MIS Based on IoT and Cloud Services: Governmental Organizations Perspective

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Abstract

Management information systems (MIS) form an important element in the overall use and leverage of technology by organisations. This article focuses on the impact of management information systems on the performance of governmental organisations. MIS has had significant influence on organisations in general, and has also led to challenges for many organisations. The research provides a review and evaluation of the MIS impact on governmental organisations in general and on the performance of the governmental organisations in particular. A systematic literature review was conducted to determine the impacts of MIS on the performance of governmental organisations. The review in this research showed that there are significant benefits in the use of MIS for governmental organisations. The questionnaire and an online survey by Google forms have been used to gather the data. The primary research conducted on the factors that impact performance identified the key factors as hardware and software, individuals and procedures, network within the organisations, and error reduction. The results indicated the strength of the impact of hardware and software, Individual and procedures and network on the performance of governmental organisations. In addition, the results are significant meaning that the null hypothesis is rejected. Furthermore, the research identified the key mediators of quality of information and quality of service as contributing to the impact of the factors on the performance of governmental organisations. With the advancement of technology and the requirements of governmental organisations to manage and use an extensive volume of data and information on the public, it has become imperative for governmental organisations to have MIS capabilities to have an effective delivery system of public services. Governmental organisations should have a clear evaluation process to understand quantitative and qualitative impacts from MIS capabilities to support decision-making in relation to the investments and costs in having extensive MIS capabilities.

Keywords: Management information Systems (MIS), Governmental organizations, Technology, Performance, Hardware and software

1 Introduction

Management information systems (MIS) form an important element in the overall use and leverage of technology by organisations [1]. The enhancements of the management of information and the automation of processes have provided organisations with significant opportunities for performance improvement [2]. For some organisations, MIS has been used in operating businesses, serving customers and developing differentiated products and services to establish competitive advantages versus competitors in the marketplace [3]. While there are many advantages in the effective use of MIS in organisations, there have also been challenges for many organisations in the implementation of MIS, and the leverage of MIS to effective for organisational objectives [4]. This has been seen to be similarly the case for governmental organisations where the implications of MIS implementation and use have had favourable and unfavourable impacts even if the academic studies have not been as extensive [5].

The significant advancement in technology including software and hardware developments have provided significant opportunities in the improvement of MIS for organisations leading to a requirement to have these structurally designed and formally established [6]. This was not previously the case as organisations started to informally integrate and design MIS in separate parts of the organisation thereby leading to incongruency and misalignment in the MIS strategy and execution [7]. With the continued developments in technology and the related implications on MIS, organisations have been able to enhance MIS use and leverage MIS as a competence with some organisations building MIS capabilities as a competitive advantage [8]. The increased collaboration among businesses and the leverage of information sharing to build competitive capabilities particularly in supply chains have brought to the fore the importance of an effective MIS in organisations [9]. Increasingly, MIS is used by organisations to not only be competitive in the market but also develop capabilities that differentiate the organisations with competitors including through development of more relevant products and services [10-11].

There is a significant need for MIS in governmental organisations due to the large and extensive data and information requirements managed by the governmental organisations as part of the services to the public [12-13]. As governmental organisations recognise and realise the role that MIS could have in the management of data and information to support the execution of operations and achievement of organisational objectives, the governmental organisational

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have pursued the implementation of advanced MIS to improve delivery of services [14]. However, as there is a significant range of information and communications technology firms and other third-party firms that can provide the implementation and execution of MIS for governmental organisations, there is a need for the governmental organisations to understand the differences of the MIS packages on offer, and the implications in the decision for specific MIS implementation [15]. One of the challenges of governmental organisations is the funding of the MIS implementation as the costs for advanced MIS that can sift through and manage large volumes of data and information can be significant [16].

