Available online at
https://journal.uitm.edu.my/ojs/index.php/JIKM

e-ISSN: 2289-5337

Journal of Information and Knowledge Management
Vol 15 Special Issue 2 (2025)

Journal of Information and Knowledge Management

Enhancing Strategic Decision-Making in Malaysian Public Organizations: The Role of Big Data Analytics and Continuous Improvement

Mohd Hazly Mazli, Mad Khir Abdullah Sani*, Nora'ayu Ahmad Uzir

Faculty of Information Science, Puncak Perdana Campus, UiTM Selangor Branch, 40150 Shah Alam, Selangor, Malaysia

Corresponding author's e-mail address: madkhirjohari@uitm.edu.my

ARTICLE INFO

Article history:
Received: 28 Jan 2025
Revised: 15 Mei 2025
Accepted: 3 July 2025
Online first
Published: 1 August 2025

Keywords:
Big Data Analytics
Strategic Decision Making
Continuous Improvement
Public Organizations

https://doi.10.24191/jikm.v16iSI2.7172

ABSTRACT

Organizations must look for ways to enhance decision-making processes due to advancements in public administration and increasing demands. This study explores the integration of Continuous Improvement (CI) and Big Data Analytics (BDA) within Malaysian public organizations, proposing a novel framework aimed at enhancing strategic decision-making. The framework comprises five interconnected components: Organizational Readiness Assessment, Analytical and Improvement Capabilities Development, Data Governance and Quality Management, Performance Measurement and Feedback Loops, and Continuous Learning and Adaptation. By addressing challenges such as resistance to change and ethical concerns, the framework offers a pathway to better governance and service delivery. Practical implications include guidelines for fostering a data-driven culture and achieving sustainable development goals. Key findings include the need for leadership commitment, robust data governance, and the cultivation of a data-driven culture. Practical and pathways for empirical testing are provided.

INTRODUCTION

The use of big data has greatly altered the working environment of public organizations and therefore there is need to shift from the conventional decision-making approaches. Malaysian public organizations face critical challenges in leveraging Big Data Analytics (BDA) and Continuous Improvement (CI) practices due to limitations in infrastructure, resistance to change, and gaps in data governance. These challenges hinder their ability to make informed decisions and achieve strategic goals. This study addresses these gaps by proposing an integrative framework to bridge theory and practice.

Big data can be defined as the large sets of data which are usually or structured unstructured that are collected from different sources such as social media, sensors and transaction systems. This has the potential of helping public organizations to make better policies and service delivery. For instance, Rukanova et al. (2019) point out that when big data is utilized effectively it can strengthen the governance systems of public organizations to enable them to make decisions (Rossi et. al, 2019).

Continuous Improvement (CI) methodologies like Lean and Six Sigma are crucial in the development of excellent culture in public organizations. CI focuses on the regular assessment of the effectiveness of various processes and aims at improving them thus increasing efficiency and effectiveness (Мандал, 2019). Given the context of Malaysian public organizations, CI measures can assist in determining the strengths and weaknesses of the organization. Thus, organizations can identify the problems and find ways of their effective resolution. For instance, Khan et al. (2019) reveal that implementing CI methods can result in the improvement of organizational performance through the reduction of waste, effective resource management, and improvement of customer satisfaction (Мандал, 2019). This approach aligns with the overall strategies of public administration which seeks to provide efficient and effective services to the citizens through the proper management of public resources.

There are however some challenges that have to be addressed in order to realise the potential of BDA and CI integration to enhance strategic decision making in Malaysian public organizations. The first challenge is the question of how organizations can ensure that they have adequate infrastructure and resources to support public data organizations analytics. The need to invest, in technology, capacity and people that can help generate and analyze big data (Dubey et al., 2019). Also, there could be opposition to change within the organization especially from those employees who are used to the normal decision-making process. To address this issue, managers should endeavor to explain to their subordinates the advantages of BDA and CI and ensure that all the employees are part and parcel of the change process as suggested by Lundkvist and Gustavsson (2018). This participatory approach can assist in ensuring that everyone is on the same page and that there is a culture of improvement at all times. The following are some of the factors that can help in reducing risks that are associated with data; putting in place proper data governance frameworks.

The integration of Big Data Analytics and Continuous Improvement is a powerful prospect for Malaysian public organizations as it enhances the effectiveness of their strategic management. Through the use of big data and the improvement process, these organizations can enhance service delivery, improve on their productivity, and adapt to the changing needs of the citizens. However, implementation of successful strategies needs effective leadership, sufficient funding and proper focus on the ethical use of data. With the increasing challenges that Malaysia faces in the area of governance especially in the digital age, the smart use of BDA and CI is crucial to create public value and attain the set goals. The study's contributions include addressing gaps in literature, offering a structured pathway for implementation, and highlighting the broader implications for governance.

LITERATURE REVIEW

The literature highlights the growing importance of both BDA and CI in public sector governance. However, integration remains underexplored. For instance, BDA capabilities—including data acquisition, analysis, and visualization—are vital for evidence-based policymaking. Similarly, CI methodologies, such as Lean and Six Sigma, optimize processes and promote a culture of continuous enhancement. Previous research by Rodgers & Antony, 2019 demonstrates the effectiveness of these methodologies in improving public service efficiency but rarely examines their combined potential. This study fills this gap by synthesizing insights from both fields, proposing a framework tailored to Malaysian public organizations.

