HUMAN-TECHNOLOGY INTERACTION: AN AUTOMATED BORDER CONTROL SYSTEM IN INDONESIA

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ABSTRACT

As automated border control systems become increasingly prevalent worldwide, their implementation in Indonesia presents challenges and opportunities at the intersection of technology and society. This literature review examines the social and technological dimensions of interactions with automated border control systems in Indonesia, focusing on the evolving dynamics between citizens, technology, and government. The review highlights how automated systems, while enhancing efficiency, also transform traditional notions of border crossing inspections. This study explores four key aspects, human-technology interaction with their positive and negative impact, biometrics technology on immigration checkpoints, social interaction impact on automated border control system, and the shift in government-society relationships in the context of technology-based services. By synthesizing existing literature and case studies, this review aims to provide insights into the socio-technical landscape of border control automation in Indonesia. Currently, there are not many studies that focus on discussing the impact of the loss of social interaction in the implementation of information technology in public services, especially in automated border control. It is essential to carefully consider the disadvantages and explore ways to address them before fully embracing the automated immigration clearance system. These findings might have significant implications for policymakers, technology developers, and social scientists, offering an understanding of how automated systems reshape social interactions and institutional relationships in the critical domain of border security and management.

KEYWORDS	*Automation technology, human-technology interaction, immigration clearance, social interaction*

INTRODUCTION

Today, in an increasingly interconnected world, the ease of travel across national borders has become a driving factor of human mobility at the global level (Westcott & Anderson, 2021). Advances in information and transportation technology, economic and banking connectivity, and immigration policy reforms have made international travel more accessible and convenient than ever before (Kartsan et al., 2024; Mouratidis et al., 2021). Over the past few decades, significant developments in transportation infrastructure, such as the construction of international airports, the development of high-speed rail networks between countries, and the emergence of low-cost airlines, have revolutionized the way people travel (Dobruszkes, 2013; Li & Ma, 2022). These developments not only reduce time and cost but also expand the range of travel, allowing millions of people to travel to explore new tourist and cultural destinations. In addition, the digital revolution has proven to have an important role in simplifying the travel planning and booking process, providing quick access to information and services for travelers (Tandafatu et al., 2024). On the other hand, the modernization of services and facilities for tourists is one of the pull factors in traveling between countries. This of course makes services in the travel industry and its supporting sectors, must be able to adapt to this rapid progress, one of which is in the state border management sector.

In an effort to deal with problems and challenges that may occur in the future, one of the solutions that needs to be done is to increase the utilization of technology, especially information technology in the state border area to monitor the traffic of people. Various studies have been conducted discussing innovations and knowledge related to the development of border management technology, including research on the theme of Automated Border Control (ABC) (Labati et al., 2017; Oostveen et al., 2014; Ortega et al., 2020), studies on the use of biometric data in human recognition or identification systems (Ashbourn, 2015; Farrell, 2016; Khan & Efthymiou, 2021; van der Ploeg & Sprenkels, 2011), studies on electronic border crossing processes (e-border/i-gates/auto gate) (Bigo, 2022; Denita et al., 2020; Morosan, 2016; Oostveen et al., 2014; Purba & Wiradinata, 2022), and several other studies on other border management systems and technologies.

Basically, the function of supervision in border areas, especially the immigration checking process in border management, is a filter door that must provide maximum performance in filtering people who enter and leave the nation's territory for the embodiment of sovereignty and play a role in monitoring foreigners to maintain national security. For example, immigration inspection and supervision at the border crossing at international airports as the entrance to the country's territory is a continuous effort that must be carried out consistently as a form of public service without reducing the elements of comfort, speed, and security, so that people's traffic can run smoothly. (Azali, 2023). In carrying out this function, the use of tools and technology is important in order to avoid negligence, provide early warning in recognizing potential hazards, and overcome forms of fraud that might be committed. (Putra & Arifin, 2020), such as document fraud and forgery, impostor, person of interest surveillance, and other form of fraud (Azali, 2023).

