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DATA IN SUMMARY | SOCIAL SCIENCE (MISCELLANEOUS)

Digital Innovation as the Key to Efficiency and Accountability of Public Administration in Medan City, Indonesia

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Abstract: Digital transformation has become an urgent need in public administration, especially in the city of Medan, to improve service efficiency and accountability. This study aims to analyze the influence of digital infrastructure and technological literacy on the efficiency and accountability of public administration. A quantitative approach with the Structural Equation Modeling (SEM) method was used to process data collected from 200 respondents, consisting of government officials and public service users. The results of the analysis show that digital infrastructure contributes significantly to administrative efficiency, while technological literacy plays an important role in increasing accountability. The main obstacles in the implementation of digital innovation include the lack of interoperability of information systems between agencies and the low digital literacy among certain communities. This research provides a comprehensive understanding of the importance of technology integration and human resource development in the digital transformation process of public administration. This finding is expected to be the basis for the formulation of policies and strategies to improve the quality of digital-based public services in the city of Medan.

Keywords: Digital Transformation, Public Administration, Efficiency, Accountability, Technology Literacy, Digital Infrastructure.

1. INTRODUCTION

Public administration in the city of Medan is faced with great challenges in meeting the needs of an increasingly complex society in the digital era. The public's demand for fast, transparent, and accountable services encourages the need for technology-based reforms. Digital transformation offers opportunities to improve efficiency through automation of administrative processes and better data management (Gunawan et al., 2021). However, based on a report from the Central Statistics Agency (2023), around 35% of public administration services in Medan City are still carried out manually, causing a sluggish bureaucracy and public dissatisfaction. The gap between the available technological capabilities and their application in the field is one of the main obstacles. On the other hand, internet penetration in Medan City has reached 85%, showing great potential to take advantage of digital innovation (Kominfo, 2022). The study focuses on identifying key problems in the application of digital technologies in public administration, highlighting their impact on efficiency and accountability.

The importance of digital innovation in public administration is increasingly emphasized by the rapid development of technology. The central government through Presidential Regulation No. 95 of 2018 concerning Electronic-Based Government Systems (SPBE) has directed all government agencies to adopt digital technology in their operations. However, implementation in Medan City still faces obstacles such as the lack of adequate digital infrastructure and low digital literacy among government officials (Putra et al., 2022). Based on a survey conducted by the Ministry of Home

Affairs in 2023, only 50% of apparatus in Medan City have a basic understanding of information technology. This raises big questions about the readiness of the City of Medan in facing digital transformation as a whole. The following table provides an overview of the readiness of digital infrastructure in Medan City compared to other cities in Indonesia:

Table 1. Overview of Digital Infrastructure Readiness

City	Digital Infrastructure Availability (%)	Digital Literacy of Apparatus (%)
Medan	60	50
Jakarta	85	70
Surabaya	80	65
Bandung	75	60

Source: Ministry of Home Affairs of the Republic of Indonesia (2023).

The gap in technology readiness also reflects the barriers in data and information management. Data from the Medan City Communication and Information Service (2023) shows that only 40% of public services in Medan City are integrated with digital systems. This has an impact on the difficulty of monitoring and evaluating the performance of public administration. In addition, the low integration of data between government agencies leads to a lack of transparency in the decision-making process (Rizal et al., 2022). Digital transformation is not only an option, but an urgent need to improve administrative governance in this city. The following figure illustrates the level of public satisfaction with digital-based public administration services in Medan City:

