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The Impact of Artificial Intelligence (AI) Capability on Service Innovation in the Public Sector of Malaysia: A Proposed Conceptual Model

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ABSTRACT

The integration of AI into the public sector has garnered attention for its potential to enhance service innovation, yet limited research has focused on this context, especially within government institutions. This study aims to bridge that gap by proposing a conceptual model to examine the impact of AI capability on public service innovation. Additionally, it explores how workforce agility moderates this relationship, positing that AI alone is insufficient to drive innovation unless accompanied by an adaptable and responsive workforce. By focusing on the Malaysian public sector, where digital transformation initiatives are in progress, this research is timely. The methodology involves developing a framework to empirically test the relationships between AI capabilities and service innovation, with workforce agility as a moderating factor. The study concludes that workforce agility is pivotal for maximizing AI's potential in public service contexts, where unique challenges such as resource limitations and bureaucratic rigidity exist. Future research can benefit from this model by further exploring how AI investments, coupled with a dynamic workforce, can improve public service delivery. Recommendations are provided for policymakers to prioritize workforce adaptability in AI-driven innovations.

Keywords: AI Capability; Digital Transformation; Public Sector; Service Innovation; Workforce Agility

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INTRODUCTION

The recent Covid 19 pandemic has forced many organizations to offer their services online as digital services for users to access remotely and more conveniently than ever before. To cater this emerging need for easier access to public services, many countries around the world are upgrading their technological infrastructure to implement innovative digital services that would effectively meet the public's needs. Malaysia is one of the countries that is at the forefront of embracing technology as a key driver of national competitiveness and spearheading secure and responsible Artificial Intelligence (AI) adoption in the public sector and these initiatives have the potential to transform the way services are delivered for the benefit of all Malaysians (Mahusin et al., 2024). Chen et al. (2020) defined public service innovation as the development and implementation of a novel idea by public service organizations to create or improve public value within an ecosystem.

AI is a technology that enables machines to perform tasks efficiently and with a high degree of intelligence (Shouran & Ali, 2024). As AI has been recognized as a powerful technology that enables organizations to herald much-delayed digital transformation (Patel et al., 2023), many organizations have started to use AI to innovate their products and services to overcome obstacles that stifled transformation in both private and public sectors. In Malaysia, the National AI Roadmap describes how Malaysia's AI capabilities will be harnessed, catalyzed, and propelled within the next 5 years, from 2021 until 2025. Moreover, the Public Service Department of Malaysia (JPA) has been reported to be taking initiatives by equipping its workforce with essential digital skills and knowledge to enhance service efficiency, transparency, and accessibility (Sharon, 2023). In the public sector, AI is used in the agriculture, healthcare, finance, and education sectors in Malaysia for enhanced efficiency and decision-making. AI assists farmers in optimizing resource usage, reducing waste, and contributing to sustainable agriculture practices. In the private sector, e-commerce, and telecommunications sectors, have implemented AI-powered chatbots to handle customer inquiries efficiently (Sari & Adinda, 2023). Based on the research by Rao in Irawan et al. (2022), it was proven that AI has a significant impact on business performance.

According to Kashettar (2023), AI is used to improve citizen experience and government services. For instance, AI-powered Chatbots are used to offer citizens individualized guidance and assistance. In healthcare, AI-powered Chatbots are used to offer patients individualized medical guidance and support and enhance patient outcomes and healthcare services. One of the important advantages of using AI in the government sector is data-driven policymaking. AI-powered analytics tools can analyze large volumes of data to extract valuable insights and inform evidence-based policy decisions. By leveraging AI for data analysis, governments can identify trends, predict future outcomes, and develop targeted interventions to address pressing social, economic, and environmental challenges.

As the benefits of AI continue to expand, its profound impact on innovation and workforce productivity is becoming increasingly evident. Reports suggest that AI could double the rate of innovation and enhance worker output by 60% in Malaysia, underscoring its transformative potential across various sectors (GetITAdmin in Lada et al., 2023). In particular, Malaysia's digital public service initiatives are rapidly evolving to improve service efficiency, user experience, and responsiveness. This shift reflects the growing demand for more personalized, data-driven services that cater to the diverse needs of the country's population.