With the increasing public demand for efficient immigration inspection services at international borders, an automated immigration inspection solution is the most reasonable choice. The development of border management technology has also become a focal point in various studies, especially related to automated border control (Gkioka et al., 2022; Zhou et al., 2022). One of the examples of automated border control systems in Indonesia is the implementation of immigration automated machines at Soekarno-Hatta International Airport in Jakarta and I Gusti Ngurah Rai International Airport in Bali (Azali, 2023; Pramana et al., 2022; Putra & Arifin, 2020). Autogate machine is a digital innovation for immigration clearance through automation that aims to improve the efficiency, quality, and security of the immigration process in border areas to meet the demands of public services due to increased international air travel (Azali, 2023; Pramana et al., 2022; Putra & Arifin, 2020). With the adoption of this technology, travelers can quickly and independently check travel documents between countries which can reduce long queues and speed up waiting times (Astuti & Wilonotomo, 2020; Denita et al., 2020; Labati et al., 2015, 2017).

This progress is supported by the integration of biometric technology that aims to automate the tasks that were originally performed by the officers, the automation process was conducted by identifying data provided by users and verifying them by comparing them with all biometrics data registered in the database. (Unar et al., 2014). The use of biometric data has become an important point in improving security in surveillance systems in border areas with various identity verification techniques, such as face recognition, fingerprint scanning, and several other verification methods. (Hassan et al., 2023; Omolewa et al., 2023; Thenuwara et al., 2022; Unar et al., 2014). This utilization of biometric data not only ensures more reliable identification of individuals but also helps to reduce illegal crossing rates by enhancing security at national borders (Hassan et al., 2023.

Research conducted by Thenuwara et al. (2022) Showed that combining different biometric modalities, such as face and ear biometric data, can significantly improve the recognition rate of around 97.1% accuracy. By implementing this biometric-based border surveillance system, countries can effectively manage and monitor the traffic of people in border areas, reducing the security threats posed by the presence of illegal immigrants, preventing the entry of people or subjects of interest, and improving national security measures thoroughly.

However, in the midst of the progress towards the utilization of biometrics technology, the role of humans as social beings cannot be eliminated. Although the use of technology has several advantages in public service in terms of efficiency, it also reduces the social interaction of the community as a user with the officers or government employees as public service providers. The loss of these social interactions due to the public service model that has switched to technology-based minimizes manual processes that require human presence, the public service process has developed by using computer devices and gadgets in the process of interaction between providers and users of the public services, this then raises concerns about the fading of human nature as a social being.

Mustar et al. (2020) Argue that humans as social creatures (zoon political) cannot live alone without the help of others, in line with this, several other opinions also reveal that in their lives, humans tend to seek groups/communities and need communication or

interaction with other humans. (Mühl, 2018; Rahmanda & Rahman, 2022; Santoso, 2017). Furthermore, Mühl (2018) Revealed that interactions between individuals and their social environment play an important role in shaping human behavior and attitudes. Erkan & Arehjan (2022) Also argued that human behavior is strongly influenced by the environment, emphasizing that it is rooted in experience, culture, and the dynamics of behavior regulation in the human social environment. Zlokazov (2022) Also explained that a person's ability to accept socially appropriate life values, willingness to build constructive relationships with others, and show concern for others in their activities will enable a person to find the meaning of life in society and can prevent them from egocentricity and criminal behavior.

Social interaction plays an important role in society because it is the main foundation for the purpose of human life to coexist harmoniously. (Dhiman, 2023). Okumdi (2022) Argues that social interaction and social relations are very important and have become an indispensable part of society, and this is why stigmatization and ostracism are very effective tools of social control and regulation. Furthermore, Okumdi (2022) Also revealed that social interactions and social relationships will form sociological orientations that evolve over time facilitated by technological advances and globalization. Understanding the importance of maintaining good social relationships involves various aspects such as the quality of social interactions, respect, and fostering a sense of security in others (Goltsova, 2022). In addition, exploring the relationship between people and social problems underscores the importance of psychosocial interventions to address issues of exclusion and change society for the better (Catão, 2011).

While automated border control systems offer efficiency and security benefits, this article argues that their implementation in Indonesia requires careful consideration of potential social consequences, particularly the impact on interpersonal interactions and the evolving relationship between travelers, citizens, and government. Therefore, it is important to understand the impact of the use of automated machines on the loss of social interaction between immigration officers and the public as service users. This study aims to explore the impact of automated immigration clearance through automated machines, identify the various potential impacts of reduced social interaction between individuals during these automated processes, and investigate changes in the interaction patterns between the state and society resulting from the adoption of technology-based public services.

