the necessity of primary data collection (Siddiqui, Rehman, and Ansari, n.d.; Bukhari et al., 2025).

Significance of the Study

This study has a number of contributions. It emphasizes the industrial sector of Pakistan, specifically Faisalabad, which is still not well-represented in smart governance studies (Tan and Taeihagh, 2020). The study reduces the gap between governance reform and technology adoption by focusing on the governance structures and institutional capacity (Bokhari and Myeong, 2024). The results will guide the local administrators, industrial leaders, and governmental organizations in creating joint, evidence-based plans of sustainable resource utilization (Ahmad et al., 2025; Myeong and Bokhari, 2023). Faisalabad insights can also be transferred to other South Asian industrial cities, such as Dhaka and Surat, that have similar problems, such as fast industrialization, fragmentation of governance, and lack of citizen participation (Temoor bin Aslam, Salman, Irfan, and Jabeen, 2018). Altogether, the research advances a holistic framework of smart governance that combines technological advancement, participation, and institutional change to advance accountability, sustainability, and inclusiveness (Bukhari et al., 2025).

2. Literature Review

Smart Governance and Institutional Capacity

Smart governance refers to the application of information and communication technologies (ICT) to enhance service delivery, transparency and citizen interaction. It is not only the automation of the existing processes, but also empowerment of a data-driven decision-making culture based on participatory mechanisms. The review of the literature on smart cities in the developing world focuses especially on the idea that technology is not enough that can be successful in smart governance; institutional, legal, regulatory, and human-capital reforms are required (Xu, Zuo, and Zhao, 2020).

It all depends on the capacity of the ailing institutions. Institutional competence (for example, the flexibility of

bureaucracy and the ability to innovate) is necessary without which digital transformation may halt. Myeong and Bokhari (2023) showed that institutional innovation in the form of structural and process reforms enhances the impact of e-governance in satisfaction of stakeholders in smart cities. Bokhari and Myeong (2024) also emphasized that it is only when the institutional and technological innovations are combined that smart city governance enhances such results as crime reduction and citizen satisfaction.

The institutional issues play an important role in the developing cities such as Pakistan. The problems that significantly hinder the effective digital governance include weak local government capacity and lack of inter-departmental coordination (Siddiqui, Rehman, and Ansari, n.d.). Leadership will also be necessary and the change should not only have tools but also a buy-in by the leaders of the public sector to initiate the change and improve the capacity (Bokhari, Park, and Manzoor, 2025).

Lastly, institutional capacity in smart governance is based on citizen trust and participation. The willingness of behavior to use e-governance systems and their effectiveness greatly depend on digital literacy, trust in institutions, and willingness to use (Memon, Hakro, Ujjan, and Abbasi, 2025).

Resource Management Enabled by Technology

Smart governance is based on the real-time information gathering and analytics through the use of IoT, AI, and big data platforms, which will allow the accurate monitoring of resources (energy, water, and emissions). Although concepts of global literature can be applied, there are still few applied studies in industrial settings in developing countries (Yaseen, Nawaz, and Zhaira, 2024).

The transparency and accountability of the Pakistani public sector have been improved through digital transformation but infrastructural and institutional barriers restrict comprehensive implementation. As an illustration, e-Office and citizen portals can only be enhanced with insufficient infrastructure and training (Yaseen et al., 2024). Also, the aspect of data sharing between industrial participants and local organizations is hardly analyzed. Systematic reviews point out that the lack of legal frameworks and non-interoperable data systems has restricted the effect of technological innovation on governance (Bokhari and Myeong, 2024).

Digital divide also impacts on resource-management technologies and people cannot have equal access to quality connectivity and IoT infrastructure to implement it. Other research in other developing cities demonstrates that digital inequality invalidates the inclusiveness of smart governance policy (Aditya, Ningrum, and Nurasa, 2023).

Citizen and Stakeholder Participation

The key feature of smart governance is citizen involvement. New models pay more attention to co-production, i.e., citizens, businesses, and NGOs actively engage in decision making (Bokhari & Myeong, 2024). Nonetheless, a meaningful engagement is hindered by a number of barriers. These are the digital divide, the inadequacy of the institutional mechanisms (formal policy of participation), and the lack of trust to the government (CPDI, 2021; Haider, Shuwen, and Hyder, 2014). Low digital literacy and limited outreach can be a reason to see a low level of uptake of e-participation platforms in Pakistan (CPDI, 2021). There are also socio-technical challenges: marginalized or less tech-savvy stakeholders (including the laborers or low-income residence) may not use the digital platforms, even in the cases when these are available, which restricts inclusivity (Raza, 2020).