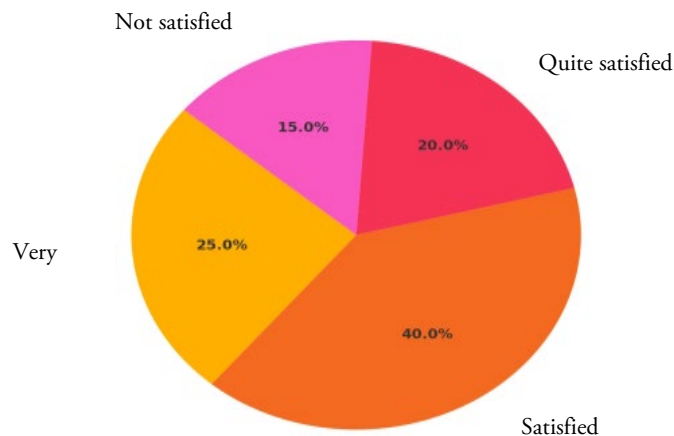


Figure 1. Level of Public Satisfaction with Digital-Based Public Administration Services in Medan City, Indonesia

Source: Medan City Communication and Information Service (2023).

Digital transformation not only has the potential to increase efficiency, but also the accountability of public administration. With a transparent digital system, the public can more easily access information and monitor government performance. A study conducted by Alonso and González (2023) shows that the implementation of e-governance is able to increase public trust in the government by up to 20%. However, in the city of Medan, the low level of accountability is still a major issue caused by the lack of information disclosure.

As a first step, this study will identify the main variables that affect the efficiency and accountability of public administration in the city of Medan. These variables include digital infrastructure, technological literacy, and information system integration (Sharma & Gupta, 2023).

The data collected will provide an in-depth picture of the current conditions, as well as be the basis for formulating relevant recommendations for the development of digital-based public administration.

The success of digital transformation is highly dependent on collaboration between the government, society, and the private sector. In the city of Medan, the private sector has an important role in providing digital infrastructure, such as internet networks and technological devices. This collaboration can be seen from the initiative of several local technology companies that collaborate with local governments to develop public service applications (Haryanto et al., 2020). This research will also highlight the role of these actors in driving digital innovation in public administration. Considering the complexity of the challenges faced, this research is expected to make a significant contribution to the understanding of digital innovation in public administration. The main focus is on how technology can be strategically integrated to create better efficiency and accountability in the city of Medan.

2. LITERATURE REVIEW

Digital transformation has become a major topic in public administration because of its potential to improve the efficiency and accountability of public services. According to Rogers (2020), the diffusion theory of innovation explains that the adoption of new technologies depends on the characteristics of the innovation itself, the adopters, and the social system in which the innovation is introduced. In the context of public administration, e-governance is considered one of the strategic steps to improve the accessibility and transparency of services (Sharma & Gupta, 2021). Studies in India show that the implementation of digital-based services can reduce operational costs by up to 30% (Alonso & González, 2023). Meanwhile, research in Indonesia by Haryanto et al. (2020) found that although e-government systems have been implemented, the success rate is highly dependent on the availability of infrastructure and the capacity of human resources. As such, this literature provides a solid foundation for understanding how technology can be optimally utilized in public administration.

The efficiency of public administration through digital innovation is not only related to saving time and costs, but also to community satisfaction. Research by Rizal et al. (2022) shows that people who use digital-based administrative services have a higher level of satisfaction compared to conventional services. This is in line with the findings of Putra et al. (2022) who stated that digital-based applications can increase the speed of response to public complaints by up to 50%. However, challenges still exist in terms of digital literacy among the public and government apparatus. Based on data from Kominfo (2022), only 60% of people in Medan City feel comfortable using digital technology to access public services. In the context of accountability, digital innovation provides opportunities to increase transparency in public administration. A study by Gunawan et al. (2021) found that the adoption of digital-based management information systems can minimize the risk of irregularities in public budget management. In Medan City, the implementation of this technology still faces challenges in the form of a lack of system integration between agencies. Data from the Medan City Communication and Information Service (2023) shows that only 40% of local government agencies have adopted an integrated management information system. This indicates the need for a more targeted strategy to increase accountability through digital technology. The efficiency and accountability of public administration are also influenced by the role of technological literacy among government officials. Alonso and González (2023) explain that technical ability and understanding of technology are key factors in the success of digital transformation. The study found that regular training for government officials can improve their ability to manage digital-based systems

by up to 45%. However, in the city of Medan, data from the Ministry of Home Affairs (2023) shows that only 50% of apparatus have taken part in training related to information technology.