There are 4 main issues discussed in this article, (1) Human-technology interaction and its positive and negative impact, this aspect focuses on how individuals interact with automated border control systems, including the potential benefits and drawbacks, (2) Biometrics technology on automated immigration clearance, this aspect examines the use of biometric technologies, such as facial recognition and fingerprint scanning, in verifying identities and enhancing security at border crossings, (3) Impact of the absence of social interaction on automated border control system, this aspect considers how the implementation of automated systems, like autogates, affects social interactions between travelers and immigration officers, particularly the potential loss of interpersonal communication and its implications, (4) The shift in government-society relationships in the context of technology-based services, this aspect explores how the adoption of technology-based services at borders influences the relationship between citizens and the

government, including issues of trust, accountability, and the changing dynamics of public service delivery. It is hoped that this study can contribute to science-technology-society (STS) studies especially in a comprehensive understanding of the social impact in the public service sector based on automated technology.

RESEARCH METHOD

This research was conducted using the literature review method, which involves surveying or studying scientific articles, books, and other sources relevant to a particular issue, theory, or field of research to provide a description, summary, and critique of these works. (Ramdhani et al., 2014). The literature review has several purposes, one of which is to share the results of other studies that are closely related to the research being conducted. (Creswell & Creswell, 2017) Mentions that a literature review can have one or more purposes, such as (a) integrating what has been done and said by other researchers, (b) criticizing previous scientific works, (c) building links between related topics, and/or (d) identifying central issues in a field. This research aims to provide an overview by integrating previous research on the relationship between people and technology and the impact of reduced social interaction in automated technology-based public services and to show whether this topic is part of a larger field of study. (Ramdhani et al., 2014).

The selection of scientific articles was carried out by applying the bibliometric analysis method that maps scientific articles on automated border surveillance systems, including biometric technology and the impact of loss of social interaction on the implementation of automated systems. The bibliometric method was conducted to cover scientific articles published in the last 10 years or from 2014 to 2024. The search for reference sources of scientific articles was carried out systematically using Harzing's Publish or Perish 8 application by searching the Google Scholar and Crossref databases with several search components on keyword references, namely: (1) automated border control system, as well as several variations of keywords around automated border control, (2) human-computer interaction, as well as several variations of keywords covering the relationship between humans and technology, (3) biometric technology, as well as several variations of keywords around the use of biometric data in human recognition or identification systems, and (4) social interaction studies and public services.

A final search strategy was then conducted to determine the final set of articles to be screened for bibliometric analysis. Relevance screening through titles and abstracts was conducted to remove articles that were not or less relevant and classify relevant articles according to their themes and subthemes. Additional searches on research articles that have strong thematic links were also carried out using the connection graph on the website www.connectedpapers.com. This research was conducted from February to August 2024.

RESULTS AND DISCUSSION

Human-Technology Interaction

The relationship between humans and technology, especially information technology and computers, is very complex and has covered various aspects of life. Information technology not only changes the way we work and communicate but also reshapes our social, economic, and cultural structures. If we look back, the relationship between humans and technology occurred starting in the 17th century with the creation of a computing tool called a slide rule which was used to help solve mathematical problems, then with the discovery of an analytical engine by Charles Babbage, the development of transistor components and integrated circuits, which developed into personal computer (PC) devices, smartphones, internet of things (IOT), to artificial intelligence technology that we know today. All of these things are forms of fulfilling human needs to overcome the problems faced, open creativity, and also increase effectiveness and efficiency in doing their work. (Karim et al., 2020). This relationship proves that the relationship between humans and technology, especially information technology, is a reciprocal relationship that cannot be separated, much more it's an interdependent relationship.

For example, in the educational sector, information technology has a very important role in the modern education system by revolutionizing the process of teaching and learning activities. Through information technology, educators and learners can access knowledge resources through various platforms, providing convenience and efficiency in delivering and acquiring knowledge. (Yousuf, 2023). Educators can also improve learning effectiveness by incorporating various teaching methods using information technology. (Gao, 2023). Shifting to digital learning methods has made the education process more engaging and accessible, benefiting educators and learners with easy access to vast information sources and enriching communication networks that ensure wide dissemination of knowledge and enhance the overall learning experience. (Lachhwani, 2023).

