DIGITAL TRANSFORMATION IN IMMIGRATION SERVICES THROUGH BIOMETRIC DATA STORAGE AND PERSONAL GOVERNANCE

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ABSTRACT

The rapid advancement of digital technology in the 21st century has ushered the world into the disruption era, a phase in which fundamental transformations across various aspects of life are inevitable. One sector that has undergone a significant transformation is immigration services, particularly through the adoption of biometric systems. Biometric technologies, including fingerprint, facial, and iris recognition, have proven effective in enhancing identification efficiency and strengthening border security. Nevertheless, the implementation of such technologies simultaneously raises critical issues regarding personal data protection and individual privacy, as biometric data are inherently unique, sensitive, and highly vulnerable to misuse if not properly safeguarded. This study seeks to examine the implications of biometric implementation in the context of Indonesian immigration, with an emphasis on its administrative benefits, potential security risks, and the relevance of legal frameworks, particularly Law No. 27 of 2022 on Personal Data Protection. Through an analytical approach, this research is expected to provide a conceptual contribution to the strengthening of digital-based immigration governance aligned with the principles of e-government, human rights protection, and public accountability in the disruption era.
Keywords: ***Biometrics, Immigration, Digital Transformation, Personal Data Protection,***

INTRODUCTION

Today, all aspects of life are dominated by technological acceleration. Rapid progress and technological developments in the early 21st century have also brought about the phenomenon of the era of disruption. Disruption is not just a minor change, but also a change that can alter fundamental structures. One of these fundamental changes is the development or evolution of technology that aims to find gaps in human life. This situation facilitates digitization resulting from technological developments (especially information). In an effort to face the challenges of evolving security and increasingly complex global migration flows, immigration control has become a major foundation in maintaining the stability and security of countries around the world. In the modern era, which is filled with rapid technological advances, the role of technology in immigration control has undergone a significant evolution. (Pramana et al., 2022)

By utilizing automation systems, biometric scanning, and advanced data analysis, the immigration inspection process has seen a significant increase in efficiency (Hendrawan, Siregar, and Shatrya, 2022). Improvements in faster and more accurate screening have enhanced countries' ability to identify potential threats and facilitate international travel. However, in achieving this efficiency, it is important to consider the aspect of individual privacy (Deshinta, 2017). The use of this technology raises serious questions about how personal data is used, stored, and secured. The sustainability and long-term impact of technological surveillance on individual privacy need to be a major concern in this era of disruption. (Hutagalung, 2023)

The use of biometric technology, which includes fingerprint recognition, facial scanning, and iris recognition, has changed the perspective on immigration. In various countries, biometric systems have been implemented to verify the identity of border crossers, speed up immigration processes, and enhance national security. However, along with its benefits, this technology also raises various questions and debates related to privacy, data security, and ethics. (Sumijan et al., 2021)

The significance of technology in this case is the importance of biometric technology in changing and improving the efficiency and security of immigration processes. This technology provides great benefits in speeding up the identification and inspection process, helping to manage crossings more effectively, and improving the ability to detect potential security threats. However, there are challenges or weaknesses that may arise with the use of this biometric technology. The era of technological disruption brings rapid and complex changes to the technological landscape, often creating new gaps or weaknesses that can be exploited by irresponsible parties. Therefore, it is important to identify potential gaps in the use of biometric technology in this era of disruption and take steps to address or mitigate the associated risks. This could lead to misuse or leakage of data belonging to immigration service users. This journal focuses on examining the significance of biometric technology in immigration, while also researching its gaps and potential risks. By understanding the implications of biometric technology in the context of immigration, it is hoped that this research can make a valuable contribution both in the field of immigration and in the broader development of biometric technology.

RESEARCH METHOD

This study uses a qualitative descriptive method that aims to provide a systematic and factual description of digital transformation in immigration services through biometric data storage. The focus of the study is on how biometric technology is integrated into immigration administration services, the benefits it brings, and the challenges that arise, especially regarding data security and privacy protection. The research data was obtained through a literature study by reviewing books, scientific articles, official reports, and online sources relevant to the research theme. This approach was chosen because it is able to highlight the phenomenon in depth without having to conduct quantitative measurements, so that the analysis emphasizes context understanding, interpretation, and critical description. Furthermore, the data obtained was analyzed descriptively by compiling, grouping, and interpreting information based on the main themes, namely service efficiency,

the risk of biometric data leaks, and the implications of digital transformation on immigration practices. In this way, the study is expected to provide a comprehensive understanding of the implications of biometrics in the framework *of e-government* immigration in an era of disruption.