Continuous Improvement Practices

According to the authors Rodgers & Antony (2019), the implementation of Six Sigma in the public sector has yielded positive results in terms of performance measures, for instance, a reduction in processing time and an increase in customer satisfaction. By applying the approach based on the analysis of data and process improvement, public organizations can develop their capacity to deliver services. Total Quality Management (TQM) is an all-encompassing concept that aims at the overall improvement of organizational performance with the help of quality and the concept of continuous change. It stresses the participation of all the employees in the process of changes and the role of customers' opinions. In public organizations, TQM can assist in developing a result-oriented organizational culture that is sensitive to the citizens' needs. According to Carlson et al. (2015), TQM practices can result in the enhancement of service quality and organizational performance by ensuring that there is buy-in from all employees regarding quality.

TQM entails the setting of quality standards and then regularly evaluating the organization to ensure that it meets these set standards. Among the major advantages of CI practices in public organizations, is the development of the learning culture. Thus, through the implementation of CI activities, organizations can encourage employees to innovate and work in an environment that appreciates creativity. This culture of learning is crucial for public organizations to be able to meet the needs of the citizens and the changes that occur in the environment. The following are some of the ways through which supporting a culture of learning in public organizations can be beneficial; enhanced employee engagement, increased job satisfaction, and improved organizational performance. Furthermore, CI practices make organizations a place to learn from the stakeholders through feedback and use the information gathered to guide their decisions. This participatory approach not only increases the quality of the decisions that are made but also increases the ownership of the employees and the stakeholders in the decision-making process, which in turn may enhance the chances of successful implementation and ownership of the decisions made. Through the active involvement of employees in the process of improvement, public organizations can benefit from the employees' knowledge and experience for effective change management.

The application of CI practices in public organizations can therefore bring about positive changes in performance measures. Through the analysis of processes and outcomes, organizations can therefore be able to identify wastage and areas that need some changes. This approach conforms with the general objectives of public administration which entail providing quality services to the citizens in the most efficient manner possible. Thus, the successful implementation of CI initiatives can lead to increased productivity, increased citizen satisfaction, and decreased costs. In addition, CI practices can also improve the efficiency of public organizations through increasing accountability and transparency. Thus, with the help of the performance measurement systems that define the effectiveness of the decisions made and their consequences in the context of service delivery, organizations can be certain that they are achieving their strategic goals. This is a continuous process that allows organizations to assess their strategies and align them appropriately to the current conditions so as to remain adaptive. However, there are some barriers that public organizations come across in the course of implementing CI practices. The first challenge is the issue of sufficiency of resources and structures to sustain the CI efforts. In order for public organizations to fully utilize the benefits of CI methodologies, they need to commit their resources to training, technology and people. For CI practices to be well implemented there is the need for leadership commitment and the provision of resources to support the improvement processes.

In addition, there can be attitude problem within organizations where some employees may not want to change their ways of working. To address this issue, leaders should explain why change is necessary and get employees involved in the change process. This approach can help to address the issue of resistance and create a culture of the ongoing search for improvements. Also, the issues to do with data privacy and security must be given due consideration. Public organizations must ensure that they adhere to the set legal requirements and protect the citizens' data when they are used for analysis. It is therefore important to

develop sound data governance frameworks that help reduce risks and foster the public's confidence in the use of data.

Big Data Analytics Capabilities

Big data analytics (BDA) on the other hand is defined as the process of analyzing large and complex data sets with an aim of generating information that can help in decision making to improve organizational performance. The BDA capabilities in the public governance include the following services: data acquisition, integration, storage, mining and presentation. Such organizations with strong BDA capabilities are able to make sense of patterns, forecast future events and improve on their performance to support informed decision making, effective resource management and increased citizen participation. Big data is defined by the four Vs which include volume, variety, velocity, and veracity with the 'four Vs' being commonly used to define big data. These attributes come with their challenges and possibilities for organizations that want to utilize data for strategic choices. As pointed out by Ongena and Davids (Rossi et al., 2019), the utilization of big data can greatly enhance governmental performance. Such changes reflect the increasing importance of BDA as the key factor in the development of effective governance.

The BDA consists of several capabilities. Data collection involves the process of obtaining information from various sources such as administrative records, social media, sensors and public databases. Integration entails the process of consolidating data that are stored in different sources into a single database for analysis. Storage on the other hand is the framework used to hold and store a large amount of data, while analysis is the use of statistical and computational methods to make conclusions. Last, visualization is the way by which data is presented in a manner that will be easy for the decision makers and other stakeholders to understand. In the area of public governance, BDA is instrumental in supporting the development of evidence-informed policies as well as service improvements. Using big data, public organizations are able to better understand citizens' wants and behaviors therefore making it easier to design services that would be best suited for their consumers. Ongena & Davids (2023) also emphasize the fact that big data has the potential of closing the gap between perceived advantages of data analytics and its actual utilization in government organizations. This divide is usually because the decision makers are not very certain about their organization's preparedness for big data projects.

