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SWOT Analysis in Smart City Project Management: Adaptation Strategy to the Industrial Revolution 5.0

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ABSTRACT

The Industrial Revolution 5.0 brings a paradigm shift towards harmonious collaboration between humans and intelligent machines, demanding a human-centric approach in Smart City development. Smart City projects in this era must be adaptive, not only integrating technologies such as IoT and AI, but also considering social dynamics, culture, and digital ethics. Key challenges include the digital divide, social resistance, and the need for more flexible and collaborative project management. This study aims to analyze the use of SWOT as an adaptive strategy tool in dealing with this complexity. The method used is a qualitative-descriptive approach through case studies in several major cities in Indonesia, with data collection techniques in the form of interviews, documentation studies, and observations. SWOT is developed from being an evaluative tool into a dynamic strategy framework that takes into account technological, social, cultural, and sustainability factors. The findings show that the integration of SWOT with additional analysis such as PESTLE and Balanced Scorecard strengthens the adaptive power of Smart City management, allowing for the formulation of strategies that are more responsive to exponential change. This study recommends updating the SWOT framework to accommodate the values of the Industrial Revolution 5.0, thereby supporting the development of more inclusive, humanistic, and sustainable smart cities

Keywords: *Adaptive-SWOT Analysis; Industrial-Revolution 5.0; Smart-City*

INTRODUCTION

The Industrial Revolution 5.0 marks a paradigm shift from the dominance of automation to harmonious collaboration between humans and intelligent machines. No longer merely prioritizing production efficiency and system digitalization, this era demands a human-centric approach where human values, sustainability, and inclusivity become the main foundations in technological transformation (Wulandari et al., 2025). In this context, the development of a Smart City is not enough to focus only on integrating technologies such as the Internet of Things (IoT), big data, and artificial intelligence, but must also consider the social dynamics and emotional needs of city residents as the main users of the system. The challenges are not only technical, but also ethical and social, especially in ensuring citizen participation and digital justice in the use of advanced technology.

Furthermore, the Industrial Revolution 5.0 broadens the spectrum of challenges in Smart City projects, especially in terms of management and strategic planning. The implementation of smart technology without a strong foundation of socio-cultural understanding can create a wider digital divide, instead of strengthening social connectivity. For example, smart city initiatives that rely too much on data without

considering the local context often experience rejection or fail to meet community expectations (José & Rodrigues, 2024). Therefore, Smart City projects in this era are required to be more adaptive and responsive to the complex realities of society, by developing strategies that are not only technology-based, but also have social, cultural, and ecological dimensions.

In dealing with the complexity of Smart City project management, administrative efficiency and managerial agility are crucial elements. Many smart city projects fail to achieve their long-term goals due to lack of cross-sector coordination, policy inconsistencies, or an overly technocratic approach. The Industrial Revolution 5.0 demands a more flexible and collaborative project management approach, where multi-stakeholder involvement ranging from government, private sector, to civil society is a key prerequisite for success (Musarat et al., 2023). Not only running technology-based projects, project management must be able to respond quickly to changing needs of city residents, environmental challenges, and ever-changing geopolitical dynamics.

Therefore, Smart City project management in the Industry 5.0 era can no longer rely on a linear or conventional approach. Adaptive management models such as Agile Project Management and participatory frameworks need to be implemented to create a system that is more responsive and resistant to disruption. The use of the SWOT method in this context is very relevant, because it can help identify internal strengths and external opportunities, while also responding to weaknesses and threats strategically (Ahmadi, 2024). This analysis allows for the formulation of contextual and evidence-based strategies, while still accommodating the humanistic aspects that are central to the Industrial Revolution 5.0. Therefore, the role of SWOT is not only as a static analysis tool, but as a dynamic instrument that navigates uncertainty and drives project sustainability holistically.

Amidst the increasing uncertainty and dynamics of the strategic environment, the use of SWOT analysis in the management of Smart City projects is becoming increasingly urgent. This method not only helps in identifying internal and external factors, but also becomes the basis for developing strategies based on competitive advantages and risk mitigation. However, the main criticism of the traditional SWOT approach is its tendency to be descriptive and qualitative, making it less able to capture the dynamics of change in real time. In the context of the fast-paced and complex Industrial Revolution 5.0, this weakness can have an impact on the inaccuracy of the strategies taken, especially if not supported by accurate data and continuous evaluation mechanisms.

To address these limitations, the integration of SWOT with other analytical methods such as PESTLE analysis, Balanced Scorecard, or even machine learning for trend prediction, can strengthen the accuracy and adaptability of strategic decision-making. In the digital era that demands high responsiveness, this approach can encourage the transformation of SWOT from a static evaluation tool to a dynamic and proactive strategic intelligence system (Asep, 2024). Thus, SWOT is no longer just a managerial tool, but becomes part of a data-based decision-making system (evidence-based policy), which is in line with the humanistic values and adaptive technology carried by the Industrial Revolution 5.0.