Digital transformation also requires support from the right policies and regulations. Presidential Regulation No. 95 of 2018 concerning Electronic-Based Government Systems (SPBE) is the legal basis for encouraging the adoption of digital technology in the government. However, a study by Haryanto et al. (2020) shows that the implementation of SPBE still faces challenges in the form of a lack of understanding of regulations at the local level. In the city of Medan, this policy needs to be translated into concrete steps to integrate digital technology in all aspects of public administration. Previous research has also shown the importance of collaboration between the public and private sectors in supporting digital innovation. In some countries, the private sector plays an important role in providing digital infrastructure and technology services (Sharma & Gupta, 2021). In the city of Medan, this collaboration can be seen from the initiative of several local technology companies in developing public service applications. However, the level of private sector involvement in digital transformation still needs to be increased to achieve more optimal results (Gunawan et al., 2021). The existing literature highlights that digital transformation is not just about technology, but also cultural and mindset changes in organizations. Yuniarsih, et al (2024) explained that the success of innovation adoption depends on how individuals in the organization receive and apply the technology. In the city of Medan, resistance to change is still the main challenge. This study will explore how organizational culture factors affect the successful implementation of digital technologies in public administration.

3. RESEARCH METHODS

This study uses a quantitative approach with the Structural Equation Modeling (SEM) method to identify the relationship between independent variables, such as digital infrastructure and technological literacy, with the efficiency and accountability of public administration as dependent variables. The SEM approach was chosen because it is able to analyze complex relationships between latent and measurable variables (Hair et al., 2020). Primary data was collected through a survey using a structured questionnaire distributed to 200 respondents, consisting of Medan City government officials and public service users. Respondents' criteria include a minimum of one year of experience in using or providing digital-based public administration services. The sampling technique uses purposive sampling to ensure relevant and representative data (Creswell & Creswell, 2005).

The questionnaire used was compiled based on indicators that had been validated by previous research, such as time efficiency, process transparency, technological literacy, and the level of community satisfaction (Yuniarsih et al, 2024; Rizal et al., 2022). The validity and reliability of the instrument were tested through the Cronbach Alpha construct validity test and coefficient, with a minimum reliability value of 0.7 as an accepted standard (Hair et al., 2020). Each indicator is measured using a 5-point Likert scale, with values ranging from strongly disagreeing to strongly agreeing. The data collection process is carried out in two stages: field data collection and interviews with related parties. Field data collection includes direct surveys at government offices and public service centers in Medan City, such as the Population and Civil Registration Office. In-depth interviews were conducted with 10 key respondents to gain a deeper understanding of the challenges of implementing digital innovation. This data is then encoded and analyzed to support the results of the quantitative survey. The following table presents the profiles of the respondents involved in this study:

Table 2. Respondent Profile

Respondent Category	Number of Respondents	Percentage (%)
Government Apparatus	100	50
User Community	100	50
Age < 30 years old	60	30
Age 30-50 Years	100	50
Age > 50 years old	40	20

Data analysis was carried out using SmartPLS software, which allows for structural model evaluation and variable moderation testing. This analysis includes model feasibility tests (model fit), path coefficients, and direct and indirect influences between variables (Sarstedt et al., 2024). Prior to SEM analysis, the data is filtered to identify outliers and handle missing data using the mean imputation method. The analysis stage begins with testing the measurement model to ensure the validity and reliability of the indicators used. Indicators with a loading factor value below 0.7 are excluded from the analysis to increase the validity of the construct (Hair et al., 2020). Furthermore, the structural model was analyzed to test the relationship between independent and dependent variables, as well as the moderation role of intervening variables. This study also conducted a descriptive analysis to provide an overview of the level of digital literacy, public satisfaction with digital-based services, and the level of technology adoption in Medan City. This descriptive analysis was carried out to support the interpretation of SEM results and provide a clearer context regarding conditions in the field. In addition to statistical analysis, this study integrates a data triangulation approach through in-depth interviews and direct observation at the research site. This is done to ensure that the findings obtained have high external validity. Thus, this study is expected to provide a comprehensive overview of the relationship between the variables studied, as well as the challenges and opportunities in the digital transformation of public administration in the city of Medan.