2 Literature Review

2.1 Impact of MIS on Performance of Governmental Organizations

Governmental organisations increase the use of MIS for data and information management to support public services and other objectives, it has been noted that the application of MIS has varied not only across countries but also even across similar governmental organisations in specific countries [17]. This has provided a challenge for many governmental organisations in ensuring consistency in the management of data and information, and the assurance of alignment with historical data and information [17]. A key challenge that has been noted has been the collection of data and information from the public and institutions with the historical requirements proving to be inconsistent and mismatched with current data parameters [17]. This has resulted in additional investments and costs for some governmental organisations in order to try and align the data and information that have been retrieved by the governmental organisations. In this aspect, the impact has been unfavourable even as the MIS has provided the governmental organisations increased ease in the retrieval and use of data and information which has improved overall governmental organisation delivery of services to the public [17].

In some instances, the use of MIS has become an impetus for governmental organisations to retrieve extensive volumes of data and information across different public services including education and health [18]. With the support of MIS underlying the servicers of the government, governmental organisations which have the MIS support have taken this as an opportunity to expand the knowledge and understanding of the public through the increased collection of data and information with the view to positively impact government services to the public [18]. This approach is not without its challenges as the current delivery of government services is challenged already without the additional data and information that is being retrieved by some governmental organisations [19]. Rather than add further to the delivery of government services that is already difficult in many countries, the argument is that the focus should be on the enhancement of current public services and the fulfilment of the required government services that can now be more easily fulfilled with the use and leverage of MIS in the governmental organisations [19].

Some academic studies have noted that the MIS in governmental organisations have enhanced the delivery of public services as the data and information of the public are being shared across different governmental organisations [20].

The capabilities of MIS in the development of insights and analysis have also expanded thereby providing governments with further support in expanding the delivery of public services that are more effective and with increase ease [21]. The key challenge for governmental organisations is to determine the appropriate level of MIS capabilities that are needed in the delivery of required public services as it would be easy to consider increased capabilities that are not necessarily needed and required [22], and at a significantly higher cost to the governmental organisations [23]. It is imperative that governments in general and governmental organisations in particular have a clear understanding of the public services that would need to be supported by the MIS to be implemented and used [24]. In addition, this should be MIS that is future proofed in that it would be capable to integrate future capabilities for the governmental organisations without need for significant investments to expand the capabilities [25].

2.2 Use of MIS to Enhance the Performance of Governmental Organizations

In government organisations including those such as the military departments, the impact of hardware and software in the performance of these organisations cannot be underestimated as these had provided increases in productivity and decreases in resource requirements as the software and hardware systems were implemented [26]. The applications for government organisations, as with non-government organisations and private institutions, are significant and there has not been a considerable barrier other than the funding and investments needed in the implementation of hardware and software systems to enhance MIS and related infrastructure [27]. Notably, in many government organisations, the hardware and software systems are integral to the MIS plans with the role that these have in relation to governance systems and record-keeping which can be substantial for government organisations [28].

According to [29], it was highlighted that government organisations benefit from individual and procedures with positive impacts on areas such as models for policymaking, standard operating processes, and organisational capabilities. Furthermore, [30] showed that administrative and managerial governance procedures are positively reinforced with the individual pushing the implementation and procedures being set to ensure guidance and consistency in the application of rules and guidelines [31-32].

The network within organisation has been particularly useful in the transition of many services of government organisations into e-government channels to enhance service delivery and improve efficiency [33]. There are many examples in which organisational performance has been positively influence by the network within organisations in the reliance on MIS with health care applications as one of these examples [34]. The network within organisations has also been a driver of improvements and changes in public policy developments with technological applications being instrumental in being integral to government programmes [35]. The network within organisations as part of MIS in government organisations can lead to impacts on overall network governance with operational applications that are

helpful for promoting institutional roles such as partnerships [36].

3 Research Model and Hypotheses

The model consists of four variables which are Hardware and Software, Individual Procedures, Network within the organization and Error Reduction that impact on the performance of governmental organizations. In addition, the model contains Mediators, which are Technological factors, represents Quality of Information, Quality of System and Quality of Service to enhance the performance of governmental organizations [37].

