

Assessing the Extent of Integration of Artificial Intelligence Technology within Management Information Systems: Case of County Governments in Kenya

Charles Owuor Omoga

Department of Management Science, Development studies and Communications,
School of Business, Economics and Human Resource Development, Alupe University, Kenya

Abstract: In today's rapidly evolving business landscape, the integration of Artificial Intelligence (AI) technology within Management Information Systems (MIS) has gained significant attention as a transformative approach to enhancing decision-making processes. The aim of this research was to assess the extent of integration of Artificial Intelligence (AI) technology within Management Information Systems (MIS) of County Governments in Kenya. The findings show that Artificial intelligence integration within MIS in County Governments in Kenya were partially Integrated. These findings are anticipated to contribute to the growing discourse surrounding the level of AI integration within MIS in enhancing decision-making processes, while offering practical recommendations for organizations seeking to harness the potential of these technologies to drive improved decision-making outcomes in the Kenyan context

Keywords: Artificial Intelligence, Management Information Systems, Integration, County Governments

I. INTRODUCTION

In today's digital age, the convergence of technological advancements and business operations has propelled the integration of Artificial Intelligence into various domains, including Management Information Systems (MIS). MIS is a term unifying various software solutions for automation at the organizational level such as Decision support systems (DSS); Executive information systems (EIS); Office automation systems (OAS); Knowledge management systems (KMS); Transaction processing systems (TPS); Enterprise resource planning systems (ERP) [1] The synergistic marriage of AI with MIS holds the promise of revolutionizing decision-making processes, optimizing resource allocation, and enhancing organizational efficiency.

The Americas, particularly the United States, have emerged as a technological hub driving AI integration within MIS. American organizations have harnessed the power of AI to derive actionable insights from vast datasets, enabling them to make informed decisions with unprecedented precision. Industries ranging from finance and healthcare to manufacturing and e-commerce have extensively adopted AI-powered tools for predictive analytics, customer behavior analysis, and supply chain optimization.[2]

In Europe, AI integration within MIS is on a steady rise, with countries such as the United Kingdom, Germany, and France leading the way.[2] European organizations are focusing on leveraging AI algorithms to extract deeper insights from their MIS, contributing to improved strategic planning and innovation. Governments and institutions in Europe are also actively investing in research initiatives and fostering collaborations to enhance AI literacy and integration across various sectors.[2],[3].

In Asia, particularly China and India, showcases a dynamic landscape for AI integration within MIS. The rapid digital transformation of businesses in this region has led to a surge in the adoption of AI-driven MIS solutions. From smart cities to autonomous manufacturing processes, Asian organizations are embracing AI to optimize operations and streamline decision-making. Governments in the region are actively promoting AI initiatives to enhance economic competitiveness on a global scale.[2]

Africa is gradually stepping onto the AI integration stage, with a diverse range of nations embarking on their digital journeys. While AI integration in MIS is still evolving in Africa[3] There are promising developments in sectors like healthcare, agriculture, and financial services. African nations are recognizing the potential of AI to address unique

challenges and drive sustainable growth, leading to increasing efforts to build local AI expertise and infrastructure[2],[3].South Africa leads the continent in AI adoption with a robust ecosystem that includes numerous technology hubs, research groups, and various. Many companies in South Africa are either integrating AI solutions into their existing operations or developing new solutions using AI [4];[5]

Despite the enormous potential of artificial intelligence (AI), many public organizations struggle to adopt this technology[6]. Furthermore,Information on the level of integration of Artificial Intelligence within Information systems in Public service sector is scarce[7].Therefore this study sought to fill this gap.

The general objective of this study was to assess the extent of integration of Artificial Intelligence technologies within Management Information Systems (MIS) in County Governments in Kenya.

This study was subsequently guided by the following research question:

1.To what extent have the County Governments in Kenya integrated Artificial Intelligence within their Management Information Systems?

II. METHODOLOGY

2.1 Research design

This research adopted descriptive survey research design, which borrows substantially from positivist philosophy in research. This was used to gather quantitative data to assess the extent of integration of Artificial Intelligence technologies within Management Information Systems (MIS) in County Governments in Kenya

3.2 Study population and Sampling technique

The target population for this study was the 47 County Governments in Kenya. This study applied a two stage sampling approach which involved simple random sampling technique to determine the number of sampling units, in this case the County Governments in Kenya and then purposive sampling technique which was used to determine the respondents for the study.(ICT Directors in this case) In this study the statistical equations approach was used to determine the sample size. The formula [8] was used to compute the sample size at a 95% confidence level and $P = 0.05$.Basing on the above formula, the sample size of 42 County Governments in Kenya was realized.

3.3 Research instrument

This study used a structured selfadministered survey questionnaire to collect the primary data from the study respondents. A Questionnaire is quantitative tool for data collection. The rationale for using questionnaire is that it is cheaper, flexible and allows for replication of the research procedure thus enhancing validity of research findings.