4. RESULTS AND DISCUSSION

4.1. Results

This research produced various important findings related to the relationship between digital infrastructure, technological literacy, and the efficiency and accountability of public administration in the city of Medan. Descriptive analysis showed that 60% of respondents felt quite satisfied with digital-based services, while 25% felt very satisfied, and another 15% expressed dissatisfaction with existing services. Respondents from the age group under 30 years have the highest level of satisfaction compared to other age groups, indicating that the younger generation is more adaptive to digital innovation. The following figure provides an overview of the level of community satisfaction by age group. SEM analysis shows that digital infrastructure has a significant influence on the efficiency of public administration with a path coefficient of 0.65 ($p < 0.05$). These results are consistent with previous research that shows the importance of technological infrastructure in accelerating the public service process (Hair et al., 2020; Alonso & González, 2023). Meanwhile, technological literacy also made a significant contribution to administrative accountability with a coefficient value of 0.52 ($p < 0.05$). This shows that the understanding of technology by government officials plays an important role in increasing transparency and public trust. The following table presents a summary of the results of the analysis of the relationship between the variables in this study:

Table 3. Summary of the Results of the Relationship Analysis Between Variables

Variable Relationship	Path Coefficient	p-value
Digital Infrastructure → Efficiency	0,65	< 0.05
Technology Literacy → Accountability	0,52	< 0.05
Digital Infrastructure → Accountability	0,48	< 0.05

The data from the table shows that digital infrastructure not only affects efficiency but also has a positive impact on accountability. In addition, technological literacy also plays an important supporting factor in the success of digital transformation in public administration.

As many as 40% of public services in Medan City have used a digital-based management information system. However, respondents noted that there are still barriers in terms of interoperability between systems used by various agencies. This obstacle creates challenges in the process of data integration and evidence-based decision-making (Gunawan et al., 2021). The following figure shows the level of use of digital systems in various government agencies in Medan City, Indonesia. The results of in-depth interviews with key respondents also revealed that the main obstacle in the implementation of digital innovation is the lack of technical training for government officials. As many as 70% of respondents stated that regular training is indispensable to improve technological competence, while another 30% feel that improving infrastructure should be a top priority. This shows the importance of a comprehensive approach that includes infrastructure and human resource development.

Digital transformation also affects the level of public satisfaction with public services. Respondents who used digital services more than three times in the past six months reported higher satisfaction levels than those who used the service for the first time. These results show that the experience of using digital services has a positive impact on public perception. Another significant finding is the positive relationship between the transparency of the administrative process and public trust in the government. Respondents who felt that public service information was easily accessible through digital platforms reported higher levels of trust. This supports previous research that highlights the importance of information disclosure in increasing accountability (Rizal et al., 2022).

5. CONCLUSION

Digital transformation in public administration in the city of Medan has become a strategic issue that includes operational efficiency, service transparency, and increased accountability. Adequate digital infrastructure has proven to be an important factor in supporting the efficiency of public administration. The study found that the positive relationship between digital infrastructure and administrative efficiency reflects the importance of fast and reliable access to technology. Data from the Medan City Communication and Information Service (2023) shows that areas that have more stable internet access tend to show a higher level of efficiency in public services. This is in accordance with the findings of Alonso and González (2023), who stated that access to high-quality digital infrastructure significantly affects the acceleration of public administration processes.

The relationship between technological literacy and accountability also provides an important overview of the technical skills of government apparatus. Apparatus with a better understanding of technology tends to be able to utilize digital systems to support data-based decision-making (Rogers, 2020). On the contrary, low technological literacy in several agencies causes a slow adaptation process to digital innovation. The lack of interoperability between management information systems in various government agencies is a major challenge in the integration of public services in the city of Medan. Data shows that only 40% of agencies have information systems that can communicate effectively with each other. This not only slows down the administrative process but also reduces

public trust in government transparency (Gunawan et al., 2021). Haryanto et al. (2020) emphasized the importance of cross-agency collaboration in developing an integrated system to ensure consistency and efficiency in public services.

