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THE ADOPTION OF BORDER TECHNOLOGY OF IMMIGRATION CONTROL AND AUTOGATES IN INDONESIA

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Abstrak

Penelitian tentang otomatisasi pemeriksaan di perbatasan atau mekanisme sistem autogate di bandara Indonesia masih sangat terbatas, termasuk studi perbandingan mengenai teknologi perbatasan di beberapa negara. Penelitian ini bertujuan untuk menggambarkan bagaimana cara kera teknologi perbatasan TPI dan autogate di bandara Indonesia serta untuk membandingkan penerapan teknologi perbatasan bandara di empat negara. Kajian ini menggunakan metode penelitian kualitatif dengan menerapkan tinjauan prosedur sistematis atau mengevaluasi dokumen atau analisis dokumen. Studi ini menunjukkan bahwa teknologi perbatasan di Indonesia telah dibangun dengan sistem informasi terpadu yang disebut SIMKIM melalui sistem EDAS sebagai sistem penghubung ke setiap sistem aplikasi yang dapat dioperasikan di kantor imigrasi, Tempat Pemeriksaan Imigrasi (TPI), Rumah Detensi Imigrasi, dan kantor perwakilan di luar negeri. Direktorat Jenderal Imigrasi telah memasang autogate untuk pemeriksaan TPI untuk pemegang paspor Indonesia di Bandara Internasional Jakarta dan Bandara Internasional Bali, dan pemegang paspor asing dari dua belas negara tertentu di terminal keberangkatan Bandara Internasional Bali. Penelitian lebih lanjut dapat mengevaluasi penerapan teknologi perbatasan dalam hal pemeriksaan keimigrasian di TPI Indonesia serta mengevaluasi penggunaan autogate pada dua bandara di Indonesia.

***Kata Kunci**: Autogate, Teknologi Perbatasan, TPI, SIMKIM*

Abstract

There has been no research on border automation or the mechanism of autogate system at airports in Indonesia, including a comparative study on border technology of immigration control in several countries. This paper is to describe how the border technology of immigration control and autogate at airports in Indonesia work and to compare the adoption of border technology of immigration control at airports in four countries. It presents a discussion with a qualitative research method by applying a systematic procedure reviewing or evaluating documents or document analysis. This study finds Border technology in Indonesia has been established with an integrated information system called SIMKIM under the EDAS as a connecting system to every interoperable system at immigration offices, border controls, detention centers, and representative offices overseas. The DGI has deployed an automated border control for Indonesian passport holders at Jakarta International Airport and Bali International Airport, and foreign passport holders from twelve selected countries at the departure terminal of Bali International Airport. For further research, it is essential to evaluate the adoption of border technology of the immigration control process in Indonesia and the evaluation of the deployment of autogate at two airports in Indonesia.

***Keywords**: Autogate, Border Technology, Immigration Control, SIMKIM*

1. INTRODUCTION

Every country has a rigorous policy to organize the mobility of people, a border control policy, and an immigration policy. Immigration policy could be a principal viewpoint of a nation, which could decide the quality of border protection and national security. A political issue may construct an immigration policy-making process referring to what the government chooses, especially in Indonesia, the welfare of the community, and foreign policy. Border control could be a central issue within the work out of national sovereignty and over territoriality. With border controls at airplane terminals over Indonesia, cutting edge officers play a critical part in immigration controls to perform the movement approach. Immigration officers have an understanding of the nature of border judgment and carry out the migration specific approach beneath the Indonesian Migration Act No.6 of 2011 [1]. The practice of immigration policy is equipped with border technology to help officers collect data, validate visitor's documents, verify visitor's data, and track them during their stay in a country.

As it is mentioned that immigrants are a substantial and rising fraction of many countries' populations [2], and often arrive in their new country with a different mix of skills than the existing workforce [3]. Of course, various countries around the world discuss the same problem with the mobility of people or immigrants, and how they review something not linear with the system at the border of the country. For countries such as Australia, Hong Kong, or the United States of America do not need to worry about their border security systems [4]. However, it requires serious attention for emerging countries that must develop the information system and the adoption of new technology [5]. It implies a comprehensive immigration border security system in terms of data collecting, verifying, validating, tracking, filtering, or recognition will become a fundamental aspect for a seamless immigration clearance process to prevent major external threats. In its implementation, it is undoubtedly desirable to emerge various innovations or ideas for the development of an immigration security system, bearing in mind that security along national borders is becoming increasingly important from day to day.