3.1 Impact of Hardware and Software on Performance of Governmental Organisations

A review of the impact that hardware and software could have on organisational performance shows significant influence and positive implications in the optimisation of processes and enhancement of capabilities [26]. Indeed, the history of the role of hardware and software in relation to MIS in organisations has presented the impact that these could have in changing the way MIS is utilised in organisations to benefit the efficiency and effectiveness of teams and organisations [45].

3.2 Impact of Individual and Procedures on Performance of Governmental Organisations

In terms of individual and procedures, these have impacts on the performance of governmental organisations. Specifically, [46] note that procedures, represented by governance as a formal term, can define the behaviour and approach that individuals take in the management and use of MIS as part of their roles. Reference [47] describes how the individual and procedures can have a large influence on the effectiveness of governance mechanisms and other processes thereby arguing the benefit that individual and procedures could have on the performance of government organisations.

3.3 Impact of Network within Organisation on Performance of Governmental Organizations

In reviewing the impact of network within organisations on the performance of governmental organisations, it was highlighted that different types of networks can have positive impacts on government organisation performance [48]. Moreover, and with partner networks specifically, the influence of network governance mechanisms in the context of relationship performance was established [48]. Similarly, the impact of network governance on organisational performance was presented in light of the implications on policy development and governance outcomes [49].

3.4 Impact of Quality of Information on Performance of Governmental Organizations

An important aspect of the role of MIS in the performance of governmental organisations is the impact of the quality of information as this is what would be the underlying content that is utilised and channelled through the MIS for governmental organisations [50]. The reliance of government on available information presents the importance of having good quality of information as an input to the MIS that governments utilise, whether for internal records or, more critically, for making decisions.

3.5 Impact of Quality of Systems on Performance of Governmental Organizations

In addition to the quality of information, the aspect of quality of systems is also notable for the impact on the performance of governmental organisations with quality of systems providing an opportunity to improve processes and reliability. The quality of systems in the context of MIS relates to the systems utilised and which provides access to the management information, and capacity for analysing trends in the information available]. Furthermore, the quality of systems is integral to the extent of reliance and use of the MIS by governmental organisations thereby leading to an impact on the performance of these organisations with this dependent on the quality of systems existing for the MIS of the governmental organisations.

3.6 Impact of Quality of Service on Performance of Governmental Organizations

The quality of service is critical to the performance of governmental organisations with quality of service as a defining characteristic of the performance that the governmental organisations would be measured against. Effectively, the quality of service reflects the performance of governmental organisations from the perspective of the public with quality of service being considerably linked to MIS particularly as many governmental services sought by the public requires the leverage and retrieval of information. In a study on the improvement of performance of Italian local governmental organisations, the enhancement of the quality of service was identified as a key driver that could impact the performance of the local governments [32]. The establishment of the ISO 9001 was even recommended as this would lead to the improvement of the quality of service including increased effectiveness of the local government, decreased defectiveness and claims, and enhanced customer satisfaction [40].

3.7 Impact of Error Reduction on Performance of Governmental Organizations

An important aspect of government services that the public would seek to experience is a reduction in the error that governmental organisations have in the delivery of services to the public [38]. The implementation of effective MIS can be helpful in reducing errors in the way services are delivered and

information is managed and utilised by governmental organisations across public services including health care [27]. Despite being well-intentioned, many governmental organisations end up making errors in decisions made or actions executed that impact the services delivered to the public including in areas such as the health and safety of the public [43].

3.8 Hypotheses for the Study

Following the discussion on the theory of various factors driving the effectiveness of MIS and, consequently, the performance of governmental organisations, the hypotheses for the research are defined as shown in Figure 1. The impact of Management Information Systems on the performance of governmental organisation and the impact of Management Information Systems through the technological factors, which represents quality of information, quality of system and quality of service on the performance of governmental organisation, are compared to provide a perspective on the role of technological factors on the performance of governmental organisations. The hypotheses statements are represented as null hypotheses.

There are two sets of hypotheses based on the conceptual model presented. The NULL hypotheses for the research are defined below.