The other essential consideration is trust. Recent studies demonstrate that technological innovations, including AI-based governance tools, can change the outcomes of governance using the mediator of stakeholder trust. The successful adoption hinges on whether the technology is present or not as also the perception and usage of the technology by the stakeholders (Bokhari, Park, and Manzoor, 2025; Fatima, Sayed, Sajid, and Ali, 2025).

Faisalabad as a Case Study Situation

The city of Faisalabad is the third largest city of Pakistan and a big hub of industries and textile. Although the specific numbers are not much, it has been traditionally known as a textile factory with large-scale production and dyeing plants located in industrial zones like M-3 (Islam Republic of Pakistan, JICA; iPortal). This industrial growth is of great environmental footprints. The Faisalabad Regional Development Plan (Environment Sector) discusses that industrial emissions and traffic are the major causes of air pollution (Urban Unit, Punjab). Textile and dyeing industries are the sources of wastewater that pollute water because most industrial units treat their water insufficiently (Islam Republic of Pakistan, JICA).

The Faisalabad institutional governance is on the brink of collapse. Although there are environmental regulations, there is a lack of uniformity in enforcement and most industrial establishments are not fully compliant (iPortal). Civil society and international organizations have undertaken capacity-building programs. As an example, the project of the WWF called Integrated Local Environmental Strategies (ILES) engages SMEs in the Faisalabad textile industry to minimize the use of water and energy (WWF Pakistan, 2023). Nevertheless, there are still few institutional incentives to share data, report on the environment, or other forms of digital governance characteristic of smaller industrial actors.

The case provides a picture of potential and challenges of smart governance within an industrial city: adoption of technologies and environmental change are necessary, but real changes would not be possible without institutional frameworks that would encourage partnership, open data flow, and regulatory responsibility. Through a case study of Faisalabad, it is possible to draw lessons about how other developing economies industrialized cities would deal with to ensure coordination of governance, technology and sustainability.

Table 1. Summary of Prior Literature and Linkage to Study Objectives

Theme	Key Findings from Literature	Identified Gap	Link to Objectives
Institutional Capacity	Governance effectiveness depends on institutional reform	Limited focus on industrial cities	Objective 1
Technology & Resources	IoT improves efficiency but lacks governance integration	Weak institutional embedding	Objective 2
Participation	Participation improves legitimacy	Few formal mechanisms in Pakistan	Objective 3

Table 1 above gives a classified overview of the previous literature by pointing out the prominent themes, chief results, the identified research gaps, along with their direct mapping to the objectives of the current research. From the above table, previous research stresses the significance of addressing the capacity of institutions, technology and resources, and the engagement of stakeholders in the context of governance and efficiency enhancement. Meanwhile, the identified research gaps include the lack of emphasis on industrial cities, the integration of technology in the framework of institutions, and the formal engagement opportunity in the context of participation in the Pakistani setting.

3. Materials and Methods

Research Design

The qualitative secondary research design is used in this study. It is designed in accordance to systematic review and synthesis of available literature, policy documents, and institutional reports. The method is appropriate in cases

where the primary data collection can be challenging because of political, logistical, or institutional facts. Key sources include:

1. Articles in scholarly databases, like Google Scholar, Scopus, and Web of science (2020-2025).
2. Government and planning documents, e.g., Faisalabad Regional Development Plan (Urban Unit, Punjab).
3. Environmental and industrial stakeholders, e.g., WWF-ILES project on resource efficiency (WWF Pakistan, 2023).
4. International comparison of other developing industrial cities.

It can be developed as a multi-source approach which allows the creation of the integrated concept of governance, institutional capacity and sustainability of resources.

Theoretical Framework

Institutional Theory (focusing on the influence of formal structures, norms, and rules on organizational behavior and

governance outcomes) guides the study, and Smart Governance Theory (focusing on the role of ICT and participatory mechanisms in enhancing accountability, transparency, and service delivery) is one of the theories. Integrating these theories, the research is examining not only an analysis of the technological tools used in Faisalabad, but also the institutional preconditions that make such tools work in Faisalabad. According to institutional theory, organizations follow the rules of the institutions in order to attain legitimacy and stability (Lawrence and Shadnam, 2008). Smart governance, its part, is based on the combination of digital technologies and citizen engagement to create more responsive and inclusive governance (MDPI smart governance literature; participatory governance in e-participation contexts; see, e.g., research on e-participation in smart cities).