Another example in the public service sector is the implementation of information technology is improving the quality and efficiency of public services organized by the government. Various studies highlight the benefits of information technology in public services such as increasing productivity and quality of service, reducing the potential for gratuities and abuse of authority, effective government performance monitoring, encouraging more responsive services, simplifying bureaucracy through transparency of procedures and certainty of service times, and expanding the reach of public services accessibility by the society (Ma et al., 2023; Popova et al., 2023; Razak et al., 2022). In addition, the use of information technology in the public service sector can encourage collaboration between the private sector and the government, which can improve the ability and capacity of the bureaucracy and pave the way for the latest technology in the development of government innovation (Ma et al., 2023).

The use of information technology has also led to various improvements and advancements in several industries as well as most human interactions. Communication between individuals or the ease of business processes between companies and customers have also benefited greatly from the application of information technology. While the claim of an interdependent relationship between humans and information technology may be seen as exaggerated, it can be seen from various cases that have currently occurred. For

example, business opportunities and development that utilize online shops and marketplaces are greater in business development than those that do not use these methods. (Ardiansari, 2022; Bathni et al., 2021), this is because information technology makes it possible to facilitate business processes in reaching customers more widely, ability to serve for 24 hours, provides more competitive prices, and speed up the transaction process (Rido et al., 2021; Riyoko & Lofian, 2020) .

Another example is the implementation of information technology in online ojek or taxi transportation services, which makes it easier for customers to get public transportation through a digital application that can easily take them to a destination, deliver any goods, or fulfill any other needs. With the emergence of online taxis and motorcycle taxi, the conventional taxi or motorcycle taxi driver's income has decreased, this is due to the certainty of rates and the ease of connecting users to drivers offered by online taxis and motorcycle taxis are more attractive to customers. (Ferdila & Us, 2021; Watung et al., 2020). These two examples indirectly show that the relationship between humans and technology is currently inseparable, although there are some parties who are unable or unwilling to adapt to these developments, as a consequence, they are less likely to benefit from technological adaptation which has now become a necessity. Ramandita et al. (2023) Their research said that if adaptation to this technology is not done as soon as possible, it will cause lagging and become one of the causes of someone's difficulties in living their life.

Although the current adaptation of information technology has enormous benefits, not all human relationships with technology have a positive impact. If examined further, human interaction with technology also has its own concerns. Stephanidis et al. (2019) in their collaborative research revealed that oriented to humane and social values, there are seven major challenges in terms of the impact of emerging intelligent interactive technologies on human life both at the individual and societal levels. These challenges include aspects of (a) human-technology symbiosis, (b) human-environment interaction, (c) ethics, privacy and security, (d) well-being, health, and eudaimonia, (e) accessibility and universal access, (f) learning and creativity, and (g) social organization and democracy.

Several studies have also clearly revealed the negative impact of human interaction with technology on health, both physical and psychological. Excessive use of information technology can cause disturbances in sleep patterns. (Chang et al., 2015), musculoskeletal function disorders (Alghadir et al., 2022), back pain, and recurrent headaches (Torsheim et al., 2010) And other health problems such as obesity, muscle pain, and so on. Other researchers in the field of mental health said that there is a link between social media use and mental health disorders such as depression and anxiety. (Seabrook et al., 2016) and feelings of social isolation (Primack et al., 2017). In addition, Wolf (2018) His book states that dependence on technology can lead to the underdevelopment of important cognitive skills such as memory, critical thinking, and problem-solving, as these abilities are no longer actively used in everyday life due to dependence on the various features provided by information technology.

The negative impact on the social environment was also observed by Antonucci et al. (2017) Their research stated that the use of information technology also has a negative

potential where humans begin to lose the art and benefits of social interaction and face-to-face communication with each other. In line with this statement, Adhiarso et al. (2019) Said that the use of information technology such as social media fosters a person's laziness to interact directly with others because it is too comfortable to communicate using social networks.