The lack of specific studies linking SWOT analysis to the challenges of the Industrial Revolution 5.0 in the context of Smart Cities reflects a significant literature gap. Most studies are still trapped in the old framework that positions SWOT as a strategic environmental diagnostic tool without linking it to the latest technological evolutions, such as the integration of AI, human-machine collaboration, or the concept of digital ethics. In fact, the Industrial Revolution 5.0 requires a strategic analysis approach that not only assesses strengths and weaknesses internally, but also considers humanistic

aspects, social inclusion, and data justice as new dimensions of "opportunity" and "threat" (Li et al., 2023). Therefore, the application of SWOT in this era must be recontextualized in order to remain relevant and effective as a visionary strategy formulation tool that is responsive to exponential change.

Furthermore, the absence of an integrated framework that combines SWOT with typical Industrial Revolution 5.0 indicators hampers the formation of long-term adaptation strategies in Smart City projects. Conventional SWOT analysis generally fails to capture disruptive factors such as shifting societal values towards data privacy, expectations towards personalization of public services, and ethical demands towards AI systems. In fact, these challenges will determine the success or failure of smart city projects in the future (Subekti et al., 2024). Therefore, a new methodological approach is needed that makes SWOT an evolving strategic platform—combining managerial intuition with AI-based data processing and feedback loops from the community—to create a truly inclusive and adaptive smart city strategy in the long term.

METHOD

This study uses a qualitative-descriptive approach with a case study method on Smart City projects in several major cities in Indonesia. The main focus is to analyze the application of SWOT as an adaptive strategy tool for the challenges of the Industrial Revolution 5.0. Data were collected through in-depth interviews, documentation studies, and observations, involving project managers, technology partners, academics, and citizens as service users.

The analysis was conducted by identifying internal factors (Strengths and Weaknesses) and external factors (Opportunities and Threats), which were then mapped into the TOWS Matrix to formulate strategies. SWOT is not only used as an evaluative tool, but is also transformed into an adaptive strategy framework that considers the technological, social, and ethical dimensions of the Industry 5.0 era. Data validity is strengthened through triangulation of sources and methods, as well as expert validation

RESULTS AND DISCUSSION

SWOT Analysis on Smart City Project Management in the Industry 5.0 Era

Based on data from interviews, documentation studies, and observations, four main groups were obtained in the SWOT analysis which reflect the dynamics of Smart City project management in Indonesia in facing the Industrial Revolution 5.0.

Strengths (Strengths)	**Weaknesses**
- Basic ICT infrastructure is starting to become available in big cities.	- Policy fragmentation between agencies
- National regulatory support for smart city development	- Dependence on external technology providers
- Increased public interest in digital services	- Low digital literacy among some groups in society
- Availability of IT human resources in local government environments	- Lack of data integration between public service platforms
Opportunities	**Threats (Threats)**
- Global trend towards inclusive and human-centric cities	- Threats to citizen privacy and data security

Strengths (Strengths)	Weaknesses
- Innovations in AI, IoT and Big Data technologies are widely open	- Digital divide between social groups and regions
- Smart City program support from the central government and donors	- Risk of project failure due to social resistance
- Citizen participation increases through digital channels	- Uncertainty about the direction of new technology regulation

TOWS Matrix Based Adaptive Strategy Discussion

From the SWOT mapping above, several adaptive strategies were developed using the TOWS Matrix approach:

1. **SO Strategy (Strengths–Opportunities)**:

   In optimizing the Strengths–Opportunities (SO) strategy, city governments can utilize existing digital infrastructure and supportive regulatory frameworks to accelerate the adoption of Artificial Intelligence (AI) and Big Data technologies ethically and responsibly. This approach is in line with the principles of the Industrial Revolution 5.0 which places humans at the center of technology development, where innovation is not only aimed at increasing efficiency but also strengthening social welfare. One strategic implementation that can be done is to build a smart city dashboard that is integrated across sectors, such as transportation, health, education, energy, and security. This dashboard not only functions as an efficient city management tool, but must also be designed in a transparent and participatory manner, so that the community can contribute directly to data-based decision making.

   Scientifically, this strategy is reinforced by the findings of Sultani et al (2023), which emphasize that technology development must pay attention to human needs, prioritize user empowerment, and uphold the principles of social justice. In addition, Bahangulu & Owusu-Berko (2025) emphasize that the use of Big Data in governance needs to consider ethical aspects, privacy, and potential algorithmic bias, to ensure the creation of fair and inclusive public policies. By adopting this approach, the city government not only increases the efficiency of public services through real-time needs predictions, but also strengthens public trust through data openness and adaptive service innovation.

   Furthermore, the idea by Rachmad et al (2024) supports this new paradigm, where the government transforms into a collaborative platform that enables synergy between citizens, the private sector, and civil society organizations based on open data. Thus, this SO strategy not only accelerates the digital transformation of cities, but also ensures that technological advances truly bring real benefits to all levels of society, in line with the values of the Industrial Revolution 5.0.

2. **ST Strategy (Strengths–Threats)**:

   In facing serious threats such as data security and the digital divide, it is important to leverage the organization's internal strengths, especially in the capacity of information technology (IT) human resources (HR) and local potential in developing digital security systems. Strengthening IT HR must be done through continuous training programs, professional certification, and fostering a cybersecurity culture throughout the organization. According to research by Permana et al (2025), investment in IT security training significantly increases organizational resilience to cyber attacks.