The following are the research objectives which will be aligned in this study.

Search Strategy and Screening Process

A systematic literature review was done to find out the relevant studies concerning the study objectives. To provide a wide range of high-quality and peer-reviewed literature, three large academic databases, namely, Scopus, Web of Science, and Google Scholar, were employed. January 2020 to June 2025 was the period of the search; this range of years encompassed the latest and topically relevant scholarly works.

The search method involved preset key word combinations and Boolean operators. The major search terms were: capacity building, women leadership, self-efficacy, women in higher education and leadership ambition in public sector universities. These keywords were chosen because they are relevant to the research variables and theoretical model.

The results were narrowed down using clear inclusion and exclusion criteria. The studies were considered eligible when they were peer-reviewed journal articles, published in English, and concentrated on women in higher education or institutions of the public sector and when they covered the issues of capacity building, leadership development, or self-efficacy. The exclusion criteria included conference papers, editorials, dissertations, non-English publications, and studies that have no empirical or theoretical relevance.

The screening was done in a PRISMA-style manner. First, the records picked in the databases were consolidated and duplicate entries were eliminated. Screening was done on titles and abstracts to determine the relevance, and full-text screening was carried on the shortlisted articles. Upon completion of the screening and eligibility test, a final list of

studies was chosen to be included in the review. Such a systematic screening process guaranteed the methodological rigor, transparency as well as relevance of literature that was incorporated.

Data Collection and Sources

This study search strategy employed the use of search words, including; Faisalabad industrial governance, textile pollution Faisalabad, smart city Pakistan Punjab, and institutional capacity local government Pakistan. The inclusion criteria were that they had to be peer-reviewed articles published no older than 2025 and also pertinent government or NGO reports, such as the Urban Unit and WWF reports, and must be in English. The exclusion criteria removed non-empirical blogs or opinion pieces, as well as studies that were specializing in residential smart cities only. After these criteria were taken into consideration, the final data is a balanced portfolio of scholarly research, planning reports, and provider reports.

Data Analysis Procedure

The thematic analysis was used in the study according to the method given by Braun and Clarke (2006). It has started with familiarization where all the chosen sources were repeatedly read and annotated. This was then followed by coding with deductive codes used to three pre-specified categories including institutional governance, adoption of technology and inductive coding used to identify other emerging sub-themes that included inter-agency coordination, data interoperability, and digital literacy. During the theme development phase, similar codes were put in the general thematic categories; e.g., the IoT monitoring, energy efficiency, and wastewater sensors were categorized under the theme of technology-enabled resource management. Lastly, the synthesis step incorporated all the clusters of thematic themes into a consistent story clarifying how systems of governance, technological solutions, and practices of stakeholders interacted within the industrial environment of Faisalabad (Braun & Clarke, 2006).

Triangulation

Triangulation was used in order to increase validity and reliability of the findings by comparing evidence based on various sources and data types as suggested by Denzin (2017). Government reports were cross-verified with academic literature on smart governance and the industrial resource management to ensure that the policy realities are taken into consideration, and the practical knowledge of the technology implementation has been presented in the industrial white papers which supplemented the theoretical outlooks. Also, international comparative research offered

standards on the evaluation of the Faisalabad governance mechanisms. Triangulation minimized bias that may arise when using one type of data and enhanced the strength of the study to come up with strong evidence-based conclusions.

Ethical Considerations

The research has used strictly secondary sources and involves no human subjects, which is typical of the documentary and desk-based research (Bowen, 2009). All used materials were referenced in APA guidelines 7th edition, which ensured the academic integrity and compliance with the traditional rules of academic writing (American Psychological Association, 2020). Moreover, every step of the analysis procedure was well-recorded, in line with the principles of transparency and reproducibility that are traditionally suggested in the approach to the qualitative research (Saunders, Lewis, and Thornhill, 2023).

Strengths and Limitations

The paper shows a number of strengths such as combining various sources of data, which offer a comprehensive view, the methodology used in the study is clear and reproducible, and the study does not face the logistical, financial and ethical problem of collecting primary data. Nevertheless, it is also limited. Lack of primary data can cause the omission of subtle stakeholder perceptions and the use of secondary sources can bring about the risk of certain information being biased or out of date. Also, local politics and informal activities might not be well represented and restrict the contextual knowledge.