Biometric Technology and Automated Immigration Clearance

In recent years, the increasing automation in immigration inspection processes has been changing the process of immigration control and inspection at various border crossings. The use of automated immigration screening systems such as automated, eChannels, and Automated Border Control System (ABCS) gates not only revolutionized the effectiveness of immigration screening but also changed the experience of international travelers when passing through border areas. These advancements not only speed up the immigration process but also allow travelers to quickly pass through immigration checkpoints and reduce overall waiting time.

An automated immigration inspection system is one of the solutions to the technological implementation in security management in border areas and in immigration inspection procedures. The development of this technology is significantly influenced by the application of facial recognition and biometric authentication technology. Biometric authentication innovation is a highly secure identification method to be able to prove or verify a person's identity through unique biological traits such as fingerprints, iris, facial features, and also Deoxyribonucleic Acid (DNA) (Ashbourn, 2015; Farrell, 2016; Zahid et al., 2019). This technology has been widely used in device technology, where we can unlock devices or approve transactions by scanning fingerprints or faces (Basare et al., 2023; W. Yang et al., 2013).

The biometric authentication method works by comparing the data of a person's physical/biological characteristics requested by the system with the biometric database that has been previously collected. In general, biometric authentication systems have two main stages of functionality, the first is the identification/recognition stage, where the system compares the user's biometric data to one of the many biometric data that has been known and stored in the biometric database system, the second is the verification stage, where the biometric authentication system will accept or reject the user after matching the user's characteristics with the stored biometric database. (Ali et al., 2017; Zahid et al., 2019).

The implementation of an automated immigration checking system with the utilization of biometric technology provides several benefits, the first is to speed up and facilitate the immigration process of entering and leaving the country's territory more smoothly and quickly so as to improve the overall experience of travelers between countries. By automating travel documents or immigration checks through an automated system, immigration officers in border areas are able to focus on more complex security threats, thereby improving the quality of security in border areas. The second is to reduce errors or negligence in the process of checking travel or immigration documents, this is possible because the automated system can check documents more thoroughly, and accurately and has less chance of making mistakes that are often made by officers due to fatigue or carelessness. The third is to ensure compatibility between documents and travelers which can reduce the chance of document forgery, this is possible because

automated systems check the biometric data and quickly verify the authenticity of documents and compatibility with travelers who use them, so as to improve the quality of security in the traffic of people in border areas.

In the implementation of an automated immigration clearance system, the Indonesian government uses a system called Autogate. This automated system is placed at several Immigration Checkpoints, especially at airports or international ports such as Soekarno-Hatta International Airport, Ngurah Rai International Airport, Harbour Bay Batam, and several other immigration checkpoints. The automated system works to validate documents and to check the suitability of travel or immigration documents with the person carrying them using biometric technology. International travelers who want to enter or leave the territory of Indonesia only need to prepare their passports and then go through several inspection procedures that have been prepared on the Autogate machine. The first stage is that the international traveler needs to scan the passport in the document scanner section, then after the document is validated through the system, the person concerned enters the biometric examination area for biometric data collection to be matched with the biometric database that has been previously owned, if the identity verification is successful then the person can immediately pass the immigration examination area, but if the verification fails, then the person needs to carry out manual inspection procedure with the immigration officer at the inspection counter. Through the inspection procedure with the auto gate, travelers between countries can shorten the immigration inspection time from an average of 1 minute to only 15-25 seconds (Abdullah, 2024).

Basare et al. (2023) Their research mentioned various potential benefits of using biometric technology at border checkpoints, in addition to the effectiveness of the inspection time, Autogate machines can also improve the quality of public services, as well as increase security and reduce document fraud through biometric technology. However, Basare et al. (2023) Also mentioned several challenges that may arise, including the dependence on ideal environmental conditions, where biometric technology requires enough lighting conditions and the availability of stable electricity and internet network connection. The use of online systems also makes it vulnerable to cybercrime such as data hacking and misuse of private and biometric data by irresponsible people. In addition, immigration clearance through an automated system can only check the suitability of the person and identity with the travel/immigration document being checked, as well as matching it on the list of persons under special surveillance. The automated system often ignores the psychological factor because it cannot detect or read body language or suspicious gestures, moreover, the automated system is unable to know the motive of a person's trip, whether it is for legal or illegal purposes, which is usually obtained through interviews with officers at the immigration checkpoint. Because even if the international traveler uses documents that validate his identity, the activities concerned cannot be reflected in the accompanying documents, it is very possible that the person concerned intends to carry out illegal and dangerous activities despite using legal and proper travel documents.