The development of a locally-based digital security system is crucial. This system not only increases control over the technology used, but also reduces dependence on foreign vendors that can pose additional risks. According to Disterer (2013), locally-based information security management supports better adaptation to specific needs and the local legal and social environment.

To ensure the effectiveness of these efforts, regular technology audits are required. These audits should include vulnerability assessments, penetration testing, and evaluation of information security policies and procedures. According to the ISACA report (2020), organizations that conduct regular IT audits are 30% more likely to detect and resolve security incidents.

On the other hand, a progressive data protection policy needs to be formulated and dynamically updated following technological developments and new threats. This policy must pay attention to the basic principles of personal data protection, as regulated in the GDPR (General Data Protection Regulation) in the European Union or the PDP (Personal Data Protection) Law in Indonesia. According to a study conducted by Bahtiar (2024), strong and consistent regulations in data protection contribute greatly to public trust in digital services.

Without these measures, projects risk losing public trust, which in turn could hinder the adoption and sustainability of digital innovation. Therefore, responses to these threats must be systematic, integrated and evidence-based.

3. **WO Strategy (Weaknesses–Opportunities)**:

Dependence on third parties and low digital literacy are two major weaknesses that must be addressed immediately so that potential opportunities can be optimally utilized. The proposed strategy is to build long-term partnerships based on technology transfer and organize community-based digital literacy programs.

First, building long-term partnerships based on technology transfer aims to reduce dependence on third parties. Technology transfer is not only limited to technology transfer, but also includes the systematic transfer of knowledge, skills, and innovation (Bejarano et al., 2023; Abdurazzakov et al., 2020). With this strategic partnership, organizations or communities can gain access to cutting-edge technology, while increasing internal capabilities in managing and developing the technology independently. In addition, long-term partnerships will create a mutualistic symbiotic relationship, where each party benefits sustainably from innovative cooperation.

Second, to overcome low digital literacy, a grassroots approach is needed through community-based digital literacy programs. According to Azwar et al (2024) in his book, digital literacy is not only about the ability to use technological devices, but also the ability to think critically about digital information, as well as the skills to adapt in a dynamic digital ecosystem. Community-based programs will be more effective because they prioritize the principles of active participation, local relevance, and contextual learning, thereby increasing the absorption and sustainability of training results.

In this context, the collaborative and inclusive values of the Industrial Revolution 5.0 become very relevant. The Industrial Revolution 5.0 emphasizes the importance of integrating advanced technology with human values such as collaboration, sustainability, and individual empowerment (Syafrizal et al., 2024). Not only machine efficiency, but also the ability of humans to partner with technology to create more personal, ethical, and sustainable solutions.

Implementing the WO strategy with the spirit of Industry 5.0 means building an innovation ecosystem that prioritizes human empowerment, strengthening cross-sector collaboration, and making digital literacy a basic right that enriches people's quality of life.

Thus, this strategy is not only an effort to overcome weaknesses, but also a proactive step to build a foundation for inclusive, sustainable, and highly competitive digital transformation.

4. **WT Strategy (Weaknesses–Threats)**:

To prevent project failure due to a combination of internal weaknesses and external threats, it is necessary to implement an agile governance approach and participatory evaluation mechanisms. Agile governance emphasizes the principles of flexibility, adaptability, and collaboration between stakeholders, so that projects can adapt quickly to changes in environmental conditions, both internal and external. This approach is in line with the theory put forward by Suryani & Diniawaty (2024) which states that agile governance can accelerate the decision-making process, reduce bureaucratic barriers, and increase the organization's capacity to innovate.

Meanwhile, participatory evaluation involves various stakeholders in the process of monitoring and evaluating the project periodically, so that an active and constructive feedback system is created. According to Adi (2025) participatory evaluation encourages a sense of ownership of the project, increases transparency, and helps identify potential problems early on, so that corrective steps can be taken immediately.

With the combination of these two approaches, the project not only avoids bureaucratic stagnation, but is also able to increase the responsiveness of the system to external dynamics, such as policy changes, market conditions, or technological developments. Overall, the application of agile governance and participatory evaluation strengthens the adaptive capacity of the project, reduces the risk of failure, and increases the chances of long-term success.

CONCLUSIONS

SWOT analysis of Smart City project management in the Industry 5.0 era shows that smart city development in Indonesia has a strong foundation in the form of ICT infrastructure, regulatory support, and public interest in digital services. However, challenges such as policy fragmentation, dependence on foreign technology, low digital literacy, and data security threats and social resistance still need to be anticipated. Through an adaptive strategy based on the TOWS Matrix, four approaches are formulated: human-centered technology optimization (SO), strengthening local IT and digital security human resources (ST), building digital literacy and technology transfer (WO), and implementing agile governance and participatory evaluation (WT). With this strategy, the Smart City project is expected to be more adaptive, collaborative, and sustainable, in line with the values of the Industrial Revolution 5.0 which places humans at the center of innovation.

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