H1 (a,b,c,d): There is no significant effect of Management Information Systems on the performance of governmental organisations.

H1a: There is no significant effect of the equipment's hardware and software on the performance of governmental organisations.

H1b: There is no significant effect of networks within the organisation on the performance of governmental organisations.

H1c: There is no significant effect of individuals and procedures on the performance of the governmental organisations.

H1d: There is no significant effect of error reduction on the performance of the governmental organisations.

H2 (a,b,c,d): There is no significant effect of Management Information Systems on the performance of governmental organisations through the technological factors.

H2a: There is no significant effect of the equipment's hardware and software on the performance of governmental organisations through the technological factors.

H2b: There is no significant effect of networks within the organisation on the performance of governmental organisations through the technological factors.

H2c: There is no significant effect of individuals and procedures on the performance of governmental organisations through the technological factors.

H2d: There is no significant effect of error reduction on the performance of the governmental organizations through the technological factors.

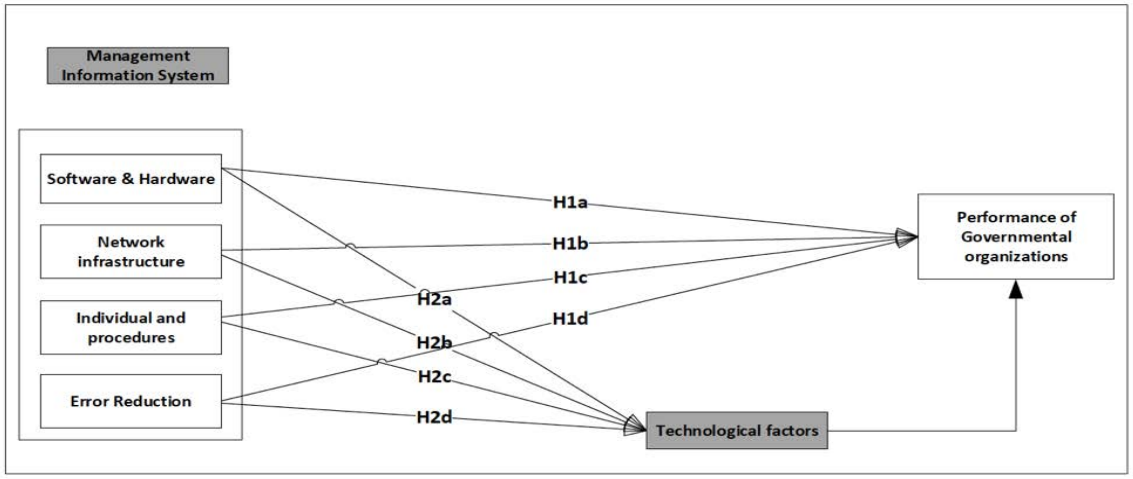

Figure 1. Conceptual model of factors impacting performance of governmental organization

4 Methodology

The research uses a systematic literature review in executing a review of the impact of MIS on governmental organisational performance. A systematic literature review is a relevant method for this type of research with systematic literature reviews designed to identify the relevant and high-quality academic studies, critically evaluate the application and relevance of the studies, and integrate the findings to form an overall perspective from the review of the academic studies in a particular subject [50]. This research focuses on the time period from 2010 to the current period for the academic studies and literature included in the study. This forms a period, which is considered to provide an extensive set of academic studies that are recent and incorporate developments and technological impacts on the MIS evolution for organizations.