In addition to the aforementioned challenges, some concerns also arise from the legal and social aspects associated with the use of biometric technology, which are inextricably linked. Social discomfort towards biometric data usage solutions can have various reasons. One of them occurs when the use of biometric data is implemented using an ambiguous legal basis and by untrusted authorities. This can be a reason for privacy concerns and proper protection of biometric data from the threat of its use by unauthorized parties or for illegal purposes. Tomaszewska-Michalak (2015) underlines some important legal and social issues along with the implementation of biometric technology, also several areas of consideration in making regulations or legal basis for biometric implementation and the level of social acceptance of existing biometric systems. Tomaszewska-Michalak mentioned seven legal issues in the implementation of biometric technology, namely (a) the purpose of the regulation, (b) technical infrastructure, (c) data collection rules, (d) user group statements, (e) excluded group statements, emergency procedures, and (g) protection of biometric data.

Meanwhile, on the social aspect, Tomaszewska-Michalak (2015) Several social issues that can be identified related to the implementation of biometric technology, including the use of biometric systems that make people always feel under the supervision of the authorities, social fear of the collection and use of biometric data, ineffectiveness and misuse of biometric data, and crime and fraud that utilize biometric data. However, this issue is quite different in Indonesia, even though the level of awareness of data privacy is quite high, people do not take enough security measures for their personal and biometric data, this is because the level of awareness of the Indonesian people on the importance of personal information security is quite low. (Nilwanda et al., 2021), agreeing with this Akraman et al. (2018) Also mentioned is that Indonesians have a poor level of awareness in maintaining the security of their information and privacy.

Impact of The Loss of Social Interaction in Automated Immigration Clearance

Technology does not only play a supporting role in the lives of human beings. Rather, as some anthropologists also emphasize, technology has always been an integral part of human life, giving humans freedom, empowerment, and new identities (Bruun et al., 2022). This is proven in the various uses of technology in everyday life, such as hearing aids, smartphones, social media, and various uses of computing devices in various fields. Today, technology no longer only helps make work lighter and easier to do, but far more than that, technology allows us to tinker with the life structure of all living things in an invisible way, technology can provide the ability to genetically engineer plants or animals to be able to produce superior varieties needed. (Khaipho-Burch et al., 2023; Townsend et al., 2009), even technology allows genetic engineering of human DNA makeup that allows us to improve human health and biological conditions (Jalil et al., 2024; Long et al., 2018). These capabilities bring opportunities and also risks that impact human life and the environment.

Various critiques have emerged which warn that technology's ability to 'modify' the lives of all living things has some impacts that are not or cannot be predicted. Some of the criticisms related to the ethics of using this technology are that there must be clearly defined boundaries where humans must rely on technology to be used to improve their lives. These concerns and criticisms of technology do not only occur in one field of technology but

cover several implementations of technology in human life, specifically, this study is a critique of the implementation of automated technology in the management of national borders. Murphy & Maguire (2015) explain that the state border is an area that has broad aspects of discussion, the border is an imaginary political and sovereignty line to an international security zone that is fortified and guarded as a transit space for the movement of people and goods with various surveillance technologies. However, there are significant differences between the concept of land or sea borders and the concept of borders at international airports. An international airport is generally a state border zone or area in the form of a space that is organized in such a way as to create crowd control where the flow of movement of people and goods in that space is controlled in order to create security and uphold state sovereignty. Furthermore, the concept of borderscape has emerged, which currently views the border as something that has gone beyond the geographical or physical aspects of state boundaries but has gone deep into linguistic, cultural, and social aspects (Krichker, 2021). Thus, the understanding of state borders in the borderscape concept is a border that involves overall border governance, including everything that is influenced and affected by it (Rusli et al., 2022).