BDA also enables resource optimization since public organizations can better target resources by applying the insights provided by data. For instance, Ferraris et al. (2019) explain how the BDA can be applied in the healthcare systems to analyses patient information and result in the enhanced practice of clinical decision making and resource utilization. In the public domain this capability is crucial for effective utilization of scarce resources and guarantee that services delivered are relevant to the population. Furthermore, BDA enhances citizen engagement through providing the tools for data sharing and interchange. Public organizations can analyze the data to recognize trends in people's emotions, which will enable them to address people's problems in a timely manner. This engagement promotes accountability because people are likely to have confidence in organizations that exhibit commitment to the use of data for decision making. According to Мандал, 2019, application of BDA in public organizations results in enhanced decision-making and increased participation. Although BDA can bring tremendous value to public organizations, those organizations face many challenges in realizing such potential. One of the major factors is that there is need to develop the right infrastructure in order to support analytics projects. Public organizations need to invest in technology, trainings, and people in order to develop the right capacity for data management and analysis. For example, as pointed out by Desouza and Jacob (Dubey et al., 2019), the successful implementation of BDA in the public sector operations needs a balanced strategy that incorporates the technological as well as the organizational aspects.

However, there might be some level of resistance to change within the organization especially from the people who are used to the previous way of making decisions. To this end, management has to ensure that

the benefits of BDA are well explained and the employees involved in the change process. This participatory approach can assist in the development of ownership and encourage the culture of decision making based on data. Data privacy and security are also some of the issues that need to be considered. Public organizations must ensure that they adhere to the set policies and laws and protect the citizens' information when using analytics. Implementing solid data governance frameworks can reduce risks and gain the trust of the public in data applications. Мандал (2019) also pointed out that ethical issues are crucial in the implementation of BDA in the public sector since ethical issues can influence the success of data projects.

BDA as a concept in public governance will continue to advance further and integrate into the public organizations as they try to optimize the utilization of data in decision making. This makes the public organizations to have easier time in accessing statistical data that they can use to improve on their performance and efficiency. According to Rogge et al. (2018) has stated that the application of big data analytics in the public sector can assist in the enhanced measurement of organizational performance as well as the identification of strengths and weaknesses. In addition, there are new technologies such as artificial intelligence and machine learning that are expected to improve on the BDA in public governance. These technologies can help in the process of data analysis thereby enabling organizations to come up with results at a faster and efficient rate. Since public organizations are gradually going through the process of digital transformation, the use of BDA in formulation of evidence-based policies and improved service delivery will be vital.

Integration of Continuous Improvement and Big Data Analytics for Strategic Decision-Making

The integration of Continuous Improvement (CI) and Big Data Analytics (BDA) forms a robust foundation for enhancing governance processes and improving responsiveness. CI techniques are designed to optimize management practices while being adaptable to changing conditions, enabling organizations to make informed decisions and innovate effectively. BDA provides factual tools and insights that help organizations identify, design, and implement improvements in products, services, and systems, ensuring that changes are impactful and beneficial.

CI emphasizes a systematic way of thinking focused on iterative progress, learning, flexibility, and the involvement of personnel. This approach ensures that improvements are continuously made to enhance performance. Popular methodologies for achieving CI include Lean, Six Sigma, and Total Quality Management (TQM). These methodologies are particularly critical for public organizations aiming to deliver high-quality services efficiently, addressing key challenges such as waste, variation, and defects (Olaniyi, 2023).

On the other hand, Big Data Analytics is the process of deriving information from large and complex data sets with a view of making a decision. BDA capabilities encompass data collection, integration, storage, analysis and presentation. It also involves the use of big data to make recommendations, to understand patterns and to improve on the overall performance of an organization. In the public management, BDA is crucial for the evidence-based policies, smartening of the resources, and interaction with the citizens (Brynjolfsson & McElheran, 2016). Therefore, the combination of CI and BDA can be regarded as the most effective tool to use data for the purpose of improvement. Thus, the integration of CI and BDA offers a conceptual framework within which organizations are able to make rational decisions based on real time and feedback data. CI practices make sure that organizations are always assessing and enhancing their strategies at all times, and this is where BDA comes in. This combination creates a synergetic effect and allows public sector organizations to adapt better to changes and meet citizen's expectations.

For example, BDA can be applied to understand the performance of service delivery and therefore, where improvements can be made. Through the application of CI methods, the organization can make changes based on these findings thus providing a feedback loop for enhancement. This process not only enhances the efficiency of the operation but also encourages innovation as employees are encouraged to try out new ideas and concepts (Intezari & Gressel, 2017). In addition, the combination of CI and BDA improves the organizations' risk management. With the help of data trends and patterns, organisations can easily determine risks and vulnerabilities that may occur and hence prevent them from worsening. This way, public organizations are able to prevent the occurrence of service disruptions and, consequently, increase their resilience (Nugroho, 2024). This is quite important in the public sector since opportunities and consequences of decisions made are usually quite pronounced and have far reaching effects on citizens' lives.