RESULTS AND DISCUSSION

3.1 Immigration from an Administrative Perspective

Immigration is one of the strategic functions of the state in managing the flow of cross-border human mobility. Law No. 6 of 2011 on Immigration stipulates that immigration is everything related to the movement of people entering or leaving Indonesian territory and its supervision in order to maintain the sovereignty of the state. The functions of immigration include public services, law enforcement, safeguarding national security, and facilitating community welfare development. Thus, immigration is not merely an administrative instrument, but also a vital element in governance and national sovereignty. (Oriwardana & Utami, 2011)

The development of digital technology in the 21st century demands significant reforms in immigration administration. The modernization of public services can no longer be separated from the use of *e-government*, which emphasizes the principles of efficiency, transparency, accountability, and integration based on information technology.(Budiyanto & Taufik, 2025) The Directorate General of Immigration then responded to this dynamic by designing the Immigration Management Information System (SIMKIM), which became the main foundation for the digital transformation of immigration services. SIMKIM is designed to support various aspects of immigration administration, ranging from passport services, monitoring the movement of foreigners, to managing immigration databases both domestically and abroad. SIMKIM reflects a paradigm shift from traditional bureaucracy to digital bureaucracy. This transformation enables service processes to be carried out more quickly, transparently, and with a focus on public satisfaction. The digitization of immigration administration also supports data-driven decision-making, which is essential in facing global challenges such as increased international migration, human trafficking, and transnational terrorism. (Daffa Raihan Arya Mas'adi, 2024)

However, digital transformation in immigration cannot be separated from the issue of personal data protection. The enactment of Law Number 27 of 2022 concerning Personal Data Protection (PDP Law) emphasizes that biometric data, which is categorized as specific personal data, must be protected with high security standards. This means that the implementation of SIMKIM and biometric technology in immigration must be in line with this regulatory framework so that it is not only efficient but also guarantees the protection of citizens' fundamental rights. Thus, the administrative framework of immigration in the digital era requires a balance between two aspects: bureaucratic efficiency through digitalization and the protection of individual rights through regulation. Without this balance, digital transformation could actually create new risks in the form of data leaks, abuse of authority, or erosion of public trust in immigration institutions.

3.2 Implementation of Biometric Data Storage in Immigration Services

Biometrics is a technology that uses an individual's physical or behavioral characteristics to identify and verify their identity. This technology has been widely used in various industries and fields, such as security, banking, and

healthcare. There are several types of biometrics, including fingerprints, iris, face, voice, and signature. Each type of biometrics has its own advantages and disadvantages, as well as different technical requirements. The use of biometrics has many benefits, such as improving security, reducing fraud, speeding up the identification process, and increasing efficiency. However, the use of biometrics also has risks and challenges that need to be considered, such as data privacy and security, dependence on technology, and technology availability. (Appsensi, 2019)

Automation systems, biometric scanning, and advanced data analysis have implications for immigration screening processes, which have seen tremendous improvements in efficiency. (Hendrawan & Lidya Marsaulina Siregar Maulana Shatrya, 2022) Faster and more accurate screening improves countries' ability to identify potential threats and facilitates smoother international travel. Based on standards issued by the ICAO, the recommended biometric data to be used is facial biometrics and fingerprint biometrics as a backup. However, to date, the international community has not been able to agree on the standards issued by the ICAO due to various reasons.

The implications of biometrics in immigration include significant impacts in various aspects, including security, efficiency, privacy, and speed of service. The use of biometric technology, such as fingerprints, retina scans, or facial recognition, has changed the way immigration processes are carried out in various countries. First, biometrics plays a major role in enhancing security at the country's entry points. With highly accurate and difficult-to-forge identification methods, biometrics helps prevent identity fraud and the use of false travel documents. This not only protects national security but also reduces the risk of threats to society. In addition, biometric technology improves efficiency in the immigration process by speeding up identity verification and reducing waiting times at immigration checkpoints at airports or seaports. This provides significant benefits for immigration officers and passengers, by reducing queues and increasing productivity. (Miller et al., 2020)

The application of biometric technology in the context of immigration also opens the door to the possibility of collaboration between countries in strengthening security and international cooperation. With widely adopted biometric standards, such as those implemented by organizations like the ICAO (International Civil Aviation Organization), countries can share biometric data for more effective identification and verification purposes. This can improve the exchange of information between countries in tackling transnational crime or individuals attempting to cross national borders illegally.