4. Results and Discussion

Results

According to the discussion of the secondary sources, the system of governance in Faisalabad shows a progressive move towards the idea of a smart city. Nevertheless, this shift is still limited by structural fragmentation, poor procedural coordination and poor stakeholder integration. The findings are presented in four thematic dimensions, including institutional alignment, technology integration, stakeholder participation, and cross-dimensional interactions.

Institutional Alignment

The results show that there is poor cooperation between the industrial agencies and the municipalities in Faisalabad. The inefficiency of e-governance initiatives, as well as the efficiency of governance in general, is curtailed by this institutional fragmentation (Bokhari & Myeong, 2024).

Despite the significant potential of artificial intelligence (AI) and information and communication technology (ICT) projects to improve the governance processes, Pakistani institutions lack the capacity to implement the smart governance systems on a large scale due to bureaucratic inefficiency and lack of capacity to manage such projects (Ahmad, Elahi, and Khan, 2025).

Technology Integration

There is evidence indicating that there is an uneven uptake of the Internet of Things (IoT) technologies in Pakistani industries. There is also an enhancement in predictive maintenance and operational efficiency in industries where IoT solutions are applied (Waheed et al., 2023). Arduino-based platforms were the low-cost industrial IoT (IIoT) that allowed real-time monitoring in small and medium-sized enterprises in resource-constrained settings (Majid et al., 2022).

Stakeholder Participation

The findings reveal that industrial stakeholders, especially in the textile industry, are increasingly interested in adopting the IoT technologies and joining the governance efforts to increase productivity and efficiency, minimize energy use, and reduce the cost of operations (Farooq et al., 2023). Although there has been this interest, formal structures of participatory governance are still weak. According to the literature, not much evidence of structured platforms/digital co-governance systems/participatory policy frameworks is found that includes active involvement of industrial actors, municipal authorities, and civil society organizations (Tan & Taeihagh, 2020).

Cross-Dimensional Findings

The results reveal that there is a close relationship between institutional alignment, technology adoption, and stakeholder participation. The problem of institutional fragmentation limits the successful integration of technology because the absence of coordinated governance bodies means that industrial IoT data cannot be used in the larger municipal or environmental framework (Majid et al., 2022). Likewise, ineffective participatory systems constrain the political applicability of technological projects since surveillance results are rarely converted into a governance system because of the lack of organized feedback systems (Farooq et al., 2023). Because of this, Faisalabad is in a middle of the road, with technological pioneers in the city, but without full-scale governance changes or participatory engagement models (Myeong & Bokhari, 2023).

Discussion

The results highlight the fact that technological innovation is not a sufficient factor towards attaining sustainable smart city governance. Rather, active institutional organizations and participatory governance systems are important facilitators of fruitful digital change in industrial urban areas like Faisalabad.

Institutional Governance as a Facilitating Support

These findings are in line with the current literature that institutional governance is a key element of successful smart cities. The low levels of inter-organizational coordination in Faisalabad are representative of the general problem in developing economies, whereby the lack of unified power and conflict in strategic alignment hamper the results of integrated governance (Tan and Taeihagh, 2020). Accountability could be improved by strengthening the institutional frameworks, including the presence of public-private partnerships, interagency coordination councils, and formal data-sharing committees (Myeong and Bokhari, 2023).

Technology Integration and Data-Based Governance

According to the previous research, interoperable platforms and centralized dashboards will be the key to transforming the factory-level data into actionable insights to be used by municipal decision-makers (Myeong & Bokhari, 2023). Predictive analytics and IIoT systems are examples of automated industrial plants that support the feasibility of such integration in Pakistan (Waheed et al., 2023).

Stakeholder Engagement and Participatory Governance

In line with the literature, the results highlight that the stakeholder participation improves the governance legitimacy, compliance, and joint responsibility (Myeong and Bokhari, 2023). Participatory governance in Faisalabad, however, is still under-institutionalized and rather informal. Smooth smart governance would also need formal mechanisms such as advisory boards, online platforms of participation and citizen-industry councils, which would systematically integrate stakeholder feedback into the policymaking processes (Tan & Taeihagh, 2020).