AI plays a pivotal role in driving this transformation by enabling public institutions to process vast amounts of data, optimize decision-making, and automate routine tasks, which frees up resources for more strategic initiatives. This, in turn, enhances innovation by allowing public servants to focus on designing creative solutions to complex societal challenges. Moreover, the integration of AI into public service delivery not only improves operational efficiency but also fosters an environment that is conducive to continuous learning and adaptation, which is essential for keeping pace with the rapid changes in citizen expectations.

Furthermore, the need for innovation in public services is becoming more critical as governments worldwide face the challenge of delivering high-quality services with limited resources. AI can help bridge this gap by streamlining workflows, reducing costs, and increasing transparency in governance. In Malaysia, where digitalization efforts are progressing steadily, AI's role in fostering a culture of innovation within public administration is central to the country's long-term vision for a digital economy. As public services continue to evolve, the emphasis will likely shift towards collaborative innovation, where AI serves as a tool to co-create solutions with citizens, enhancing both trust and engagement. This dynamic, driven by AI, is not just about technology adoption but about transforming the very fabric of public service delivery to be more proactive, inclusive, and sustainable.

Problem Statement and Literature Gap

Recently, the need for service innovation in government sectors has become more pressing especially in rapidly developing countries. By embracing innovation, government institutions may improve the quality of their services and boost their performance (Damanpour & Schneider, 2009). However, it was reported that Malaysian public service needs to be more adaptable, responsive, flexible, and resilient in providing more effective, efficient, and reliable services (Yusof et al., 2022). Asia-Pacific Economic Cooperation secretariat executive director Tan Sri Dr Rebecca Fatima Sta Maria also said that Malaysia needs to quickly change the way it delivers public services by making better use of technology to improve the efficiencies of its bureaucracies (Bernama, 2021). Despite the importance of service innovation and the effort of the government to develop strategies to improve their services, Alosani and Al-Dhaafri (2023) reported that many employees are reluctant to perform innovatively due to challenges and obstacles. This finding highlights the need for the government to provide more customer-centric innovative public services for customer satisfaction. Although the Malaysian government has initiated major changes and improvements in its sustainable development framework to reshape and restructure current public sector frameworks and processes to increase the level of access, responsiveness, and pace of public services, it is still unknown whether the level of innovation in public service has improved in recent years due to lack of study.

From the Dynamic Capability View (DCV), some studies (Haefner et al., 2021; Johnson et al., 2022) have linked AI-related factors to innovation. However, only a few studies have linked AI capability to service innovation in particular (Akter et al., 2023; Kumar et al., 2023). Moreover, there is a lack of studies that link AI to service innovation in the context of digital transformation in the government sector. Hence, it is questionable whether AI capabilities will enhance public service innovation.

On the other hand, it has been reported that challenges faced in public service delivery are due to the government employees' inability or unwillingness to change structures, processes, and behaviors (PwC, 2007). Thus, there is a need for the government workforce to be more agile in adapting to the changing needs of the public due to the new normal situation after Covid 19 pandemic changed the way things were done before.

Braun et al. (2017) defined workforce agility as the skill of individuals to proactively overcome obstacles or create opportunities by rethinking usual approaches. They argued that agile individuals constantly monitor the environment to be able to anticipate and quickly respond to change. A study by Dahms et al. (2023) found that agility and digital capabilities drive high innovation performance. However, due to insufficient evidence, it is still questionable whether the agility of government employees has a direct or indirect impact on service innovation. This research gap warrants us to question whether workforce agility moderates the relationship between AI capability and service innovation.

In view of the problem statement and literature gaps, this study develops a conceptual model that can be tested empirically (1) to investigate the impact of AI capability on service innovation of government agencies and (2) to examine the moderating effect of workforce agility on the relationship between AI capability and service innovation.