There is also an enhancement of the culture of innovation when integrating CI and BDA in public organizations. The integration of data provides with the opportunity for culture organizations of to improvement find new ways of improving services and meeting citizen's needs. This is very important for public organizations because they have to meet the challenges of change in the modern world (Nnaji, 2024). Also, the application of BDA can support the analysis of successful practices and projects implemented in other organizations. Thus, organizations can analyze the data on effective programs and interventions and apply and modify these practices to their contexts to enhance the performance. It is therefore important that organizations embrace this approach to innovation as it not only results to improved performance but also propagates on knowledge sharing and learning in the public sector (Senavirathne, 2022).

Although the combination of CI and BDA has numerous advantages, some difficulties may hinder effective integration of the two in public organizations. A major obstacle is the question of how organizations can build the necessary capacities for analytics by developing appropriate infrastructure and resources. In order to build the required capability in data analytics, public organizations need to make investments in technology, training and people (Ichdan, 2023). There might be some push back from employees as they may not be comfortable with changes that are being implemented in the organization. To address this issue, leaders are to explain the advantages of adopting CI and BDA and ensure that employees are involved in the change process. This approach can assist in the development of ownership and promote the culture of improvement based on data. Ethical concerns such as data privacy and security are also important since data has to be used in an analytic manner while ensuring that legal requirements are met. Some of the measures that can be taken include; the development of data governance frameworks that help in reducing risks that are involved while building the public's trust in the data (Miah et al., 2017).

Thus, it can be stated that application of Continuous Improvement and Big Data Analytics is an effective tool for improving strategic management in public organizations. This integration helps the organizations in identifying the right way to use data for iterative enhancement of processes, increased response rate, and risk management, and innovation. Through the cultivation of learning organization and the ability to change, public organizations can better meet citizens' needs and achieve their strategies. However, organizations must also address the challenges associated with implementing these practices, including resource allocation, resistance to change, and ethical considerations. With the integration of CI and BDA, public organizations can prepare for the challenges that are present in the modern world.

PROPOSED FRAMEWORK AND EMPIRICAL TESTING

The framework incorporates CI and BDA to support the achievement of the stated objectives for Malaysian public organizations. This integration is crucial for improving the effectiveness of governance and the ability of organizations to adapt to changing environments. The framework consists of five key components: The first component is Organizational Readiness Assessment, the second component is Building Analytical and Improvement Capabilities, the third component is Data Governance and Quality

Management, the fourth component is Performance Measurement and Feedback Loops, and the final component is Continuous Learning and Adaptation.

Organizational Readiness Assessment

The first phase of the suggested framework for integrating CI and BDA in the Malaysian public organizations is Organizational Readiness Assessment. This assessment is very relevant for determining the existing capacities and resources of the organization as well as its culture to assess whether there are deficiencies in the data infrastructure and CI practices. It helps to assess the current status of public organizations so that they can come up with proper plans to improve on their strengths and meet their goals effectively. In order to assess organizational readiness, public organizations must first analyze the current data management systems, technologies, and human resources of the organization. This evaluation should be broken down into several areas such as the availability of data sources, the quality of the data that is being captured and the current analytical tools and technologies being used. According to Rossi et al., (2019), organizational learning capability is a key antecedent to the effective use of BDA. This means that the organizations with strong foundation in learning and adaptation can effectively implement and utilize big data technology. Also, the assessment should also take into consideration the organizational culture since it plays a significant role in determining the organizational readiness for change. It has been identified that organizational culture that embraces data and improvement mindsets is critical for the CI and BDA integration. In order to determine if the organization has the right resources to engage in CI and BDA, it is important to check if the employees have the required skills and knowledge to work with data analytics and improvements. This entails determining the data literacy levels of employees and any gaps that may require skills development interventions.

The second phase is to assess the differences between the actual and desired state in order to determine the gaps in data infrastructure and CI practices. This entails establishing which aspects need to be enhanced and which require reinforcement with regard to the BDA and CI conjunction. For instance, organizations may find out that their data storage architecture is obsolete or that they don't have proper instruments for data processing and presentation. These gaps should be addressed so that organizations can properly use data for their decision-making processes. Organizations must evaluate how well their current Continuous Improvement (CI) practices support data-driven decision-making. This involves assessing the effectiveness of existing improvement approaches and identifying opportunities to enhance processes through data analysis and insights (Ongena & Davids, 2023). According to Alieva and Haartman (2020), integrating data analytics into CI practices can lead to better decision-making and improved organizational performance. By identifying gaps in data infrastructure and CI practices, public organizations can develop strategic approaches to enhance their capabilities. This alignment ensures that CI efforts are supported by robust data-finding and analytical processes, ultimately driving continuous growth and operational excellence.

The findings from the organizational readiness assessment can be used to shape the improvement plans. Such organizations should focus their attention on the areas that need enhancement so that the organizations can fully embrace both BDA and CI. This may include enhancing data management systems, enhancing training for employees, and forming groups that will work on data analytics and CI integration. Also, organizations should endeavour to come up with a plan that will help in the integration of BDA and CI practices. This roadmap should identify certain objectives, steps, and resources that have to be allocated for the implementation of every initiative in order to be able to track the performance and outcomes of the initiatives in the future. Through adopting a strategic approach to enhancement, public organizations can boost their preparedness to integrate BDA and CI and hence enhance their decision-making capacities.