However, despite its benefits, the use of biometrics also raises concerns regarding privacy and data security. Sensitive biometric data can be targeted for misuse or identity theft if not properly regulated. In addition, there is a risk that the biometric information collected could be used for unlawful purposes or to create profiles that are detrimental to individuals. Therefore, it is important for governments and service providers to take the necessary steps to protect privacy and data security in the use of biometrics in the context of immigration. In addition, the community must also be taken into consideration in the implementation of biometric technology. Therefore, it is important to ensure that biometric systems are well designed and implemented, taking into account the needs and preferences of the community. The use of biometrics in immigration

has a significant impact in terms of security, efficiency, and user experience. However, challenges related to privacy, data security, and user experience also need to be carefully addressed. By taking the right steps, governments and service providers can optimize the potential of biometric technology while ensuring the protection of the rights and interests of the individuals involved.

In addition, the use of biometrics in immigration also has social and political implications that need to be considered. In some countries, the use of biometrics can raise concerns about excessive government surveillance or violations of individual privacy rights. Resistance to the use of biometrics in some communities may also arise due to concerns about potential data misuse or distrust of existing systems. Therefore, it is important for the government and relevant agencies to communicate effectively and transparently with the public regarding the purpose, benefits, and use of biometric data in the immigration process. This can help build public trust and support for the use of this technology and strengthen the legitimacy of the immigration policies implemented. (Hendrawan & Lidya Marsaulina Siregar Maulana Shatrya, 2022)

In addition, it is important to recognize that the use of biometrics in immigration is not entirely flawless. Although biometric technology has a high degree of accuracy, there is still the possibility of errors or failures in the identification process. For example, uncontrolled environments, such as poor lighting or significant physical changes in individuals, can affect the quality of biometric scanning. Furthermore, security risks also remain, including the possibility of cyber attacks aimed at stealing or manipulating biometric data stored in the system. Therefore, it is important to continue developing biometric technology by taking these potential loopholes into account and improving security measures to protect the data collected (Putra & Wiraputra, 2020).

In the context of globalization, collaboration between countries in regulating and managing the use of biometrics in immigration is also important. Standardizing procedures and protecting biometric data can help facilitate the safe and efficient exchange of information between countries. In addition, the exchange of biometric information between countries can also be an effective tool in dealing with cross-border crimes, such as human trafficking, terrorism, and other transnational crimes. (Santoso, 2004)

In facing challenges and utilizing the potential of biometric technology in immigration, collaboration between the government, the private sector, academics, and civil society is also key. Through cross-sector cooperation, various perspectives and expertise can be combined to identify innovative and integrated solutions. In addition, civil society participation in policy development and monitoring of its implementation can also help ensure that the use of biometrics in immigration is ethical and respects human rights. (Mayang et al., 2021)

Thus, the implications of biometrics in immigration are a complex and multidimensional subject involving various aspects, including security, privacy, efficiency, social, and political issues. It is important for stakeholders to thoroughly understand the impact and implications of using this biometric technology and to commit to addressing the challenges that arise as it develops. Only with a holistic and sustainable approach can the use of biometrics in immigration provide maximum benefits while ensuring the protection of the rights and interests of the individuals involved. (Santoso, 2012)

3.3 Challenges, Risks, and Implications of Personal Data Protection

On the technical side, even though biometrics has a high level of accuracy, the system isn't totally error-free. Environmental factors like bad lighting or physical changes in individuals can affect the quality of verification. Plus, the risk of cyber attacks targeting biometric databases is also a real threat. Biometric data leaks are way more dangerous than conventional data leaks because they're permanent and can't be changed.

From a socio-political perspective, the use of biometrics has the potential to cause public resistance. Concerns about excessive surveillance by the government and the potential misuse of data can undermine public trust in the immigration system. This social rejection can weaken the legitimacy of government policies, making transparent and participatory public communication essential.

From a legal perspective, the protection of biometric data must refer to a clear regulatory framework. Law No. 27 of 2022 concerning Personal Data Protection stipulates that biometrics are included in the category of specific personal data that must be protected based on the principles *of lawfulness, fairness, purpose limitation, data minimization, accuracy, storage limitation, integrity, confidentiality,* and *accountability for* . This means that every collection, storage, and processing of biometric data must meet strict and accountable security standards.