LITERATURE REVIEW

Service Innovation in Public Sector

In the public sector, innovation has been defined as the development and implementation of new methods, services, products, and processes that lead to achieving considerable improvements in quality, effectiveness, and efficiency (Mulgan & Albury, 2003). This definition emphasizes the role of innovation not only in addressing existing challenges but also in anticipating future needs. In the context of digital public services, innovation often leads to the introduction of new technologies that can revolutionize how services are delivered. This includes improvements in user interfaces, enabling a more seamless and user-friendly experience, as well as streamlined processes that reduce bureaucracy and increase responsiveness. Moreover, enhanced security measures play a crucial role in maintaining public trust, particularly as digital services expand and citizens' data becomes more exposed to potential vulnerabilities.

Demirkan and Delen (2013) highlighted the need for organizations to adopt innovative strategies that differentiate them from competitors by becoming more collaborative, virtual, accurate, synchronous, adaptive, and agile. This is especially relevant in the public sector, where innovation is often driven by the need to rapidly respond to changing citizen demands and societal needs. By leveraging collaborative technologies, government institutions can engage more effectively with stakeholders, including citizens and private sector partners, to co-create solutions that are more aligned with public expectations. Virtual platforms allow for greater flexibility in service delivery, while synchronous processes enhance real-time communication and coordination. These innovations help public institutions remain adaptive and agile, enabling them to adjust quickly to evolving market and societal conditions.

By embracing innovation, government institutions can not only improve the quality of their services but also boost overall performance (Damanpour & Schneider, 2009). This improvement is often reflected in increased public satisfaction, higher levels of transparency, and more efficient resource utilization. However, the challenge remains that the Malaysian public service, while making strides in digitalization, still needs to become more adaptable, responsive, flexible, and resilient in order to provide more effective, efficient, and reliable services (Yusof et al., 2022). This critique points to a gap between the potential for innovation and its actual implementation, indicating that significant work remains to be done to fully realize the benefits of innovation in the public sector.

Asia-Pacific Economic Cooperation Secretariat Executive Director Tan Sri Dr. Rebecca Fatima Sta Maria echoed these sentiments, stating that Malaysia must quickly change the way it delivers public services by making better use of technology to improve the efficiencies of its bureaucracies (Bernama, 2021). This highlights a broader regional recognition of the importance of leveraging technology to drive public sector innovation. The pressure to modernize public service delivery in Malaysia, as in many other countries, is not just about improving efficiency but about transforming the role of government in a digital society, making it more responsive to citizens' needs and expectations.

The emergence of AI has created significant interest among academics and policymakers in integrating AI capabilities to enhance innovation while maintaining agility. AI-powered service innovation offers unique opportunities for the public sector, allowing for more intelligent and efficient implementation of newly identified opportunities (Akter et al., 2023). By automating routine tasks, predicting citizen needs through data analytics, and optimizing resource allocation, AI can facilitate more proactive government services. This connection between AI and service innovation is vital, as it enables public institutions to seize new opportunities with greater efficiency, ultimately leading to better outcomes for citizens and a more resilient, future-ready public service sector. As AI continues to evolve, its potential to drive service innovation will become increasingly important, allowing governments to remain agile in the face of rapid technological and societal changes.

Development of Conceptual Model

AI Capability

AI has been defined as “the use of computational machinery to emulate capabilities inherent in humans, such as doing physical or mechanical tasks, thinking, and feeling” (Huang & Rust, 2021). AI's multifaceted applications, ranging from data management to candidate screening and interviewing, have demonstrated its ability to streamline various organizational processes. In the context of public services, AI's potential goes beyond efficiency gains—it fosters innovation by enhancing service accessibility and personalizing citizen engagement. AI-driven tools like chatbots and virtual assistants enable citizens to access information and support services instantly, providing a 24/7 touchpoint for government services. These tools reduce bureaucratic delays and allow individuals to obtain the assistance they need, regardless of time or geographical limitations. AI also enables governments to tailor service delivery according to the unique needs and preferences of each citizen by employing data analytics and machine learning algorithms. This personalized approach to citizen engagement makes public services more inclusive and responsive, meeting the evolving expectations of a digitally connected society.