Building Analytical and Improvement Capabilities

Developing the analysis and enhancement capabilities of public organizations is a complex process that of depends the on training the programs efficiency and structures. It is crucial for the employees to undergo training on data literacy and process optimization so that they are well equipped to understand and use data properly for decision making. According to Saravanabhavan et al. (2021), data literacy is the meaningfulness, that is, the ability to interpret, communicate, and use data as information in the current world that is full of data. This enhances the employees' capability to analyze data for decision making thus leading to increased organizational performance. Also, enabling the culture of continuous improvement through proper training measures can greatly improve the efficiency of operations and service delivery. The studies have revealed that organisations that embrace training on CI tools and techniques such as Lean and Six Sigma achieve remarkable improvements in their performance measures (Handfield et al., 2019; Oh, 2024). It's not only that the methodologies help to minimize the costs and time, but also help to develop a mindset of an organization that is always willing to improve and adapt. Therefore, by incorporating CI tools into the training materials, public organizations can develop a workforce that is capable of recognizing inefficiencies and generating solutions that can add value.

However, forming cross-functional teams for analytics and CI is also an important factor in the development of analytical skills. These help in the implementation of the sharing of information and best practices across the different units. The literature review reveals that cross-functional teamwork is effective in the improvement of organizational learning and innovation (Monko, 2023). In this way, public organizations can integrate different viewpoints and areas of expertise to formulate more coherent approaches to deal with emerging issues and enhance the effectiveness of service delivery. This approach not only helps in increasing the problem-solving capacity but also helps in developing accountability and ownership which is very important for the success of any analytics and CI initiatives. Also, the formation of cross-functional teams can be accompanied by the application of business analytics in management. According to Saravanabhavan et al. (2023) business analytics can be effective only if it provides better insights for decision making, which in turn can result in better performance improvements. Through the use of analytics, public organizations can analyze data and make it into useful information for strategy and operational changes. This is especially important in the context of public service, where data-based approach can only enhance the organization's response to the community's needs and overall performance.

However, training and collaboration are not the only aspects that organizations have to consider in order to improve and sustain performance. It also means that besides conventional training, organizational culture also has to facilitate formal learning, for instance through mentoring and peer training. Thus, by promoting the culture of knowledge transfer and collaboration, public organizations can develop their analytical skills and foster improvement processes at all levels of the organization. In addition, the contribution of leadership in the analysis and improvement process cannot be ignored. It is therefore important that leaders embrace data literacy and CI techniques as strategic imperatives and ensure that these are part of the organizational culture. Leadership can play a great role in motivating people to adopt data-based approach and create a culture in which improvement is sought-after. This is very important as the aspect of leadership and organizational goals is the key to the sustainable development of analytical capabilities and the desired lasting results.

Therefore, it is evident that in order to develop analytical and improvement capacities in public organizations, there is the need to put in place training in data literacy and CI tools, formation of cross functional teams and an organizational culture that is supportive. With these areas, public organizations can manage the data effectively, make right decisions, and improve on their operations to provide efficient services to the public. The incorporation of analytics into the organization's structure not only increases performance but also enables public organizations to meet the challenges that are present in the community they serve.

Data Governance and Quality Management

Data governance and quality management are critical for the effective management and appropriate use of data in the public domain. Developing robust data governance policies is essential to ensure data integrity and uphold ethical considerations in data management (Baschung, 2023). This is particularly important in public administration, where proper governance frameworks not only protect sensitive information but also enhance accountability, openness, and public confidence in government activities.As public organizations increasingly rely on data for decision-making and service delivery, the need for strong governance systems becomes even more evident.

Data ownership establishes the individuals that are in charge of the data as well as the management and decision-making process in the organization. Stewardship of data involves the processes through which the management of data assets is maintained with focus on data quality and data quality improvement throughout the data lifecycle. This is especially important in the public sector, where wrong data can cause many adverse impacts including poor resource management and loss of the public's confidence (Bondarenko et al., 2020). Through the establishment of clear roles and responsibilities, the public organizations are able to set the standard for ethical data use. This is why it is also crucial to adopt quality management systems for ensuring data correctness and the absence of mistakes. According to Fant (2023), it can be stated that the availability of high-quality data is a precondition for successful decision-making and service delivery in the public sector. Organizations have to set and enforce data quality guidelines as well as schedule the frequent audits to reduce the impact of data errors. Some of the practices that needs to be adopted are data validation, data auditing and the use of technology analytical to capabilities assure and data hence quality. improve Through their enhancing performance. the Further, data the quality, enhancement the of public quality organizations management are principles able into to data enhance governance their frameworks can result into better performance in public sector projects. Quality management systems such as Total Quality Management (TQM) and the European Foundation for Quality Management (EFQM) model offer a systematic approach to change management and stakeholder engagement as pointed out by Džinić (2017).

These frameworks stress the need to ensure that data governance processes are in conformity with organization goals, thus creating a culture of excellence and accountability. Through the application of quality management principles, public organizations can be assured that their data governance frameworks are not only efficient but also effective in the long run. It is also impossible to overemphasize the importance of technology in data governance and quality management. New and innovative tools for data management such as cloud computing and big data analysis help public sector organizations to handle large data sets in the most efficient manner. These technologies help organizations to set up data quality checkpoints, optimize data governance processes and make data accessible for decision makers (Džinić, 2017). Through the application of technology, public organizations can enhance their data governance frameworks and preserve the quality of data as key factor.