This challenge confirms that the application of biometrics in immigration is a double-edged sword. On the one hand, this technology brings efficiency and increased security. On the other hand, without good governance, biometrics can become a loophole that jeopardizes individual privacy and poses a serious risk to national security. Therefore, a holistic approach is needed in managing the implementation of biometrics. This approach includes:

3.3.1 Strengthening regulations through synchronization between the Immigration Law and the PDP Law.

3.3.2 Improving digital security, including the use of multi-layered encryption and regular security audits.

3.3.3 Global standardization through cooperation between countries, particularly within the framework of the ICAO and other international organizations.

3.3.4 Cross-sector collaboration between the government, private sector, academia, and civil society in formulating policies.

3.3.5 Public transparency by providing education on the objectives, benefits, and mechanisms of biometric data protection, thereby increasing public trust.

The successful use of biometrics in immigration depends heavily on the extent to which the government is able to balance technological innovation and the protection of privacy rights. Without this balance, digital transformation could actually create a paradox, namely administrative efficiency that leads to security vulnerabilities and public distrust.

CONCLUSION

Digital transformation in immigration services through the use of biometric technology is a necessity in this era of disruption. The digitization of public administration implemented through the Immigration Management Information System (SIMKIM), the use of e-passports, and biometric scanning have been proven to increase service efficiency, speed up the identification process, and strengthen border control. This is in line with the principles of e-government, which emphasize transparency, effectiveness, and accountability in bureaucracy.

However, the application of biometrics is not without serious challenges, especially regarding the protection of personal data. Biometric data is sensitive, unique, and irreversible, so its leakage or misuse has the potential to cause social and economic losses and even threaten human rights. Cyber security risks, the potential for profiling, and public resistance are factors that must be systematically anticipated.

Therefore, the implementation of biometrics in immigration requires a comprehensive governance framework. Regulatory synchronization between Law No. 6 of 2011 on Immigration and Law No. 27 of 2022 on Personal Data Protection must be strengthened, accompanied by the application of strict digital security standards, periodic audits, and transparency mechanisms to build public trust. With a holistic approach, combining administrative, technological, legal, and socio-political aspects, biometrics can become an important pillar in realizing modern, efficient, secure, and equitable immigration services. Digital transformation in the field of immigration is not only aimed at improving bureaucratic performance, but must also guarantee the protection of citizens' privacy rights as a tangible implementation of the principles of good governance and a commitment to personal data protection in the era of digital disruption.

ACKNOWLEDGEMENTS

The author would like to thank the supervising lecturer, family, and all parties who have provided support, guidance, and input in the process of writing this article. Hopefully, this paper will be useful for the development of scientific studies and immigration service practices in Indonesia.

REFERENCES

Budiyanto, & Taufik, A. (2025). Digitalization-Based Public Service Reform. *Jurnal Dwija Kusuma*,*13* (1), 11–18. https://doi.org/10.63824/jdk.v13i1.297

Daffa Raihan Arya Mas'adi. (2024). Digitalization of Migration Administration: Implementation of Technology in Immigration and Population Management. *Journal of Administrative and Social Science*,*6* (1), 24–33. https://doi.org/10.55606/jass.v6i1.1832

Hutagalung, G. A. M. (2023). The Impact of the Latest Technology in Immigration Control: Between Efficiency and Privacy. *Innovative: Journal Of Social Science Research*,*3*(4), 8370– 8380. http://j-innovative.org/index.php/Innovative/article/view/4351

Kharisma, B. (2014). Good Governance as a Concept and Why it is Important in the Public and Private Sectors (An Institutional Economic Approach). *Journal of Economic Studies Bulletin*, *19*(1), 9–30.

Oriwardana, N., & Utami, D. (2011). Immigration Provisions Against the Traffic of People Entering /. *Journal of Law and Border Protection*, *2*(1), 79–86.

Pramana, G. M. A., Nurkumalawati, I., & Arifin, R. (2022). Evaluation of Electronic Immigration Stamps, Biometric Data, and Autogate Machines in the Concept of Geopolitics. *Scientific Journal of Legal Policy*, *16*(3), 457–478.

Riwanto, A., & Suryaningsih, S. (2024). Local Government Corruption Prevention Strategies to Achieve Good Local Governance. *Legal Reflection: Journal of Legal Science,9* (1

Sumijan, M. S., Purnama, P. A. W. S. K. M. K., & Arlis, S. S. K. M. K. (2021). Biometric Technology Implementation in the Medical Field Using Matlabs. In *Biometric Technology*.

Suwanda, I. G. M., & Tjenreng, M. B. Z. (2025). Implementation of Good Governance Principles in Improving Public Service Quality: A Case Study of Local Government. *Journal of PKM Business Management*,*5* (1), 271–282. https://doi.org/10.37481/pkmb.v5i1.1298