3.4 Data Presentation

For the study, data presentation utilized tables for easy understanding. SPSS was preferred over other software's because it is systematic and has a wide coverage of common graphical and statistical data analysis

3.5Ethical considerations in this study.

Many ethical issues arise during this stage of the research [9]. In this study the participants were not mentioned by name. However codes were used to identify the individual respondents. This ensured their privacy and anonymity [10] . Voluntary participation was also made clear as the respondents were not coerced to participate

III. RESULTS

4.1 Analysis of Survey response

The analysis of survey response was done to determine the number of respondents who did or didn't respond to the survey. Out of a total of 42 respondents, 23 Counties responded to the questionnaire.

4.1 Descriptive statistics for the level of Integration of Artificial Intelligence within MIS

Normality tests were run for all the measurement items and skewness and kurtosis examined. Normally the rule of thumb for normality test is for the skewness and kurtosis to be between +3 and -3 for skewness and -8 and +8[11].The results show that all the normality test results were within the acceptable range. The measurement of central tendency for level of the level of Integration of Artificial Intelligence within MIS measurement items were run.The scores show that the mean score for the measurement items were between 1-2.35 while the modal score was 2.This means that most of the respondents agreed that Artificial intelligence integration within MIS in their respective institutions was partially Integrated.Table 1 captures these findings

Table1: Statistics for the level of the level of Integration of Artificial Intelligence within MIS

| Statement | Mean | Median | Mode | Skewness | Kurtosis |
|--|------|--------|------|----------|----------|
| AI technologies are used to automate routine tasks within our MIS. | 2.13 | 2.00 | 2 | -0.85 | -2.06 |
| AI-driven analytics are utilized to derive insights from our MIS data. | 2.35 | 2.00 | 2 | -0.47 | -0.540 |
| AI-powered predictive models are applied to anticipate future trends in our MIS. | 1.91 | 2.00 | 2 | -0.36 | 3.42 |
| AI algorithms assist in identifying patterns and correlations in our MIS data. | 1.91 | 2.00 | 2 | -0.77 | 3.42 |
| AI-based recommendation systems provide suggestions for decision-making within our MIS. | 2.00 | 2.00 | 2 | 0.54 | -1.048 |
| Our organization employs Machine Learning techniques to enhance MIS data accuracy. | 1.00 | 1.00 | 1 | 0.74 | 0.68 |
| AI is utilized to optimize resource allocation and utilization within our MIS | 2.00 | 2.00 | 2 | 0.60 | -1.048 |
| Natural Language Processing (NLP) technology is integrated into our MIS for text analysis. | 1.65 | 2.-00 | 2 | -0.684 | -1.687 |
| AI-based chatbots or virtual assistants are used for customer interactions within our MIS. | 1.00 | 1.00 | 1 | 0.74 | 0.68 |
| Our organization consistently evaluates and updates AI algorithms used in our MIS. | 1.00 | 1.00 | 1 | 0.74 | 0.68 |

Source:Research Data(2023)

4.2 Measurement for the level of Integration of Artificial Intelligence within MIS

The measurement for the level of Integration of Artificial Intelligence within MIS was composed of ten items. The respondent were required to respond on a four point likert scale. The results show that most respondents (60.9%) indicated that AI technologies were used to automate routine tasks within MIS was partially integrated; for the utilization of AI-driven analytics to derive insights from MIS data, most respondent indicated that it was partially integrated at 47.8%.

As to whether AI-powered predictive models were applied to anticipate future trends in their MIS, most respondents (82.6%) indicated that it was partially integrated. on whether AI-based recommendation systems provided suggestions for decision-making within their MIS,most respondents showed that it was partially integrated at 47.8%. Responding to whether organization employs Machine Learning techniques to enhance MIS data accuracy, most respondents indicated that it was not integrated at 95.7%.

For the utilization of AI to optimize resource allocation and utilization within MIS,most respondents(47,8%) were at partial Integration. The item on whether Natural Language Processing (NLP) technology was integrated into MIS for text analysis, most respondents indicated that it was partially integrated at 60.9%. Table 2 Captures these findings