Policy and Practical implications

The discussion indicates that Faisalabad and other industrial cities should focus on integrated reforms in governance to promote smart city programs. Formal interagency committees need to be strengthened by means of industrial associations, municipalities and environmental regulators. At the same time, interoperable digital infrastructure will

have to be invested in to unify factory-level IoT data with more comprehensive urban governance systems (Majid et al., 2022). Lastly, the most important steps toward the sustainability and inclusion of smart city development include the establishment of participatory mechanisms and the investment in capacity-building initiatives centered on the establishment of digital literacy, data governance, and collaborative decision-making (Waheed et al., 2023; Razzak et al., n.d.).

Theoretical Contribution

By combining Institutional Theory and Smart Governance Theory, this study demonstrates that digital technologies alone do not produce smart governance outcomes unless embedded within coordinated institutional structures. This integrated perspective extends smart governance literature beyond technological determinism, particularly in developing-country industrial contexts.

5. Conclusion and Policy Implications

In this research, it is shown that smart governance in Faisalabad is based on institutional capacity, technological infrastructure, and stakeholder involvement. Factories are embracing IoT and automation, without which the absence of institutional alignment and participatory processes restrains the conversion of these innovations into improvements in the overall governance of the systems.

Key Recommendations

The results of the current research indicate that institutional capacity, technological integration, and stakeholder involvement are the factors that affect the achievement of smart governance in Faisalabad. Despite the growing industrial players using IoT, automation, and digital surveillance systems in Faisalabad, the findings reveal that such technological innovations have not yet been translated into the improvement of the governance in general. The main factor that explains this deficit is the poor institutional correspondence and a lack of formal participatory governance frameworks.

Regarding the specified institutional disintegration among industrial associations, municipal governments, and other environmental regulators, the study suggests creating formalized coordination frameworks in Faisalabad. To be more precise, the institutionalization of inter-agency committees or smart governance coordination units is to be used in order to facilitate the process of joint decision-making, sharing data, and regulatory alignment. This recommendation specifically relates to the fact that the introduction of industrial innovations into the city-level

planning and control is not possible due to the isolated practices of governance.

The findings also indicate that the governance value of industrial IoT systems is limited by the interoperability. The solution to this problem would be to focus the municipal authorities Faisalabad development on the creation of compatible digital infrastructure and unified data standards that would enable the data available at factory level to stimulate city-wide monitoring, planning and control processes. In the absence of these platforms, the IIoT applications will be limited to isolated factories, thus playing a lesser role in environmental management and urban sustainability.

In accordance with the weak stakeholder participation findings, the research suggests institutionalization of the continuous mechanisms of participatory governance in line with the industrial situation of Faisalabad. They should introduce the digital feedback platforms, advisory boards, and citizen-industry councils, which would facilitate the structured interaction between industrial actors, municipal authorities, and the civil society. The mechanisms would contribute to turning the interest of the stakeholders into meaningful co-production, accountability, and policy responsiveness and, as shown, the institutional and technological innovation improves the satisfaction of stakeholders and the performance of the governance (Myeong and Bokhari, 2023; Bokhari and Myeong, 2024).

The findings also demonstrate the problem of capacity limitations in the state institutions and industrial management. In order to fill this gap, the targeted capacity-building programs ought to be applied in Faisalabad, with an emphasis on digital literacy, data governance, and participatory practices among the government officials, industrial managers, and workers. This would enhance institutional preparation and better utilization of digital governance tools.

Lastly, due to the bureaucratic inefficiencies observed in the government's governance system, the research endorses a progressive adoption of artificial intelligence into the decision-making of the government and with the help of adequate regulatory and ethical standards. Analytics based on AI have the potential to increase transparency and shorten time spent on procedures, as well as aid evidence-based policymaking in the municipal government structures of the city of Faisalabad (Ahmad, Elahi, and Khan, 2025). Such technological changes should be accompanied by better institutional requirements and enhanced local governmental structures to anchor the decision-making process based on data into daily municipal functions.

Future Research

However, future studies have the potential to further the results by employing empirical research, including interviews, focus groups, or workshops, to understand the attitudes of governmental officials, factory managers, workers, and community members concerning the adoption of technology and changes in governance. The comparative studies with other industrial South Asian cities like Surat or Dhaka can also indicate the best practices in the integration of technology, governance, and stakeholders' participation. Longitudinal studies would also contribute to evaluating the changes in digital governance reforms over time and its impact on environmental performance, compliance with regulation, and trust among stakeholders. Additionally, the ethical aspect of AI, data privacy, and accountability of algorithms would help to ensure the responsible utilization of digital technologies in the municipal governments. Altogether, these guidelines can help build a more solid theoretical and practical basis of developing smart governance in industrial cities.