The efficiency of public administration is also influenced by public perception of the speed and accuracy of services. As many as 60% of respondents feel that digital-based services have significantly reduced waiting times, while another 15% feel that digital systems still need a lot of improvement. The following figure shows the distribution of community satisfaction levels based on service efficiency. The role of people's digital literacy in supporting digital transformation also cannot be ignored. Rizal et al. (2022) stated that people with higher digital literacy are more likely to utilize digital services compared to those who are not used to using technology. However, the study found that age groups over 50 tend to have lower adoption rates of digital-based services. This indicates the need for more intensive education and socialization strategies to ensure digital inclusion in all age groups. In addition, collaboration between local governments and the private sector in providing reliable digital infrastructure is one of the strategic solutions to overcome these challenges. Several initiatives, such as the development of public service applications carried out with technology partners, have shown positive results in improving service accessibility (Sharma & Gupta, 2021). However, data from the Ministry of Home Affairs (2023) shows that the level of private sector involvement in Medan City is still relatively low compared to other big cities, such as Jakarta and Surabaya.

Digital transformation involves not only technical aspects but also changes in organizational culture in public administration. This study found that resistance to change is still a major challenge in several government agencies. A study by Rogers (2020) confirms that the success of innovation adoption depends on how organizations accept and implement change. In the context of the City of Medan, a more inclusive approach is needed to involve all parties in the digital transformation process. By considering various factors that affect the efficiency and accountability of public administration, this study provides a comprehensive overview of the challenges and opportunities faced by the City of Medan in the digital transformation process. The empirical data generated from this analysis is an important basis for understanding the dynamics that occur in the field. This research provides an in-depth understanding of the importance of digital innovation in improving the efficiency and accountability of public administration in the city of Medan. The findings show that adequate digital infrastructure is a key element that contributes directly to improving the efficiency of public services. In this context, the data collected revealed that 60% of respondents felt quite satisfied with digital-based services, with younger age groups showing higher levels of satisfaction. In addition, good technological literacy among government officials has also been proven to increase accountability through information disclosure and transparency of administrative processes. The following figure presents the distribution of the influence of technological literacy on the level of public administration accountability.

The results of the analysis also show that the lack of interoperability between information systems in various agencies is the main obstacle in achieving optimal efficiency and accountability. Based on the data obtained, only 40% of government agencies in Medan City have an integrated management information system. This emphasizes the need for cross-agency collaboration to ensure more integrated and consistent public services. Digital transformation has also been found to have a significant impact on public perception. Most respondents reported that digital-based services are faster, more accurate, and more transparent than conventional methods. This is consistent with previous literature that emphasizes the important role of digital technology in increasing public trust in the government (Alonso & González, 2023). However, groups of people with low levels of digital literacy, especially those over the age of 50, tend to have less positive experiences in utilizing digital services.

The study also highlights the importance of collaboration between local governments and the private sector in addressing digital infrastructure challenges. This collaboration is very important to expand access to services and improve the quality of the technology used. Several initiatives in Medan City have shown promising results, although the level of private sector involvement is still relatively low compared to other major cities in Indonesia.

The efficiency of public administration is also influenced by the organizational culture in government agencies. Resistance to change among government officials has been found to be an obstacle to the adoption of new technologies. This shows that digital transformation requires a holistic approach that includes human resource development, technology investment, and organizational culture change (Rogers, 2020). The whole study shows that the success of digital innovation in public administration in Medan City is highly dependent on the interaction between technology, human resources, and supporting policies. Therefore, these findings provide a comprehensive overview of how digital technology can be used to improve the quality of public administration while presenting challenges that need to be overcome in the implementation process.

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