A survey questionnaire was utilised with the objective of understanding the perspectives of the respondents in relation to the role and impact of MIS on the performance of governmental organisations. The questionnaire was designed to address each of the research hypothesis with several statements representing each of the categories that were evaluated in terms of the impact on the performance of governmental organisations: (1) hardware and software; (2) individual and procedures; (3) network within organisation; (4) quality of information; (5) quality of systems; (6) quality of

service; and, (7) error reduction. The scoring for each of the statements in the survey questionnaire involved the use of a 5-point Likert scale with each response being provided a specific score. For the scoring of the Likert scale, the following was: followed: strongly agreed – 2; agreed – 2; neutral – 1; disagree – 0; and, strongly disagree – 0. This type of scoring was decided to impact the analysis positively as this provides the opportunity to differentiate strongly disagree with disagree because according to the questionnaire, the questions are subjective and not objective, and this means that the respondents may be biased or may not be biased. As these questions are subjective and answered subjective questions may sometimes not be accurate, the optimal approach to minimise the subjectivity is to have the proposed scoring for the research where disagree equals 0, neutral is 1, and anything with agree is scored 2 points. A total number of 395 participants were completed the study and responded to the questionnaire.

For each of the items across sections to represent the categories tested in terms of the impact on the performance of governmental organisations, the responses are provided in the ensuing tables to reflect the skew and trends in the responses, and the t-value and p-value measures for each of the items for each section of statements in the survey questionnaire. The results are expressed as a percentage (%) and indicate the mean ±SD, with SD referring to the standard deviation for the results. The p-value was calculated using the difference between percentage tests. For the t-value, a negative sign indicates that the % of negative responders is higher than the corresponding % of positive responders. The minimum-maximum mean value of scoring of each item is 0-2, following the approach taken for Likert scoring. The minimum-maximum mean value of scoring of the section, with the consolidation of the 5 items, is 0-10. After the scoring is done, the next calculation is the number of positive responders versus the number of negative responders for each option using difference between percentages test.

In the statistical analysis, the data from the responses provided for the survey questionnaire were analysed using descriptive analysis, testing of the differences between responses using t-value and p-value measures, the x-factor analysis using extraction and rotation methods, and linear regression model with ANOVA (analysis of variance). Boxplot and Scree plot are constructed to represent the responses from the primary research. A **p-value <0.05** is considered as the lower limit of significant and rejected the null hypothesis. Using SPSS-version 20, compatible with IBM, carried on statistical analysis.

5 Analysis

5.1 Primary Research Respondent

From the Ministry of Higher Education and Scientific Research's primary research respondents, 411 replies were obtained from 600 questionnaires sent out, and 395 samples were taken, yielding a response rate of 65.8%. The Ministry's total staff headcount ranges from 28,000 to 30,000 persons. Males made up 63% of the responses, while females made up 37%. 61% of those polled had post-graduate degrees, 33% had a Bachelor's degree, and 6% had completed the pre-degree Bachelor's level. 29 percent of respondents had worked at the Ministry for more than 15 years, 44 percent had worked there for 10 to 15 years, 20% had worked there for 5 to 10 years, and 7% had worked there for fewer than 5 years. In terms of age, 63 percent of respondents were 35 years old or older, 35 percent were 25 to 35 years old, and only 2% were under 25 years old. 4 percent of the respondents were senior managers, 6 percent were department heads, 11 percent were unit heads, and 79 percent were Ministry employees. The sample size was calculated using the following formula:

$$S = \frac{N}{1 + N(e)^2} \quad \textbf{(1)}$$

$$S = \frac{28000}{1 + 28000(0.05)^2} \quad \textbf{(2)}$$

$$S = \frac{28000}{1 + 70} = 394.366 = 395 \quad \textbf{(3)}$$

5.2 Distribution of Responses: Approach to the Analysis

The following steps are the outcomes of each of each of the following: Hardware and Software, Individual and Procedures, Network, Quality of information, Quality of systems, Quality of service and Error reduction.

5.2.1 Summary of Responses

Options 4, 5 and 6 have the highest score sum which provided the initial consideration of these options as mediators in the factors impacting the performance of governmental organisations. Table 1 presents the summary of the characteristics of the responses across the options including the mean, standard error of mean, median, standard deviation, the minimum and maximum values, and the quartile cut-offs. The median value is greater than 5 in all options, indicating that the positive responses are more than the number of negative responses.