6. References

- Aditya, T., Ningrum, S., & Nurasa, H. (2023). *Community needs for the digital divide in smart city policy: A study from an Indonesian city*. *Heliyon*, 9(8), e18932. <https://doi.org/10.1016/j.heliyon.2023.e18932>
- Ahmad, K., Elahi, M. M., & Khan, A. R. (2025). *Smart governance in Pakistan: (Re-)thinking bureaucratic efficiency through AI integration*. *The Critical Review of Social Sciences Studies*, 3(2), 1684–1700. <https://doi.org/10.59075/zyh56149>
- Aisyah, S., Hidayat, Z., and et al. (2024). *Transforming smart city governance for quality of life and sustainable development in Semarang City, Indonesia*. *IETA Journal of Sustainable Development and Planning*.
- American Psychological Association. (2020). *Publication manual of the American Psychological Association* (7th ed.).
- Atique, M. (2024). *An analysis of e-governance in Pakistan from the lens of the public sector*. *Heliyon*.
- Bastos, D., Fernández-Caballero, A., Pereira, A., & Rocha, N. P. (2022). *Smart city applications to promote citizen participation in city management and governance: A systematic review*. *Informatics*, 9(4), 89. <https://doi.org/10.3390/informatics9040089>
- Bokhari, S. A. A., & Myeong, S. (2024). *How do institutional and technological innovations influence smart city governance? Focused on stakeholder satisfaction and crime rate*. *Sustainability*, 16(10), 4246. <https://doi.org/10.3390/su16104246>