Over the past fifteen to twenty years, the web, network, and technology have changed the outlook and function of the public administration by transforming government processes and external interactions. This transformation has also been labeled by policymakers and also by scholars, who come from various disciplines, too electronic government or e-government. E-government is one of the pillars in Indonesian government modernization due to the utilize of innovation of technology, and data frameworks are considered to rationalize and improve government. E-government can be described as the use of ICTs for new designs or redesigns existing information processing practices to achieve better governance, especially in Indonesia, the field of sending electronic services to companies and citizens [6], [7]. Thus, in case of the development of information systems, the government should be prepared for one step ahead in the border technology system.

To support the adoption of the e-government and security approach, sensor hubs are conveyed deliberately on parts, or the aggregate of the border rely on potential interruption or standard courses to gather sensors data by an organization of communicating hubs on a controlled radio channel [8]. These radio signals are used to attach to the environmental parts that cause many events, like a body movement. The Wireless Sensor Network (WSN) issue is to provide information exchange between the sensor nodes and an application platform [9]. The appeared of examples of innovation like this certainly illustrates that some countries are aware of how vital it is to create a movement in the technology system amid the current dynamics of immigration border security.

Based on research in an article of Biometric Technology Today in 2010, "Indonesia rolls out border control system," the Directorate General of Immigration (DGI) under the Ministry of Law and Human Rights Indonesia has worked with Societe Internationale de Telecommunications Aeronautiqiues (SITA) since 2007 in which it implemented a system to manage watch lists and perform name searches [10]. The DGI Indonesia has deployed a border control automation called Autogate that has been interconnected with the Immigration Management Information System (SIMKIM). Autogate integrates biometric identity management with other passenger-handling

processes, including secure self-service check-in and automated passport scanning. This allows a passenger to use a single biometric credential, such as a smartcard or e-passport, to deal with every aspect of travel at the port [10]. Gidionton Siagian from Angkasa Pura I Airports (terminals) has clarified that Indonesia provides two options currently: passengers could go to the officers, or they could go to the Autogate for immigration clearance. Angkasa Pura is capable for the administration of airports in Indonesia, and concurring to later figures, the airports have had capacities of 30,700,440 individuals, but the development was 49,237,437 travelers [11].

Border technology has some serious deficiencies in the case of the implementation. There were almost 1,300 imperfections caught from Walk 2008 to July 2009 — with the number of issues happening speedier than they were being settled. The report moreover recognized critical absconds workstations that habitually slammed, wrong acknowledgment, untrue checking, radars that broke when the radar dish pivoted as well distant, wrong positives, and foggy camera pictures [12]. Also, a challenge has arisen for the implementation of border technology, which can be utilized successfully to screen the uncontentious border, like between Brussels and Italy. But the more tricky the border, the less computerized innovation is the arrangement [13].

In case of facing that future problem and challenge in border technology, there are research that has brought knowledge and innovations in the purpose of border technology development, such as research of Automated Border Control (ABC), Methodology for the Evaluation of an International Airport Automated Border Control Processing System, A Comparative Study of Automated Border Control, A study of e-border crossing process and also a research of systems in automated border control. Previous studies discussed challenges in the biometric system in automated border control [14], the evaluation process of automated border control in international airports [15], a comparative study of automated border control in two airports [16], e-border crossing process [17], and e-gates and facial recognition systems [18]. However, there has been no research on the border automation or the mechanism of the automated border system at airports in Indonesia, including a comparative study on border technology of immigration control in several countries. It is significant to fill the practical knowledge gaps for further systematic evaluations by the Indonesian government or stakeholders about the deployment of border automation in Indonesia.