Table 1. Summary of characteristics of responses

		Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7
No.	Valid	395	395	395	395	395	395	395
	Missing	0	0	0	0	0	0	0
Mean		5.198	4.957	5.342	6.423	6.818	6.671	5.656
Std. Error of Mean		0.199	0.185	0.192	0.194	0.192	0.192	0.196
Median		6.00	5.00	6.00	8.00	9.00	8.00	7.00
Std. Deviation		3.94	3.67	3.81	3.86	3.82	3.81	3.89
Minimum		0.00	0.00	0.00	0.00	0.00	0.00	0.00
Maximum		10.00	10.00	10.00	10.00	10.00	10.00	10.00
Quartile	25	1.00	1.00	2.00	2.00	3.00	3.00	2.00
	50	6.00	5.00	6.00	8.00	9.00	8.00	7.00
	75	9.00	8.00	9.00	10.00	10.00	10.00	9.00

Option 1: availability equipment and software; Option 2: individuals and procedures; Option 3: network within the organisation; Option 4: quality of information; Option 5: quality of system; Option 6: quality of services; and, Option 7: error reduction

5.2.2 Error Reduction

The final factor of error reduction has results that are in line with the results for the previous three factors albeit with lower t-values than the previous three factors discussed, as shown in Table 2. The p-values indicate that each of the items is significant with the overall null hypothesis being rejected. The positive t-values provide indication of the extent of the positive responses that the items received versus the negative responses that were noted for each item. The factor of error reduction is considered to have an impact on the performance of governmental organisations.

Table 2. Distribution of responders on error reduction

Items	No. (%) positive responders	No. (%) equivalent responders	No. (%) negative responders	Mean ±SD of scoring	t-value	p-value
1	190 (48.1)	64 (16.2)	141 (35.7)	1.120±0.910	5.950	<0.001
2	188 (47.6)	77 (19.5)	130 (32.9)	1.150±0.890	7.374	<0.001
3	177 (44.8)	91 (23.0)	127 (32.2)	1.130±0.870	6.628	<0.001
4	172 (43.5)	94 (23.8)	129 (32.7)	1.110±0.870	5.737	<0.001
5	189 (47.8)	76 (19.2)	130 (32.9)	1.150±0.890	7.481	<0.001

5.2.3 Factor Analysis

For the factor analysis, the extraction method utilised was the Principal Component Analysis (PCA), and for the rotation method, the Varimax with Kaiser was applied. The results of the application of PCA for factor analysis are presented in Table 3. The results provide the analysis of each component as it contributes to the outcomes in the mediators.

The components with eigenvalues greater than 1.0 are the most essential. Option 1 and 2 meet the standard level for eigenvalues, whereas the other options failed to meet the eigenvalues threshold. Option 1 accounts for 42.765 percent of the variability, whereas option 2 accounts for 31.177 percent. These two alternatives together account for 73.942 percent of total variability. Option 1 and 2 account for 73.942 percent of the data, while alternatives 3, 4, 5, 6, and 7 account for 100 percent of the remaining 73.942 percent, or 26.058 percent. Option 1 and 2 have unobservable data as a result of the factor analysis, as demonstrated in the results. Table 3 when the number of eigenvalues is higher than one These alternatives' unobservable data is also referred to as having hidden factors. This means that in future situations where options 1 and 2 are included in questionnaires, these should be noted as including hidden factors which need to be considered as there could be bias resulting from the inclusion of these options.

The scree plot of the alternatives shows the extent to which options 1 and 2 have an impact on unobservable data. Exhibit 3 demonstrates this. This demonstrates that there are unspoken factors that influence the responses given for options 1 and 2. This is evident in the scree plot's diminishing slope. Future questions with similar objectives will need to be changed to lessen the impact of hidden elements, which will result in a shift in the scree plot, with a flatter curve if hidden factors impacting responses for specific options or components in the questionnaire are minor. When a scree plot for the factor analysis shows no slope or a flat curve (see Figure 2), this indicates that hidden factors that influence the questionnaire answer have been eliminated.