The integration of AI into public services has therefore become a strategic priority for many governments aiming to enhance both employee and public experiences. AI not only improves internal processes but also transforms citizen-government interactions, making services more user-friendly and accessible. As Kashettar (2023) noted, many countries are now leveraging AI to improve experiences for remote employees, employers, and the general public. This trend is driven by the capabilities of AI-based decision support systems, which enable organizations to make smarter, data-driven decisions. Through data analytics, these systems offer actionable insights that can lead to the development of new products, services, and business models. In the public sector, AI-fueled data management can optimize resource allocation, improve service efficiency, and even predict citizen needs, thereby enabling governments to be more proactive and effective. Demirkan and Delen (2013) argued that investing in data capabilities, which

are closely tied to AI, can significantly enhance an organization's performance, creating opportunities for continuous improvement and innovation in public service delivery.

In the domain of AI-enabled service innovation, recent literature underscores the transformative potential of AI across various service industries. Naeem et al. (2024) pointed out a significant gap in the research, indicating that no comprehensive reviews have yet been conducted on the role of AI in enabling public service innovation (PSI), product-service systems (PSS), servitization, or digital servitization. However, the authors observed that innovative companies have rapidly adopted AI to enhance their service ecosystems, reshaping traditional concepts of service quality and delivery within their respective sectors. This swift integration of AI into existing service frameworks has led to profound shifts in how services are conceptualized, designed, and delivered. In particular, AI is not just augmenting service delivery; it is reimagining the very nature of service interactions by introducing new possibilities for real-time, customized, and predictive services that better meet the needs of customers and citizens alike.

Building on these insights, Akter et al. (2023) identified three critical capabilities that drive AI-powered service innovation: AI-market capability, AI-infrastructure capability, and AI-management capability. Their findings revealed that these capabilities have a partial but significant relationship with service innovation. First, AI-market capability refers to an organization's ability to leverage AI to enhance customer orientation, industry orientation, and cross-functional integration. This capability allows organizations to better understand and anticipate market needs, positioning themselves to innovate in response to evolving demands. Second, AI infrastructure capability pertains to the foundational elements that support AI-powered service innovation, including data, models, and ecosystems. Without a robust infrastructure, organizations cannot fully harness the power of AI to deliver innovative services. Lastly, AI management capability involves the strategic leadership and organizational learning necessary to implement AI solutions effectively. This includes fostering an AI-oriented culture, ensuring that ethical considerations are integrated into AI practices, and promoting continuous learning to keep pace with AI advancements.

These capabilities, when combined, enable organizations to adopt a dynamic capability perspective, which Akter et al. (2023) argued is crucial for achieving organizational agility and sustainable competitive advantage. By prioritizing AI capabilities and aligning them with organizational goals, public sector organizations can enhance their service innovation efforts, thereby improving the overall quality of services delivered to the public. The study by Akter et al. (2023) thus provides a theoretical framework for understanding how AI can be harnessed to drive innovation, particularly in sectors like public services where technological adoption has historically been slow. Based on these findings, this research proposes the following hypotheses to explore the impact of AI capabilities on public service innovation:

H1: The AI market capability of government employees has a positive impact on their service innovation.
H2: The AI infrastructure capability of government employees has a positive impact on their service innovation.
H3: The AI management capability of government employees has a positive impact on their service innovation.

These hypotheses are designed to test the extent to which AI capabilities within government organizations can facilitate service innovation, emphasizing the role of human factors in implementing and maximizing the potential of AI technologies. By focusing on public sector employees' ability to effectively use AI, this study aims to

provide a clearer understanding of the conditions under which AI leads to meaningful service improvements.

Workforce Agility

Agility refers to a firm's capability to sense threats and opportunities in its environment and respond swiftly by leveraging flexibility and adaptability to its advantage (Lee et al., 2015). In today's rapidly evolving business landscape, characterized by technological advancements, global competition, and shifting consumer demands, firms must operate in a perpetual state of transformation to remain competitive (Teece et al., 2016). The need for agility is no longer confined to top-level strategy but permeates all levels of an organization, making workforce agility a critical asset. This form of agility, which encompasses the capacity of employees to adapt to new challenges and opportunities, has emerged as one of the key organizational paradigms necessary to sustain innovation and competitive advantage.