This paper is to describe how autogate as the border technology of immigration control at airports in Indonesia works and to compare the adoption of border technology of immigration control at airports in four countries. This paper raises questions as to how border technology and autogate at international airports in Indonesia work in the framework of the immigration clearance process and how the mechanism of border technology of immigration control in Australia, Hong Kong, Singapore, and the U.S. as a comparative study. These four countries are countries included in the group of developed countries with the development of sophisticated and optimal information technology in various lines, with one of them using the concept of smart cities [19].

2. RESEARCH METHODS

This paper presents a discussion with a qualitative research method by applying a systematic procedure reviewing or evaluating documents or document analysis [20]. This study is collecting printed and electronic document materials from the Indonesian government reports, regulations, standards, and from each country with scopes of border control and border technology. The data analysis is providing the descriptions of border technology in Indonesia and displaying visuals or graphs about the automated border control at airports in Indonesia and comparing border automation in four countries. Existing literature supports the analysis for a review and a comparative study in terms of border technology and e-government.

3. RESULTS AND DISCUSSION

3.1 Data Description

Directorate General of Immigration (DGI) Indonesia deploys management of information system called SIMKIM that controls all application systems in every section at immigration offices, points of entry and exit (border control), immigration detention centers, and representative offices overseas. In 2010, the DGI installed the BCM system in SIMKIM as the primary control in immigration control at points

of entry and exit for improving the border protection and intelligence management [21]. The management of information systems at the DGI is integrated by the Enterprise Data Access System (EDAS) as a connector with other immigration application systems. An interoperable system of BCM comprises visa and residence permit system (Visa Online/E-Office), departure ban and entry ban data (ECS), passenger's movement system (PMS/APK), passport application (SPRI/E-Office), detention center application system, and immigration operation and enforcement system (Nyidakim). Three types of databases can be retrieved: passenger's movement system (PMS), enhanced cekal system (ECS), and passport applicants. At points of entry and exit, the APK system records biometric data of visitors such as fingerprints and face recognition and scans the travel documents and visa. After collecting data, the ECS will verify names and data of visitors whether they are eligible to enter or to leave Indonesia or to refuse entry or exit.

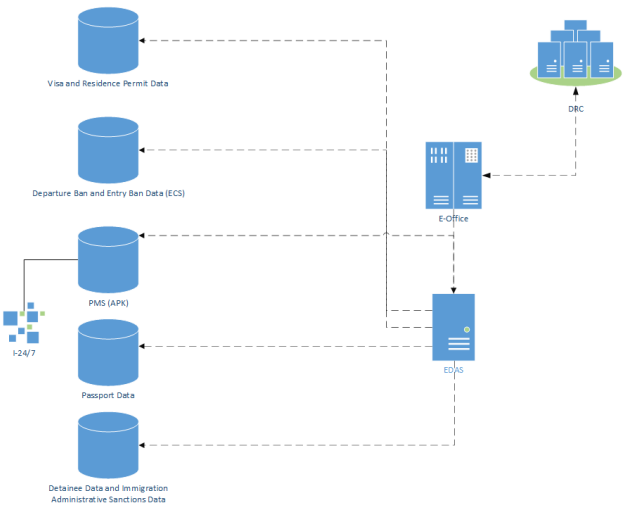
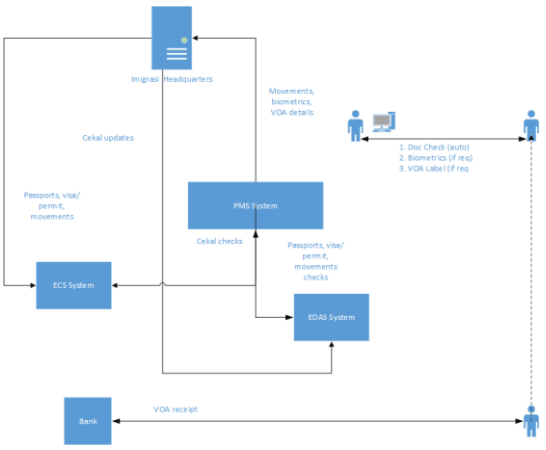