In addition, the encouragement of data literacy within the public organizations is crucial in the achievement of effective data governance skills and quality knowledge management. to Every enable member them of use the and staff across deal the with organization data must properly. be This made entails to training have in the data necessary areas management of best practices, ethical data processing, and the role of data quality. Thus, public organizations should enhance employees' training and development to prepare the workforce that will understand and appreciate data governance. Thus, can they be development stated of that the data comprehensive governance data and governance quality policies, management they are quality crucial management encouragement to system of the implementation, data proper and the literacy work among of public organization employees are crucial for the enhancement of data integrity and ethical usage. These measures not only ensure the safety of sensitive information but also foster the confidence of the public and enhance service delivery. Since public organizations are further embracing the

use of data management in the current world, data governance and quality management should be given high priority to achieve strategic goals.

Performance Measurement and Feedback Loops

Developing Key Performance Indicators (KPIs) aligned with organizational goals is vital for assessing the success of Continuous Improvement (CI) and Big Data Analytics (BDA) initiatives in public organizations. KPIs serve as a performance measurement tool, allowing organizations to evaluate their progress and identify areas for improvement. Studies show that organizations that establish clear KPIs and consistently measure themselves against these benchmarks improve efficiency, effectiveness, and accountability (Duong et al., 2018). An important aspect of effective performance measurement is fostering a culture of transparency, ensuring that KPIs are directly related to specific organizational goals. Additionally, the use of dashboards for real-time monitoring and visualization is a critical factor in enhancing performance evaluation. These tools allow organizations to track performance metrics easily and provide valuable insights that support the decision-making process (Lan et al., 2021).

It is possible to present complex information in a way that can be easily understood at a glance, which is trends ideal and for decision make makers decisions to based identify on them. Real-time data presentation is especially important in public organizations, where the rapid response to the population's requirements is crucial. Through increasing the availability of data, organizations can guarantee that the decision makers have all the information they need in the timeliest manner possible, which is imperative for effective governance. Therefore, it is imperative that feedback loops are incorporated in the performance measurement process so that the culture of improvement is promoted. Feedback mechanisms enable the organizations to reinforce their knowledge base, change strategies and improve processes based on the real data (AnandaRao et al., 2015). This is consistent with the research that highlights the importance of knowledge generation from both the best practice and lessons of failure for organizational improvement (Belsvik et al., 2019). Through the implementation of the feedback loops, the public organizations can be able to improve on their response to the needs and wants of the society thus enhancing service delivery.

Feedback loops can be of many types such as performance appraisal, stakeholder surveys and data analytics assessment. For instance, performance reviews can be done frequently to check on the efficiency of the initiatives and make any adjustments that are necessary. Leadership can play a role great in motivating people to use feedback as a resource for development and improvement, and create an atmosphere in which learning is a continuous process. This is even more so because the leadership has to be well aligned with the organizational goals to ensure that there is a continuous measurement of performance and improvement towards the achievement of the desired results. The above-discussed performance measurement and feedback loops also help in enhancing accountability in public organizations. This is because if employees know how they are being measured and the impact of their performance towards the achievement of organizational goals then they will be compelled to work to the best of their ability.

This sense of accountability is very crucial in the public sector and is a crucial factor in the enhancement transparency of and trust between the public and the government. Therefore, the development of KPIs, the application of performance dashboards measurement for in public real-time organizations.

Continuous Learning and Adaptation

Fostering a culture of experimentation and learning from data-driven insights is essential for public organizations aiming to enhance their operational efficiency and service delivery. In an era where data is increasingly recognized as a valuable asset, organizations must cultivate an environment that encourages experimentation and the iterative use of data to inform decision-making processes. This approach not only

enhances organizational agility but also empowers employees to leverage data insights to drive innovation and improve outcomes. A culture of experimentation involves encouraging employees to test new ideas and approaches without the fear of failure. This is particularly important in public organizations, where traditional bureaucratic structures may stifle creativity and risk-taking. By promoting a mindset that values experimentation, organizations can unlock new solutions to complex challenges. For instance, organizations can adopt methodologies such as the "test and learn" approach, which has been successfully implemented in various sectors to evaluate the effectiveness of new initiatives before full-scale implementation. This iterative process allows organizations to gather data on the outcomes of their experiments, enabling them to make informed decisions based on empirical evidence.

Moreover, the integration of data-driven insights into the decision-making process is crucial for fostering continuous learning. Public organizations should prioritize the collection and analysis of data to identify trends, patterns, and areas for improvement. By utilizing advanced analytics tools, organizations can gain valuable insights that inform strategic planning and operational adjustments. For example, data analytics can reveal inefficiencies in service delivery processes, allowing organizations to implement targeted improvements that enhance overall performance. This data-driven approach not only supports informed decision-making but also fosters a culture of accountability, as employees can see the direct impact of their actions on organizational outcomes. Encouraging feedback and iterative improvements is another critical aspect of fostering a culture of continuous learning. Feedback mechanisms, such as performance reviews and stakeholder surveys, provide valuable insights into the effectiveness of initiatives and identify areas for enhancement. By establishing robust feedback loops, public organizations can create a dynamic environment where learning from both successes and failures is prioritized. Research indicates that organizations that actively seek feedback and adapt their strategies accordingly are more likely to achieve sustained improvements in performance. This iterative approach allows organizations to remain responsive to changing needs and expectations, ultimately leading to better service delivery.