It is clear, then, that we cannot talk about a nation's borders in general from the geographical aspect alone. Instead, what needs to be considered are the efforts to create security and uphold state sovereignty at the border through various social and security aspects by using technology that is able to provide certainty and convenience in realizing safe and better border management. By promoting efficient and automated processes, border control authorities can streamline immigration procedures and overall security enhancement measures. (Yu & Huang, 2014). In Indonesia, these efforts were delivered with the implementation of Automated Border Control Systems (ABCS) called Autogate.

The use of automation addresses the transformation needed to overcome the current problems, where human mobility and security in border areas must be carried out in the smoothest and most efficient method. The emphasis is on speed and security factors. The speed factor can be achieved by minimizing human intervention and increasing the use of technology that allows for automated immigration clearance using more reliable biometric data. Meanwhile, the security factor, which can be interpreted as a condition of absence of threats (Booth, 1991) or a feeling of comfort like at home (Maguire et al., 2014) This can be achieved by ensuring that the security methods used at the border can reduce or eliminate potential security threats and realize better border management in order to create law enforcement and state sovereignty. The implementation of these methods must also be able to guarantee social acceptance and the realization of a sense of security, which is a basic human need to be able to develop and create social order,

However, with the shifting methods of border management using automated systems that continue to change the form of border control, it is important to carefully understand the sociological implications of these technological advances. The potential consequences of the lack of social interaction in the automated immigration inspection process cannot be ignored. Social interaction can take the form of verbal communication as well as non-verbal communication (Kitishat & Freihat, 2015). The ability to cooperate and communicate effectively through language is a unique human ability, that distinguishes it

from other species (Bohn, 2015) The use of language can describe almost any situation, such as emotion, fear, excitement, anxiety, paranoia, or sanity. The reason why humans are considered the center of the world despite their weak constitution is language. Their sophisticated communication allowed humans to create groups and develop civilization faster than any other species. Moreover, the mastery of information and communication technology is increasingly pushing human society towards globalization and the formation of knowledge societies (Saloff-Coste, 2022; UNESCO, 2005).

One of the main concerns with the implementation of automated immigration clearance technology is the reduction of communication or human interaction in the border screening process. The loss of personal interaction between travelers and immigration officers can actually reduce the welcoming and friendly atmosphere at the time of entry into another country, this will certainly affect the overall travel experience. In addition, the use of technology in automated immigration clearance may inadvertently lead to the marginalization of certain groups. For example, individuals who are less tech-savvy or have limited access to digital resources are more likely to face difficulties in using the auto gate, which can lead to feelings of alienation and hinder integration into the host society. In addition, the forms of support and assistance that are usually provided by border officials to individuals with special needs or unique circumstances such as disabilities or the elderly during immigration checks cannot be performed under these automated system settings. Moreover, one of the impacts of technology use is technostress, which refers to feelings of anxiety, frustration, and discomfort caused by one's inability to cope with the demands and pressures of constantly adapting to new technologies. (Ayyagari et al., 2011).

There are also concerns that the emphasis on the efficiency of the human crossing process facilitated by automated immigration clearance systems such as automated may overshadow the need and potential for genuine cultural exchange and communication between travelers and border officials. This cultural exchange and communication can enrich the social fabric of the host country, promoting tolerance, empathy, and respect for diversity, contributing to mutual understanding and appreciation of different cultures.

While speedy immigration clearance provides a range of benefits, critics argue that they should not come at the expense of meaningful human interactions that can contribute to genuine community integration. In seeking to integrate automation in border control, it is important to adopt a more holistic perspective that encompasses both the operational benefits and sociocultural impacts of these technological advancements. The goal of achieving a balance between efficiency and maintaining interpersonal dynamics that contribute to a positive travel experience for all individuals remains an important consideration in the evolution of border management systems. Therefore, this study suggested that it is important to ensure that these advancements do not diminish the quality of social interactions at the nation's border area.

The Shift In Government-Society Relationships In The Context Of Technology-Based Services

Automated technology-based services have significantly changed the pattern of interaction between the state and society. With the adoption of automation technology in various public services, there is an increase in efficiency and responsiveness in the relationship between government and society. (Danu et al., 2023; Weningsih et al., 2022).

Citizens can now access government services more easily and quickly through digital platforms, such as mobile applications and online websites. This reflects the transformation towards a more open and inclusive government, where people's needs can be met more effectively through technology. Interactions between the state and society are no longer limited to direct and face-to-face communication, but also through digital interactions that enable wider participation and better accessibility to public services. As such, technology-based services have shaped a more dynamic relationship between the state and society, pushing for a government that is more adaptive and connected to the needs and expectations of modern society.