Figure 1. Network Design of e-Office including several systems in EDAS

[Source: Adopted from Slides in Document of DGI Ministry of Law and Human Rights Indonesia 2015, the e-Office concept]

In EDAS, there are other examples of the results of the development of the system on SIMKIM that connects the visa on arrival (VOA) system. The VOA service system is an automation system for scanning VOA labels, and the details of the VOA are sent directly to the DGI. Machine-Readable Travel Documents (MRTD) or e-MRTD such as electronic passports or electronic visa contains a Machine-Readable Zone (MRZ) and barcodes where an immigration officer is equipped with a scanning device to validate the passport and verify the visa.



Picture 2. BCM Systems in 2010

[Source: Adopted from Slides in Document of DGI Ministry of Law and Human Rights Indonesia 2010, Development of BCM System]

In terms of primary border technology in the airport, DGI Indonesia has adopted an immigration gate system called Autogate. In 2011, the DGI Indonesia rolled out the Autogate for Indonesian passport holders for an immigration clearance process at Soekarno-Hatta International Airport Jakarta. The autogate system is a self-service of the immigration clearance process for Indonesian passport holders. Passengers go through the automatic entry door after scanning their passports, where the door will open if the passport is validated. Then, autogate machine records their biometric data such as fingerprints and face recognition. The exit door will open if the passenger data is matched and verified, which means a passenger is an eligible person to enter or leave Indonesia. The immigration officer will come and open the final door, and then visitors will have a further inspection. The implementation of the autogate system facility is provided for Indonesian citizens who hold either electronic or non-electronic passports at Soekarno-Hatta International Airport and Ngurah Rai International Airport.

In 2019, Bali Immigration Office deployed the autogate for foreign visitors from twelve countries in response to a massive influx of visitors entering Bali for a short-term holiday with a free visa facility. As reported by

Kompas.com, the immigration autogate service in Indonesian airports was already accessible as it was for the country's citizens since it was, to begin with, propelled in 2014. Presently, foreign tourists can moreover appreciate the autogate service, but they must be nationals from ASEAN countries, Australia, New Zealand, or East Timor. Also, the facility is only available for them at the departure terminals, for the time being, to reduce a long queue, and it makes an immigration clearance process faster, more effective, and accurate. In fact, the autogate framework had been tried by remote travelers who were members of the IMF and World Bank Yearly Gatherings in Bali final year. During this trial period, the system successfully served over 2,000 passport holders. As shown on an official video posted by Ngurah Rai's Immigration Office, the method includes filtering one's international identity, taken after by a unique mark and facial scan. It is assessed to require around 35 to 60 seconds in add up to [22].

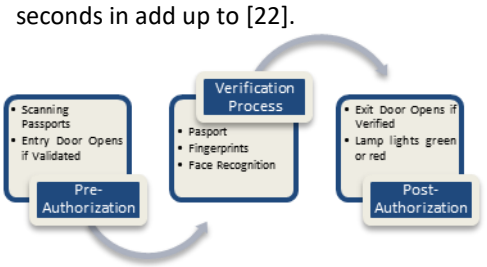


Figure 2. Autogate Verification Process in Indonesia

[Source: Adopted from Official Website of Immigration Office of Border Control Soekarno-Hatta 2018, Autogate]

In Figure 2, it shows that autogate has several key benefits, such as improving the quality of public services, simplifying the immigration check process, constructing one embodiment of the accountability value system within the Directorate General of Immigration, and minimizing the interaction of officers with the community. This system incorporates with the e-government theory, which refers to the use of ICT, particularly organize advances, to encourage or to update the intelligent between government and relevant stakeholders in its internal and external environment to achieve added value [23]. On the contrary, Figure 2 indicates the autogate machine does not verify the boarding pass of passengers, and it is not suitable for a child passenger. For foreign passport holders, autogate device is limited to visa-free subjects and unable to detect other visa holders. It implies the concept of e-government has a fundamental foundation for the development of information systems and technology, especially in terms of immigration clearance at airports despite the weaknesses of the autogate.