Workforce agility plays a particularly pivotal role in service innovation, where flexibility and responsiveness are essential to meet changing customer needs and expectations. Several studies have underscored the importance of an agile workforce in fostering an environment conducive to innovation. Franco and Landini (2022) provided empirical evidence demonstrating that workforce agility, conceptualized as a blend of task and time agility, significantly enhances work motivation and knowledge transmission. These factors are crucial at the workplace level and directly contribute to an organization's ability to innovate. Agility allows employees to switch between tasks efficiently and manage their time dynamically, fostering a work culture that supports creative problem-solving and continuous improvement.

Similarly, Petermann and Zacher (2022) argued that an agile workforce actively cultivates a climate of innovation. In this environment, employees are not only encouraged to take initiative and experiment with new ideas, but they are also empowered to regularly test, refine, and adapt their products or services. This iterative process of innovation is driven by the workforce's ability to respond quickly to feedback and changing market conditions, ensuring that new solutions remain relevant and effective. The study found that such an environment enables employees to engage in exploration and experimentation, both of which are essential for continuous service innovation. Consequently, workforce agility acts as an underlying force that sustains a culture of innovation within organizations, where employees feel confident and supported in their creative endeavors.

However, despite the growing recognition of workforce agility as a critical enabler of service innovation, the direct relationship between the two remains underexplored. Existing research has often focused on agility's indirect effects, leaving a gap in empirical studies that could conclusively establish its direct impact on service innovation. This gap suggests that while workforce agility undoubtedly supports innovation, the mechanisms through which it influences service innovation need further exploration. Moreover, the dynamic nature of modern business environments adds complexity, as the interaction between workforce agility and other organizational capabilities, such as AI, might yield different outcomes depending on various contingencies.

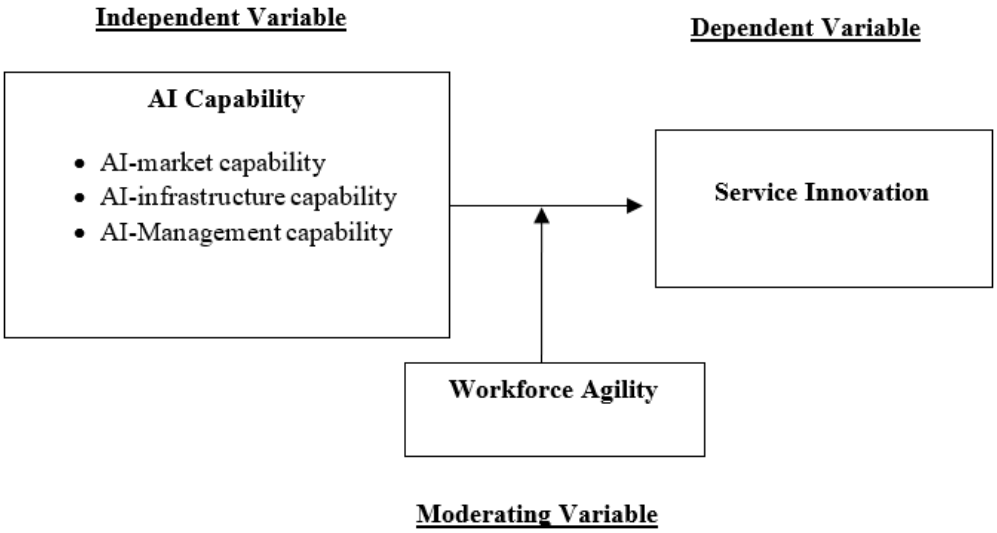
Given this, the current study proposes a hypothesis to investigate the indirect contingency effect of workforce agility on service innovation. Specifically, it posits that workforce agility moderates the relationship between AI capability and service innovation. As AI continues to transform industries by automating processes and enhancing decision-making, its integration with an agile workforce could be key to maximizing innovation potential. Agility may enable employees to better harness AI's

capabilities, applying them more effectively to creative problem-solving and adapting AI-driven solutions to meet emerging needs. Thus, the proposed hypothesis seeks to explore how workforce agility can act as a moderator, amplifying the positive effects of AI on service innovation and contributing to a more nuanced understanding of the factors driving innovation in modern organizations.