At the same time, modern information technology has become an indispensable tool in the production and delivery of public services. With the advancement of e-government, as well as the rapid development of various new information technologies, public services can be grouped by information technology as an integrated system. The integration of information technology has enabled the adoption of service models that are more efficient and responsive to public needs. In addition, the successful application of information technology in public services also depends on a deep understanding of the mechanisms and corresponding productivity strategies.

Through the use of technologies in public services, such as automated immigration screening services at immigration checkpoints, there has been a shift in the interaction between the state and society. The adoption of automated technologies allows people to access immigration services more quickly and efficiently. This creates a more dynamic relationship between the state and society, where the government uses technology to provide more responsive and digitally connected services. Automated technology-based services also change the traditional pattern of interaction between immigration officers and travelers, focused on the use of technology that facilitates the examination process without reducing the security factor. This transformation illustrates the shift towards a modern and inclusive government, where technology is the key to meeting the demands of society for better public services.

While the development of information and communication technology has many benefits, there are also challenges that need to be faced. One of them is concerns related to data privacy and security. In this digital era, our personal data is often exposed and can be compromised by lawbreakers. Sulaiman (2012) Explains that some of the weaknesses of technology use in public services provided by the government through e-government have not been supported by an effective management system and the poor implementation strategy, other than that the implementation of this technology is also influenced by the inadequate capacity of human resources and the budget allocated for the development and the maintenance of information technology in each government agency.

In the aspect of social relations, public services through information technology that are excessive and not in proportion have concerns that they can build an apathetic relationship between the government and society, because the focus of public service changes to the delivery of the service only, but does not contribute to social relations between the community as service users and the government as a public service provider. This is important because social interaction in the public service process between

government officials and the community should be the starting point to foster empathy and build public trust and satisfaction with government performance.

In addition, uneven technological infrastructure and digital literacy that is still low in various regions are obstacles and challenges in themselves so this affects the effectiveness of technology implementation in government public services. Efforts need to be made to overcome these challenges so that maximum public services can be realized and meet the expectations of every element of society and government.

CONCLUSION

Through this study, it is concluded that the use of technology in the border control system, especially in automated immigration clearance, has changed the experience of international travelers, especially in the effectiveness and efficiency of immigration checks supported by biometric technology. In addition, the positive impact of the use of technology in the immigration examination system is to reduce the occurrence of errors or negligence in the process of checking travel or immigration documents which still often occur in manual checks by officers. However, the use of automated immigration clearance also has a negative impact, such as the loss of personal interaction and communication between travelers and immigration officers, which can reduce the friendly and welcoming atmosphere when entering the territory of another country. In addition, this loss of social interaction will lead to various impacts such as marginalization of certain groups, creating feelings of alienation, hindering social integration, and various other social impacts.

Meanwhile, in the context of changing patterns of interaction between the state and society through automated technology-based services, there is a significant transformation in the way the state provides services to the community. Easier and faster services through information technology can improve the quality and more inclusive public services. Other than that, information technology also encourages the formation of a more dynamic relationship between society and the state to realize a government that is more adaptive and connected to the needs of modern society. However, on the social aspect, the provision of public services through information technology can actually foster apathy between the government and the society because there is no direct relationship that full of empathy in the process of providing public services through information technology.

Research conducted by Okumdi (2022) States that the development of humans and their societies depends on the level of social interaction and social relations that occur, so it is important to carefully consider the various disadvantages of using automated technology in the delivery of public services and find ways to overcome them before fully using automated systems as a comprehensive solution for monitoring people's traffic in border areas. One of the things that should be the key consideration is the essential social interactions that occur in the process of automated border surveillance.

In the end, new research is needed that discusses the loss of social interaction in the implementation of information technology, especially in the public service process. This is important to be able to ensure that the use of technological advances in automation does not have a negative impact because it reduces the chance of interaction and communication between the community and government officials, in fact, humans are social creatures who need each other in their daily lives and social interaction is very important to foster empathy and build public trust and satisfaction with government performance.

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