With regards to border technology application in Indonesia today, the immigration border technology system in Indonesia is falling flat to meet the wants of today's economy. It is not prepared to get ready for future demands. Immigration reform must empower the kind of advancement and work creation that fulfills the desires of tomorrow's economy and welfare of the community. The reality of the global marketplace means talent competition is universal as well [24].

No.	Countries	Top Systems	Functions	Obstacles
1.	Australia	SmartGate System	Automatic gate does not need to use a manual way	Sometimes it could not want to read the passport
2.	Hong Kong	e-Channel	Automatic machine gateway for Hong Kong Citizens and frequent travelers	The system down by itself sometimes
3.	Singapore	VETS	Provides online retrieval of visa records including photos for verification	Some bug sometimes shown up
4.	United States of America	ATS	An automated system that could scan and track a cargo from travelers	Need an adjustment for the speed of the cargo with the capture system

Table 1. Border Technology Adoption in Four Countries

With various systems that have been released by the I.T. (Information Technology) professional of several countries, it could be a reference to some countries to adopt, create or develop a new system or better system [25]. It infers border technology, and border automation can boost economic growth, border security, and the welfare of the community.

Concerning the adoption of border technology in four countries, Table 1 illustrates the systems, functions, and obstacles of border automation.

There are plenty of matters to recognize before moving on to the development of systems, such as human resources, materials, software, the result of researches, and many more. It will take a couple of years to reach a good result on the implementation of the system.

Figure 3. Various Immigration and Border Technology Systems

[Source: ABF, ICA, HI, ICE]

In Figure 3, it presents several immigration technology systems from four countries that contain different functions, mechanisms, implementations, frameworks, designs, etc. Among those four countries, the most unique one is the ICA from Singapore, with a useful innovation for the immigration checkpoints system. However, these four countries are in front of other developed countries in terms of immigration technology system development.

3.2 Discussion

The immigration clearance system can be a gateway that indeed produces maximum performance in sorting out those who come from outside, maintain the upholding of the country's sovereignty, and playing the role of national security. For example, immigration control at the airport is a consistent adjustment between security and speed in which travelers must get their flights, but security must be reached. Besides, machines are fundamental to avoid wrong cautions by recognizing genuine dangers and things that take after dangers, all without violating the privacy of visitors, students, workers, and businesspeople. A highly sophisticated immigration technology system will read your face and vital signs and scan your bags smoothly, all without compromising security - technology that can warn authorities of suspicious tourists and need further inspection [26]. It may be a cutting-edge innovation for the future that a border technology can speed up the immigration clearance process supported with border security aspects.

Border security is the key point of national sway in each country by utilizing border judgment. A border issue could be a complex handle that incorporates all components of government and community from neighborhood, territorial to the central government since it deals with the relations of control, culture, social, bequest, authoritative issues, sanctioning, and financial components [27]. Security isn't restricted to territorial security and defense, but it alludes more to the security of society, economy, and framework dependability [28]. Along these lines, border security is centered on people and reports at the side of its concept of solidarity to endorse the royal borders, and it is related to movement approaches [29]. Meanwhile , border judgment application concerns nearly the authorization of the conventions, movement, and disconnect laws and headings on the improvement of items and people crossing borders of a nation [30].

To apply border security, migration control concerns with everybody who voyages, trades, enters and takes off a nation through-plane terminal, seaports, and border crossing stations. A movement office, as one of the open specialists whose parts in securing the border,

includes passage and exit methods for all visitors traveling by air, sea, and land. As national methodologies for border security, nations might actualize the Border Control Management (BCM) to recognize, approve, coordinate, and record the visitor's information approximately their visa, travel archives, biometric information, watchlists, databases, and computerized automated border controls [31]. Each country must have specific areas that serve as a gateway between their countries, both from land, sea, or air. The presence of technology that strengthens security at the border certainly helps the level of immigration surveillance where inspection performance will be faster and more effective.