To validate the proposed framework, future studies could employ mixed methods research. Case studies in Malaysian public organizations, combined with quantitative analysis of performance metrics, would provide actionable insights. Pilot projects focusing on specific BDA and CI initiatives can help identify implementation challenges and measure their impact on organizational outcomes.

CONCLUSIONS

Enhancing strategic decision-making in Malaysian public organizations necessitates a transformative approach that integrates Continuous Improvement (CI) and Big Data Analytics (BDA) capabilities. The framework proposed in this paper addresses existing gaps in governance and operational efficiency while promoting agility and ensuring sustainable growth. By leveraging the power of data analytics and fostering a culture of continuous improvement, public organizations can significantly enhance their decision-making processes, leading to better resource allocation, improved service quality, and heightened accountability. The integration of CI and BDA is particularly relevant in the context of Malaysian public organizations, where the need for efficient governance and responsive service delivery is paramount. As highlighted by Ongena & Davids (2023), the development of big data analytics capabilities within the public sector can lead to improved governmental performance. This aligns with the growing recognition of the potential of big data to transform public administration, enabling organizations to make data-driven decisions that are informed by real-time insights. Furthermore, the ability to analyze large volumes of data allows public organizations to identify trends, forecast future needs, and allocate resources more effectively.

To support this transformative approach, policymakers and leaders must prioritize capacity building and infrastructure development. This includes investing in training programs that enhance data literacy among employees, ensuring that they possess the skills necessary to interpret and utilize data effectively. Additionally, organizations must develop robust data governance frameworks that safeguard data integrity

and promote ethical practices in data handling. As highlighted by Reichborn-Kjennerud (Baschung, 2023), effective data governance is essential for building public trust and ensuring accountability in government operations. Future research could focus on the empirical validation of the proposed framework, exploring its applicability across different contexts within Malaysian public organizations. Case studies demonstrating the framework's impact on decision-making processes and service delivery outcomes would provide valuable insights into its effectiveness. Furthermore, examining the challenges and barriers to implementation will be crucial for understanding how to facilitate successful adoption of CI and BDA initiatives in the public sector.

ACKNOWLEDGEMENT

The authors would like to thank the Institute of Postgraduate Studies (IPSis) and Universiti Teknologi MARA, Puncak Perdana Campus, UiTM Selangor Branch, for their research support and opportunities.

REFERENCES

Abhari, K., Davis, D., Ness, H., Pagador, J., Parsons, M., & Brodskiy, R. (2022). Data swagger: a systemic approach to train, motivate and engage data savvy employees.. https://doi.org/10.24251/hicss.2022.742

Alieva, Jamila & von Haartman, Robin. (2020). Digital Muda - The New Form of Waste by Industry 4.0. Operations and Supply Chain Management: An International Journal. 269-278. 10.31387/oscm0420268.

AnandaRao, A., Reddy, G., & T.V, R. (2015). Text clustering using incremental frequent pattern mining approach. International Journal of Data Mining & Knowledge Management Process, 5(6), 53-65. https://doi.org/10.5121/ijdkp.2015.5605

Baschung, L. (2023). Conditions for effective implementation of quality management systems in public administration. Hrvatska I Komparativna Javna Uprava, 23(3), 365-386. https://doi.org/10.31297/hkju.23.3.6

Belsvik, M. R. , Lædre, O. & Hjelseth, E. 2019. Metrics in VDC Projects, *Proc. 27th Annual Conference of the International Group for Lean Construction (IGLC)* , 1129-1140. doi.org/10.24928/2019/0167

Bondarenko, S., Liganenko, I., & Mykytenko, D. (2020). Transformation of public administration in digital conditions: world experience, prospects of ukraine. Journal of Scientific Papers Social Development & Security, 10(2), 76-89. https://doi.org/10.33445/sds.2020.10.2.9

Brynjolfsson, E. and McElheran, K. (2016). The rapid adoption of data-driven decision-making. American Economic Review, 106(5), 133-139. https://doi.org/10.1257/aer.p20161016

Carlson, V., Chilton, M., Corso, L., & Beitsch, L. (2015). Defining the functions of public health governance. American Journal of Public Health, 105(S2), S159-S166. https://doi.org/10.2105/ajph.2014.302198

Dubey, R., Gunasekaran, A., & Childe, S. (2019). Big data analytics capability in supply chain agility. *Management Decision, 57*(8), 2092-2112. https://doi.org/10.1108/md-01-2018-0119

Dubey, R., et. al. (2019). Can big data and predictive analytics improve social and environmental sustainability?. Technological Forecasting and Social Change, 144, 534-545. https://doi.org/10.1016/j.techfore.2017.06.020

Duong, L., Wood, L., & Wang, W. (2018). A review and reflection on inventory management of perishable products in a single-echelon model. International Journal of Operational Research, 31(3), 313. https://doi.org/10.1504/ijor.2018.089734

Džinić, J. (2017). Effective implementation of a quality management policy in public administration: Experiences from Spain and lessons for Croatia. *Hrvatska i komparativna javna uprava: časopis za teoriju i praksu javne uprave*, *17*(4), 639-664.