- Bokhari, S. A. A., Park, S. Y., & Manzoor, S. (2025). *Digital government transformation through artificial intelligence: The mediating role of stakeholder trust and participation*. *Digital*, 5(3), 43. <https://doi.org/10.3390/digital5030043>
- Bowen, G. A. (2009). *Document analysis as a qualitative research method*. *Qualitative Research Journal*, 9(2), 27–40. <https://doi.org/10.3316/QRJ0902027>
- Braun, V., & Clarke, V. (2006). *Using thematic analysis in psychology*. *Qualitative Research in Psychology*, 3(2), 77–101.
- Bukhari, S., Kamran, S. M., Asif, M., Abro, M. M. Q., & Zaman, K. (2025). *Engineering smart governance systems and e-government services for urban sustainability: A systems-based approach to SDG-aligned urban efficiency*. *Spectrum of Engineering Sciences*, 3(4), 304–322.
- Denzin, N. K. (2017). *The research act: A theoretical introduction to sociological methods*. McGraw-Hill.
- Farooq, M. S., Abdullah, M., Riaz, S., Alvi, A., Rustam, F., López Flores, M. A., ... Ashraf, I. (2023). *A survey on the role of industrial IoT in manufacturing for implementation of smart industry*. *Sensors*, 23(21), 8958. <https://doi.org/10.3390/s23218958>
- Fatima, R. B., Sayed, S., Sajid, M. A., & Ali, S. (2025). *Assessing the impact of digital governance on citizen participation and public service delivery: A comparative study of developing and developed countries*. *Review Journal of Social Psychology & Social Works*, 3(1), 99–109. <https://doi.org/10.71145/rjsp.v3i1.80>
- Haider, Z., Shuwen, C., & Hyder, S. (2014). *Citizens' participation in e-government services: Comparative study of Pakistan & Singapore*. *IOSR-JECE*, 9(6), 35–48.
- Hardi, R., Nurmandi, A., Purwaningsih, T., & Manaf, H. (2025). *Smart city governance and interoperability: Enhancing human security in Yogyakarta and Makassar, Indonesia*. *Frontiers in Political Science*, 7. <https://doi.org/10.3389/fpos.2025.1553177>
- Islamic Republic of Pakistan, JICA. (n.d.). *Project for water supply, sewerage and drainage master plan of Faisalabad*.
- Kaponda, T. (2025). *From new public management to digital public administration: Examining the role of technology in shaping super smart societies*. *IJRISS*, 9(5), 3306–3320. <https://doi.org/10.47772/IJRISS.2025.905000257>
- Khalid, A., & others. (2025). *Inadequate governance of urban ecosystems in Lahore*. *Urban Science*, 9(5), 162.
- Kitagawa, F. (2025). *Smart cities as “mission-oriented” innovation and entrepreneurial ecosystems*. Cambridge Journal of Regions, Economy and Society. <https://doi.org/10.1093/cjres/rsaf019>
- Lawrence, T. B., & Shadnam, M. (2008). *Institutional theory*. In W. Donsbach (Ed.), *The international encyclopedia of communication* (Vol. 5, pp. 2288–2293). Blackwell.
- Lim, B., Yigitcanlar, T. (2022). *Participatory governance of smart cities: Insights from e-participation*. *Journal / MDPI*.
- Majid, M. I., Malik, E., Aslam, T., Mahfooz, O., & Maqbool, F. (2022). *Design and implementation of low-cost data acquisition system for SMEs in Pakistan*. *Proceedings of the Pakistan Academy of Sciences*, 59(4), 13–23. [https://doi.org/10.53560/PPASA\(59-4\)784](https://doi.org/10.53560/PPASA(59-4)784)
- Maulana, R. Y., Marjamat, U., Subekti, D., & Wicaksono, A. (2025). *Catalyzing digital transformation through smart cities initiatives in Indonesian local government*. *Smart Cities and Regional Development*, 9(1), 35–46. <https://doi.org/10.25019/59kh3t06>
- Memon, B., Hakro, D. N., Ujjan, I., & Abbasi, S. (2025). *A behaviorally-driven software architecture for e-government adoption in Pakistan*. *VFAST Transactions on Software Engineering*, 13(2).
- Myeong, S., & Bokhari, S. A. A. (2023). *Building participative e-governance in smart cities: Moderating role of institutional and technological innovation*. *Sustainability*, 15(20), 15075. <https://doi.org/10.3390/su152015075>
- Nadeem, M., Matsuyuki, M. (2025). *Institutional challenges and opportunities for encouraging transit-oriented development in Lahore*. *Transportation Research Interdisciplinary Perspectives*.
- Raza, I. (2020). *Digital divide and e-governance in Pakistan: Factors affecting the citizen portal app*. (MPhil thesis, PIDE).
- Razzak, A., Haneef, A., Ahmed, W., & Ayub, A. (n.d. 2023). *Pakistan aqua surveillance and control using IoT and LoRa protocol*. *IJCRT*.
- Saunders, M., Lewis, P., & Thornhill, A. (2023). *Research methods for business students* (8th ed.). Pearson. https://www.researchgate.net/publication/240218229_Research_Methods_for_Business_Students
- Siddiqui, A. A., Rehman, S. S. U., & Ansari, M. I. (2025). *The future of e-governance in Pakistan: Current status and future direction*. *Journal of Political Stability Archive*. <https://doi.org/10.63468/jpsa.3.4.10>
- Tan, S. Y., & Taeihagh, A. (2020). *Smart city governance in developing countries: A systematic literature review*. *MDPI* <https://doi.org/10.3390/su12030899>

- Temoor bin Aslam, Salman, Y., Irfan, S., & Jabeen, N. (2018). *Smart cities – A multidisciplinary perspectives model*. *South Asian Studies*, 33(2), 435–459.
- Transforming digital government in Pakistan: Challenges & citizen participation*. Centre for Peace & Development Initiatives (2021). <https://mjmsear.com/wp-content/uploads/2021/08/Transforming-Digital-Government-in-Pakistan-August-2021-Final.pdf>
- Waheed, F., Omar, M., Ibrahim, S. Z., Chughtai, R., & Aejaaz, S. H. (2023). *Application of industrial IoT in developing a sustainable and automatic liquid filling plant*. *Pakistan Journal of Scientific Research*, 3(1), 130–140.
- WWF Pakistan. (n.d. 2023). *Integrated Local Environmental Strategies (ILES) – Textile Sector*. https://wwfasia.awsassets.panda.org/downloads/annual-report-2023_compressed--1-.pdf
- Xu, Y., Zuo, J., & Zhao, R. (2020). *Smart city governance in developing countries: A systematic literature review*. *Sustainability*, 12(3), 899. <https://doi.org/10.3390/su12030899>
- Yaseen, A., Nawaz, A., & Zhaira, D. (2024). *The impact of digital transformation on public sector governance in Pakistan*. *Journal of Neonatal Surgery*. <https://doi.org/10.63682/jns.v14i2S.9220>
- Zhang, H. (2022). *Digital transformation of smart industries and transformation of smart city governance models*. *Proceedings of the International Conference on Internet Technology, Big Data & Security*.