Immigration Technology System in Indonesia

To address immigration issues in Indonesia, the coordinates BCM framework was worked for the primary time in 2010 at movement border controls at 27 airplane terminals and seaports all through Indonesia, concurring to News Border Controls [10]. Furthermore, Santoso (2015) describes the Indonesian immigration agency implemented the BCM system to process the data of every person who arrives and departs from Indonesia by the intelligent character recognition (ICR), to record, store and organize passenger's development information within the headquarter of movement organization and migration workplaces beneath the huge information of SIMKIM (Immigration Management Information System) [32]. The BCM framework is additionally prepared with the watchlist application called the Enhanced Cekal System (ECS), and it had been associated with all migration workplaces in Indonesia, airplane terminals, seaport, border intersections, Indonesian international safe havens, and departments abroad [33].

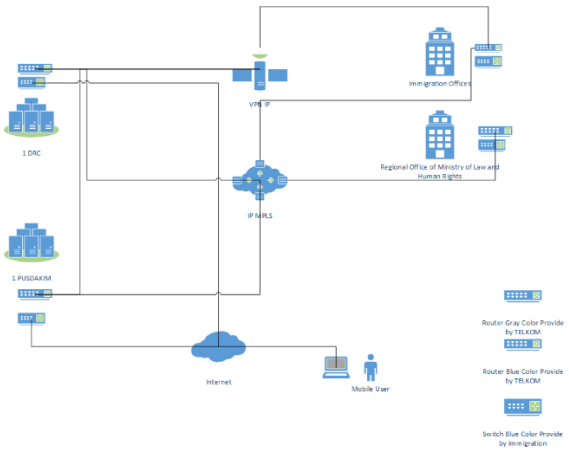


Figure 4. Network Scheme of Immigration Indonesia

[Source: Adopted from Slides in Document of SISTIK 2020, SIMKIM version 2]

In expansion to border administration upgrade, the Indonesian immigration authority, and the NCB Interpol Indonesia agreed to sign the Memorandum of Understanding to build cooperation on the assembly of the I-24/7 system to the BCM system [34]. The information and data in the I-24/7 Interpol system containing an identity of missing persons, wanted persons, lost and stolen documents data, which is synchronized to the BCM at Jakarta and Bali Airports. Immigration officers at airports are more cautious in conducting a movement clearance to each individual coming and clearing out the domain. It shows up that the integration of two systems may advance a movement appraisal to support border control management in Indonesia.

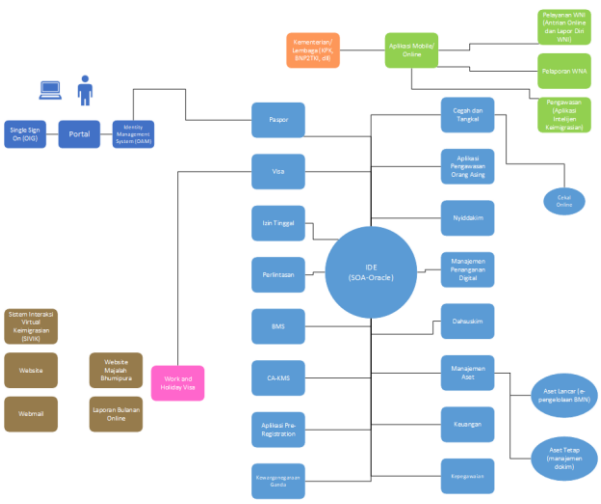


Figure 5. Current Scheme of SIMKIM V.2

[Source: Adopted from Slides in Document of SISTIK 2020, SIMKIM Version 2]

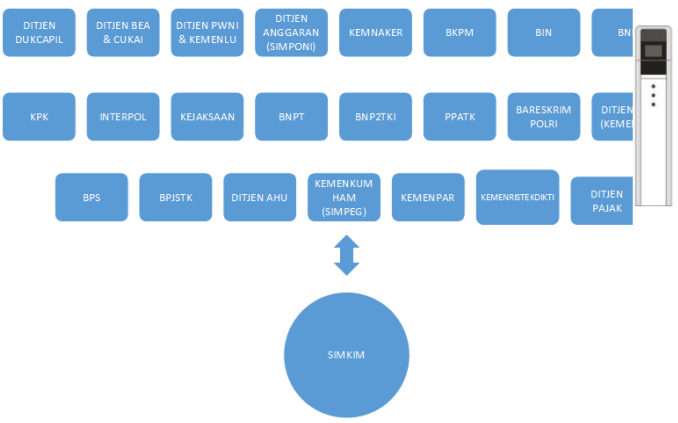


Figure 6. Institutional Integration with SIMKIM V.2

[Source: Adopted from Slides in Document of SISTIK 2020, SIMKIM Version 2]