Fant, G. (2023). Technical review: key concepts of health database management for public health workforce development in resource-limited settings. International Journal of Science and Research Archive, 9(2), 222-230. https://doi.org/10.30574/ijsra.2023.9.2.0526

Ferraris, A., Mazzoleni, A., Devalle, A., & Couturier, J. (2019). Big data analytics capabilities and knowledge management: impact on firm performance. Management Decision, 57(8), 1923-1936. https://doi.org/10.1108/md-07-2018-0825

Handfield, R., Jeong, S., & Choi, T. (2019). Emerging procurement technology: data analytics and cognitive analytics. International Journal of Physical Distribution & Logistics Management, 49(10), 972-1002. https://doi.org/10.1108/ijpdlm-11-2017-0348

Ichdan, D. (2023). Participation in decision-making, career development, and organizational commitment. Jurnal Ilmiah Akuntansi Dan Bisnis, 18(2), 342. https://doi.org/10.24843/jiab.2023.v18.i02.p10

Intezari, A. and Gressel, S. (2017). Information and reformation in km systems: big data and strategic decision-making. Journal of Knowledge Management, 21(1), 71-91. https://doi.org/10.1108/jkm-07-2015-0293

Khan, S., Kaviani, M., Galli, B., & Ishtiaq, P. (2019). Application of continuous improvement techniques to improve organization performance. International Journal of Lean Six Sigma, 10(2), 542-565. https://doi.org/10.1108/ijlss-05-2017-0048

Lan, C., Bellemare, M., & Castro, P. (2021). Metrics and continuity in reinforcement learning. Proceedings of the AAAI Conference on Artificial Intelligence, 35(9), 8261-8269. https://doi.org/10.1609/aaai.v35i9.17005

Lundkvist, A. and Gustavsson, M. (2018). Learning conditions for continuous improvement in a public service organization. Journal of Workplace Learning, 30(8), 578-591. https://doi.org/10.1108/jwl-03-2018-0049

Мандал, С. (2019). The influence of big data analytics management capabilities on supply chain preparedness, alertness and agility. Information Technology and People, 32(2), 297-318. https://doi.org/10.1108/itp-11-2017-0386

Miah, S., Vu, H., Gammack, J., & McGrath, G. (2017). A big data analytics method for tourist behaviour analysis. Information & Management, 54(6), 771-785. https://doi.org/10.1016/j.im.2016.11.011

Monko, M. (2023). The role of computer literacy familiarity in the adoption of e-government by public sector workers in local government authorities: a case of Kigamboni municipal council. European Journal of Theoretical and Applied Sciences, 1(6), 776-786. https://doi.org/10.59324/ejtas.2023.1(6).77

Nugroho, D. (2024). The impact of social media analytics on sme strategic decision making. Iaic Transactions on Sustainable Digital Innovation (Itsdi), 5(2), 169-178. https://doi.org/10.34306/itsdi.v5i2.664

Oh, S. (2024). Community-based learning and data literacy: the role of the public library. Information and Learning Sciences, 125(7/8), 456-474. https://doi.org/10.1108/ils-06-2023-0078

Olaniyi, O. (2023). Utilizing big data analytics and business intelligence for improved decision-making at leading fortune company. Journal of Scientific Research and Reports, 29(9), 64-72. https://doi.org/10.9734/jsrr/2023/v29i91785

Ongena, G. and Davids, A. (2023). Big data analytics capability and governmental performance. International Journal of Electronic Government Research, 19(1), 1-18. https://doi.org/10.4018/ijegr.321638

Rodgers, B., & Antony, J. (2019). Lean and Six Sigma practices in the public sector: A review. *International Journal of Quality & Reliability Management, 36*(3), 437-455. https://doi.org/10.1108/ijqrm-02-2018-0057.

Rogge, N., et al. "Big data and the measurement of public organizations' performance and efficiency: The state-of-the-art" Public Policy and Administration (2017) doi:10.1177/0952076716687355.

Rossi, E., Rubattino, C., & Viscusi, G. (2019). Big data use and challenges: insights from two internet-mediated surveys. Computers, 8(4), 73. https://doi.org/10.3390/computers8040073

Rukanova, B., et. al (2019). Value of big data analytics for customs supervision in e-commerce., 288-300. https://doi.org/10.1007/978-3-030-27325-5_22

Saravanabhavan, C., et. al (2021). Data Mining Model for Chronic Kidney Risks Prediction Based on Using NB-CbH. In *2021 International Conference on Advance Computing and Innovative Technologies in Engineering (ICACITE)* (pp. 1023-1026). IEEE.

Senavirathne, R. (2022). Application of big data analytics in telecommunication sector company in Sri Lanka: with reference to marketing perspective. Sri Lanka Journal of Marketing, 8(3), 114-140. https://doi.org/10.4038/sljmuok.v8i3.114