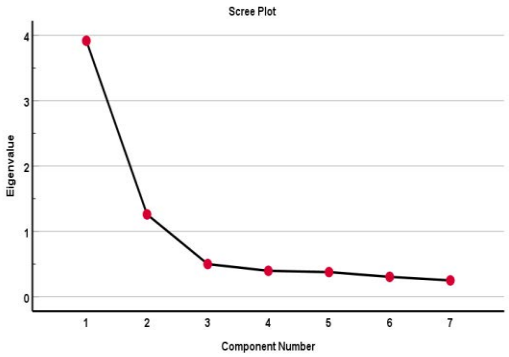

Figure 2. Scree plot showing the slope of curve

Table 3. Extraction method – Principal component analysis

Total Variance Explained						
	Initial Eigenvalues			Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.916	55.947	55.947	2.994	42.765	42.765
2	1.260	17.995	73.942	2.182	31.177	73.942
3	.499	7.132	81.074			
4	.396	5.656	86.729			
5	.376	5.376	92.105			
6	.304	4.339	96.444			
7	.249	3.556	100.000			

To discover the factors influencing the outcomes, factor analysis was employed to examine the components omitting the mediators. The questionnaire offered seven alternatives, each with five questions. The scores from the respondents were incorporated in the SPSS program execution to demonstrate which respondents answered the questions and were accountable for the mediator findings, which were represented by questionnaire alternatives 1 to 7. When respondents answer the questions, hidden considerations emerge, and some respondents may desire to answer yes but end up answering no. Furthermore, responders may mean for a positive response, but because the option does not exist or is disguised, they select a negative response. Another example is that an Internet router requires electricity to function, but if the electricity is turned off, the Internet router will not function. If the electricity is turned off on a regular basis and someone asks how the Internet is, the response may be that the connection is poor. However, this is not the case because there is a hidden factor, which is the electricity, which is obstructing the Internet connection and making it appear that the connection is poor. The finding that alternatives 1 and 2 have hidden factors based on the results of the principal component analysis is referred to as this.

5.2.4 Rotated Component Matrix

The Rotated Component Matrix provides the factor loadings for each variable. Table 4 shows the results for the rotated component matrix. The highlighted factors (components) are the ones that each option loaded most strongly on. From the option loadings, it can be seen that options 1, 2, 3 and 7 sub-tests loaded strongly on component 1, and options 4, 5 and 6 loaded strongly on component 2. The results also provided further indicators of hidden factors that are considered as unobservable data, which are reflections of the responses provided by the respondents to the questionnaire. With the rotated component matrix, with the 7 options, two of the components, options 1 and 2, influence the answers as shown in the previous table where option 1 had an eigenvalue of 3.916 and option 2 had an eigenvalue of 1.260. In the program which rotated with all options from availability equipment (hardware) and software to error reduction, the results show option 1 has hidden factors which influence options 2, 3 and 7, and option 2 also has hidden factors which influence options 4, 5 and 6 which were decided as mediators. From the results, this means that in the future, in considering a similar questionnaire, it is important to note that for option 2, if the questions of option 2 (individuals and procedures) are compared with options 4, 5 and 6, there may be a need to revise the statements to limit the incidences of misunderstanding of the statements included in the questionnaire. These would represent the hidden factors that impacted the responses, as these were the ones that could be considered, as the responders may not have understood well. This could be a result of the readers misunderstanding the questionnaire well.

Table 4. Rotated component matrix

Options	Components	
	1	2
Availability equipment and software	0.848	0.183
Individuals and procedures	0.857	0.231
Network within the organization	0.860	0.232
Quality of information	0.231	0.828
Quality of system	0.144	0.840
Quality of services	0.274	0.772
Error reduction	0.806	0.232

5.2.5 Summary

From the data analysis, it was identified that options 1 and 2 have hidden factors, which can impact the responses of the respondents. Options 4 and 6 were identified as the main mediators for the factors impacting the performance of governmental organisations. Option 5 did not result as a mediator. It is possible that options 1 and 2 had hidden factors that influenced the responses to lead to option 5 missing out being included as a mediator.