The establishment of the BCM system aims to support an immigration clearance at borders in Indonesia so that immigration checks can be more effective and efficient [35]. BCM is a technology-based border surveillance system to handle all crossing activities at immigration control at borders [36]. The BCM system functions aim to assist immigration officers in conducting a clearance process related to pre-empting measures to unauthorized people who will enter Indonesia.

The Indonesian immigration agency (DGI) has applied an Autogate as an automatic system of immigration clearance at two international airports. The autogate is to mitigate and off-load the increasing volume of air passengers entering and transiting through the borders via the manual clearance process. It is expected to complement, ultimately bolster, and surpass the execution of existing security measures for manual clearance of travelers entering and leaving Indonesia. The Autogate can be used by Indonesian citizens who hold the Indonesian biometric passport (e-passport) or non-biometric machine-readable passports (MRP) in Jakarta and Bali Airport and by foreign passport holders from twelve countries at departure terminals of Bali Airport. However, the autogate must be expanded to include other types of visa holders, temporary or permanent residents, business card holders, e.g., APAC Travel Card Holders, ASEAN nationals, etc. in a future phase to be determined by the authorities [37]. Figure 7 demonstrates the specifications, systems, and functions of autogate in Indonesia.

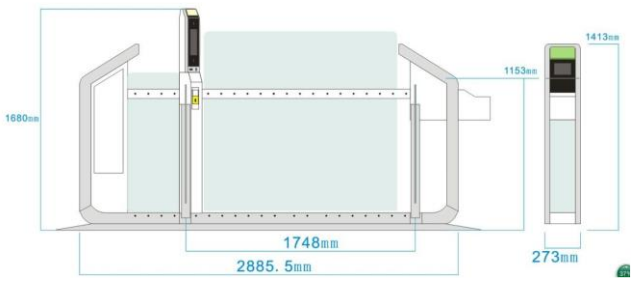
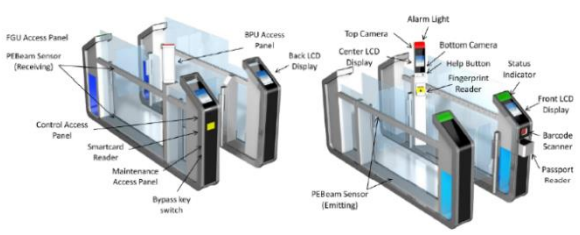


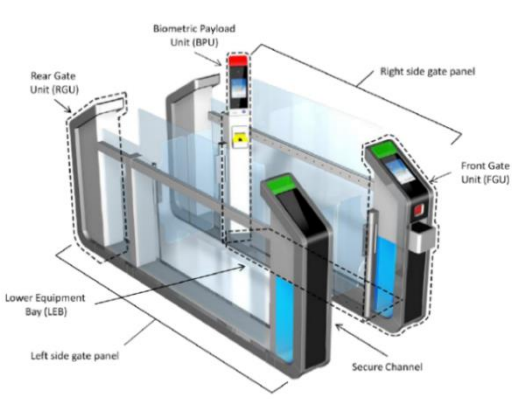
Figure 7. Autogate Dimenssion

[Source: David, 2015]



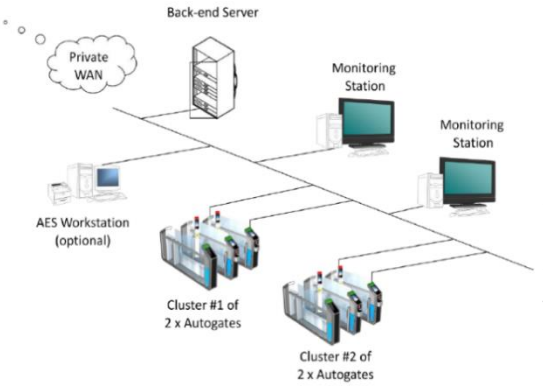
Picture 8. Main Components

[Source: David, 2015]