H4: Workforce agility moderates the relationship between AI capability and service innovation.

Figure 1 represents the model of this conceptual study.

Figure 1. Conceptual Model



CONCLUSION

Although there is a consensus that AI holds significant importance in driving service innovation within the public sector, transforming how governments deliver services and interact with citizens, the existing literature on this topic remains inconclusive and fragmented. Much of the research has focused on the private sector, leaving a gap in understanding how AI can specifically enhance innovation within public service delivery. This gap is particularly significant given the unique challenges faced by public sector institutions, such as resource constraints, bureaucratic inertia, and the need for transparency and accountability. Therefore, further studies that introduce new conceptual models tailored to the public sector are necessary to deepen our understanding of AI's role in service innovation in this context.

The objective of this paper is to propose a conceptual model that builds on the notion that AI capability enhances the innovation of services provided to the public, and that this effect is contingent on the agility of the workforce tasked with adopting and implementing AI solutions. Workforce agility is a critical factor because while AI can provide the technological foundation for innovation, it is the adaptability and responsiveness of the human element that determines how effectively these AI tools are integrated into service delivery. The combination of AI and workforce agility may therefore create a synergistic effect, driving greater innovation than AI alone. This study makes significant contributions to the body of knowledge in this increasingly important

area of AI-enabled service innovation by offering a framework to test these relationships empirically.

First, while numerous studies have linked AI to innovation, only a limited number have explored its connection to service innovation within the public sector. This study aims to fill that gap by developing a conceptual model to examine whether the AI capabilities of public sector organizations lead to enhanced service innovation. Given that public service innovation is a strategic priority for many countries as they seek to modernize their operations and meet the evolving needs of citizens, this research is highly relevant. It highlights the specific context of the public sector, where innovation often involves complex, multidimensional problems that require both technological and human solutions. By linking AI capabilities directly to public service innovation, this study provides a framework for assessing the impact of AI on a sector that has historically lagged behind in technological adoption.

Second, this study uncovers the moderating effect of workforce agility, an under-researched factor in service innovation studies. While the literature has explored various drivers of service innovation, workforce agility has often been overlooked as a contingency that can significantly influence the outcomes of AI adoption. In organizations where employees are flexible, adaptive, and capable of responding to change, the potential for AI to drive service innovation is likely to be much higher. Workforce agility ensures that AI technologies are not just passively adopted but actively leveraged to create more dynamic and responsive public services. This study brings attention to the critical role that human capital plays in maximizing the benefits of AI, adding a new dimension to the ongoing discourse on public sector innovation.

Third, this study is both important and timely to conduct in Malaysia, a country that has undertaken numerous initiatives to improve the innovation of its public services as part of its broader digital transformation agenda. The Malaysian government has recognized the need to enhance service delivery through the adoption of digital technologies, and AI has emerged as a central component of this strategy. However, the success of these initiatives depends not only on the deployment of AI but also on understanding how effectively it is implemented by the workforce. Thus, it is crucial for the government to assess the innovation impact of these services and identify areas where workforce agility could further enhance the outcomes. By proposing a model that integrates AI capabilities with workforce agility, this study provides a timely framework for evaluating the effectiveness of Malaysia's public service innovation efforts.

In essence, the proposed model will help guide future empirical studies by offering a foundation for exploring the relationship between AI, workforce agility, and service innovation in the public sector. It offers practical insights for governments, particularly in Malaysia, to take the necessary initiatives to further improve the quality of AI-empowered public services. Moreover, by emphasizing the contingent role of workforce agility, this research not only contributes to theoretical advancements but also provides actionable recommendations for public sector leaders. The findings from future studies based on this model could lead to targeted strategies for building a more adaptive and innovation-

driven workforce, ensuring that AI investments yield the maximum possible benefit for public service delivery.

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