6 Discussion

6.1 MIS Impacts on Governmental Organizational Performance

There have been various academic studies that have discussed the role of MIS on governmental organisations. Not all of the academic studies have specifically discussed and presented the impacts on governmental organisational performance, but the studies provide implicit indications of the impacts on governmental organisational performance. Reference [48] discussed the increased prevalence of the role of MIS in the delivery of government and public services with the management and use of data and information argued to be the main basis for government services. Governmental organisations are in an enviable position to be the collectors and providers of public data and information because of the implicit trust of the public in the management of data and information related to individuals in the public [49].

In many instances, the data and information from the public are required and it is the role of governmental organisations to manage these effectively for use of the government, the public and other institutions [50]. The use of MIS is required in these instances for the benefit of the management of extensive data and information as this ensures the optimisation of the collection of the data and information, and the effectiveness of the analysis of the data and information [44]. The results of the primary research support the views on the positive impact of factors on the performance of governmental organisations. Each of the factors evaluated – hardware and software, individuals and procedures, network within the organisation, error reduction – resulted in adequate acceptance that each factor would have an impact on the performance of governmental organisation. For the factor of hardware and software, the confirmation that this would have an impact on the performance of governmental organisations is consistent with the position of [26] in the role of hardware and software for MIS in governmental organisations. In considering the factor of individuals and procedures, [29] argued the role of individuals and procedures as benefitting governmental organisations. This aligns with the results in the primary research of the positive impact that the factor of individuals and procedures has on governmental organisation performance.

For the network within the organisation as it relates to MIS, the primary research supported the view of the positive benefit that this leads to for the performance of governmental organisations. This is similar to the confirmation made in [33] of how the network within organisations can influence the performance of governmental organisations with the evidence of the changes related to the implementation of e-government initiatives. Finally, for error reduction, the primary research indicated the importance of this factor in improving the performance of governmental organisations. This was similarly shown in [44] where error reduction created improvements in the performance of governmental organisation.

6.2 Mediators in Research Model

For the research model, there were two elements that were identified as significant as mediators in enhancing the impact of factors in improving the performance of governmental organisations. The mediators were quality of information and quality of service. These elements were significant in the results with the impact from these elements considered to be beneficial to the other factors. One of the possible mediators – quality of system – did not meet the significance levels and was thus not considered as a mediator for the factors impacting the performance of governmental organisations. The four factors included in the evaluation provided support for the role of MIS variables in positively influencing the performance of governmental organisations. The mediators that were identified were noted to add to the impact with these mediators effectively enhancing the positive impact of the factors in improving the performance of governmental organisations. For the quality of information, [38-39] presented how the quality of information could lead to optimising public access to government services thereby reflecting the improvement of performance of governmental organisations. Quality of service, as highlighted in [40-41] also leads to better services to the public by the government, which represents the improved performance of governmental organizations [42]. The exclusion of quality of system as a mediator was in contradiction to the findings from the literature review where [44] argued that quality of systems was important to the reliance and use of the MIS by governmental organisations which would have an impact on the performance of these governmental organisations.

7 Conclusion

The study looked at the effects that MIS could have on government organizations. The study also highlighted the characteristics that would lead to an improvement in governmental organization performance. For many of these governmental organisations, there are favourable implications on performance ranging from a more comprehensive set of data and information retrieved for government and public use to the increased access and ease of delivery of public services. Governmental organizations manage a large amount of data and information, and using MIS is a prerequisite for them to perform successful public services. Many of the benefits cited as a result of the implementation and use of MIS have not taken into account the cost-benefit trade-offs, with an effective decision based on the requirement for MIS capabilities While this is true, there is a need to understand the performance impacts of the leverage and use of MIS from both quantitative and qualitative perspectives in order to determine the appropriate level of MIS capabilities that governmental organizations require to effectively deliver services to the public. The use of identified mediators will increase the influence of the factors in improving governmental organization performance.

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