Table 2: Results for the level of Integration of Artificial Intelligence within MIS

| Statements | Not Intergrated | Partially Intergrated | Moderately Intergrated | Fully Intergrated |
|--|-----------------|-----------------------|------------------------|-------------------|
| AI technologies are used to automate routine tasks within our MIS. | 03(13%) | 14(60.9%) | 06(26.1%) | 00 |
| AI-driven analytics are utilized to derive insights from our MIS data. | 02(8.7%) | 11(47.8%) | 09(39.1%) | 00 |
| AI-powered predictive models are applied to anticipate future trends in our MIS. | 03(13%) | 19(82.6%) | 01(4.3%) | 0 |
| AI algorithms assist in identifying patterns and correlations in our MIS data. | 03(13%) | 19(82.6%) | 01(4.3%) | 0 |
| AI-based recommendation systems provide suggestions for decision-making within our MIS. | 06(26.1%) | 11(47.8%) | 05(21.7%) | 01(4.7%) |
| Our organization employs Machine Learning techniques to enhance MIS data accuracy. | 22(95.7%) | 01(4.3%) | 00 | 00 |
| AI is utilized to optimize resource allocation and utilization within our MIS | 06(26.1%) | 11(47.8%) | 05(21.7%) | 14.(7%) |
| Natural Language Processing (NLP) technology is integrated into our MIS for text analysis. | 08(34.8%) | 14(0.9%) | 01(4.7%) | 0 |
| AI-based chatbots or virtual assistants are used for customer interactions within our MIS. | 21(91.3%) | 02(8.7%) | 00 | 00 |
| Our organization consistently evaluates and updates AI algorithms used in our MIS. | 21(91.3%) | 02(8.7%) | 0 | 00 |

N=23; Source:Research Data(2023)

IV. DISCUSSION OF RESULTS

The results show that most respondents(60.9%)indicated that AI technologies are used to automate routine tasks within MIS was partially integrated;for the utilization of AI-driven analytics to derive insights from MIS data,most respondent indicated that it was partially integrated at 47.8%.As to whether AI-powered predictive models were applied to anticipate future trends in their MIS,most respondents(82.6% indicated that it was partially integrated.On whether AI-based recommendation systems provided suggestions for decision-making within their MIS,most respondents showed that it was partially integrated at 47.8%.

Responding to whether organization employs Machine Learning techniques to enhance MIS data accuracy, most respondents indicated that it was not integrated at 95.7%. For the utilization of AI to optimize resource allocation and utilization within MIS,most respondents(47,8%) were at partial Integration. The item on whether Natural Language Processing (NLP) technology was integrated into MIS for text analysis, most respondents indicated that it was partially integrated at 60.9%. These findings show that Artificial intelligence integration within MIS in their respective County Governments were partially Integrated. The results of these investigations are reflected in research conducted by[12] ;[13]; [14] These studies suggested that while public service entities have initiated efforts to integrate Artificial Intelligence within their MIS, a significant number of them encounter challenges in realizing the anticipated advantages that AI technologies should bring about

V. CONCLUSION

In conclusion, the examination of the extent of integration of Artificial Intelligence (AI) technology within Management Information Systems (MIS) in County Governments in Kenya has illuminated a landscape of technological advancement and potential. The findings of this study indicate that while AI integration is making its mark in the Public service sector, there is still room for growth and optimization. The adoption of AI within MIS systems is a multifaceted process, impacted by factors such as infrastructure, resources, organizational culture, and technical expertise. By strategically aligning technological advancements with the County Governments goals and investing in necessary resources and expertise, County Governments of Kenya can harness the power of AI to optimize information management, streamline decision-making processes, and elevate overall operational efficiency.

VI. RECOMMENDATIONS

Building on the insights garnered from this study, the following recommendations are proposed to enhance the integration of AI technology within Management Information Systems of County Governments in Kenya:

Strategic Planning: Develop comprehensive strategic plans that outline the vision and roadmap for AI integration within MIS. These plans should align with the university's overall goals and leverage AI's potential to enhance decision-making and information management.

Investment in Infrastructure: Allocate resources for upgrading technological infrastructure to accommodate AI capabilities. This includes investing in high-performance computing systems, robust data storage solutions, and high-speed networks.

Capacity Building: Facilitate training and capacity-building programs for university staff to equip them with the technical skills required for effective AI integration. This can involve workshops, seminars, and collaborative learning opportunities.

Data Governance and Security: Prioritize data governance and security measures to safeguard sensitive information. Establish protocols for data collection, storage, and utilization to ensure compliance with privacy regulations.

Collaborative Partnerships: Foster collaborations with AI technology providers, research institutions, and industry experts. These partnerships can facilitate knowledge exchange and keep the university abreast of the latest AI advancements.

Pilot Projects: Initiate pilot projects that demonstrate the tangible benefits of AI integration within specific MIS processes. These projects can serve as proof of concept and build support for broader implementation.

Change Management: Implement change management strategies that address any resistance to AI adoption among staff. Effective communication, training, and demonstrating the positive impact of AI can alleviate concerns.

Continuous Evaluation: Establish a mechanism for continuous evaluation and monitoring of AI integration efforts. Regular assessments of AI's impact on decision-making, efficiency, and data accuracy will inform refinements and optimizations.

Adaptability and Scalability: Design AI solutions with adaptability and scalability in mind. As technology evolves, the university's AI infrastructure should be capable of accommodating new developments and expanding its applications.

Ethical Considerations: Develop guidelines for the ethical use of AI within MIS. Ensure that AI-driven decisions align with the university's values and principles.

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