Picture 9. Single Channel Main Parts

[Source: David, 2015]



Picture 10. Autogate System Network Architecture

[Source: David, 2015]

For MRP holders, the passport information and fingerprint will be obtained from the backend SPRI system. An enrollment system may be offered as an option. It will be implemented to allow non-e-passport MRP holders such as foreigners, to be enrolled for autogate use.

Immigration Technology System in Four Countries

There have been so many interesting discussions about technology, and the most unique one is about the immigration technology system, which has some crucial functions, such as security, surveillance, and many more. This section discusses the border technology of immigration control in Australia, Hong Kong, Singapore, and the U.S. The immigration technology systems applied by Singapore is the Immigration and Checkpoints Authority (ICA), Hong Kong with the Immigration Department, the United States of America with the Immigration and Customs Enforcement (ICE), Australia with Australian Border Force (ABF). Some fresh concepts are coming from their innovations about immigration technology systems such as Visa Electronic Transmission System (VETS), e-Channel, Automated Immigration System, SmartGate System, etc. The most prominent and reliable system is the SmartGate System and e-Channel.

The new generation of SmartGates in Australia, preparing both inwards and outwards travelers, will be rolled out to existing and unused universal airplane terminals and seaports. Increments in advanced preparation, computerization, and the Australian Trusted Dealer program will give efficiencies at the border relating to product preparation. The referral prepare for visas overstayers will be robotized to empower visa choices made by officers at the border to be more reliable and way better upheld by convenient, suitable, and important data. The Robotization of this work will increment the judgment and exactness of the data collected at the border [38]. The system has been operated by the Australian Border Force under the Department of Home Affairs, which works in nine Australian international terminals such as in Sydney, Melbourne, Adelaide, Brisbane, Cairns, Canberra, Gold Coast, Darwin, and Perth. Basically, the SmartGate Framework is a computerized self-service border control framework that permits Australian visa holders and e-Passport holders from a determination of other nations - to urge through migration controls more rapidly at airplane terminals. It was first presented in 2007, the stand framework employments facial acknowledgment innovation to coordinate the traveler's confront to a computerized photo put away interior their visa on a microchip. On the process of the two data matches, the traveler is consequently cleared through the checkpoint without having a conversation with a customs officer [39].

And e-Channel, which is an automatic gateway from Hong Kong that has an order to been used for Hong Kong Citizens and "*frequent traveller*". This system has been supporting three main components of Hong Kong's Business Plan, which are; (1) Control, (2) Facilitative, and (3) Service [40]. In this case, the Division of Immigration Information Technology has a full charge and responsibility to create, develop, and fulfill any technology systems in immigration. This division has a responsibility for the development and maintenance of the immigration information technology system that owned by each immigration department (for example from the Hong Kong Immigration Department), which includes border systems (including prevention and deterrent), passport systems, foreign and resident registration systems, and immigration control systems [40].

The Automated Targeting System (ATS) is a United States Department of Homeland Security automated and computerized system. This framework for each person who crosses U.S.

borders scrutinizes a gigantic volume of data related to that person, and after that, subsequently, designate a rating. Then, it makes a difference gage whether this individual may be put inside a chance gather of psychological militants or other offenders. Additionally, ATS looks at information related to holder cargo [41]. In brief, ATS has expanded to travelers by allotting all subjects who cross the nation's borders, citizen and non-citizen alike, with a computer-generated "chance appraisal" score that will be held for 40 years [42].

4. CONCLUSION

Border technology is an essential element in the immigration control system, which generates impacts on the national economy, border security, national sovereignty, national security, and community. Border technology in Indonesia has been established with an integrated information system called SIMKIM under the EDAS as a connecting system to every interoperable system at immigration offices, border controls, detention centers, and representative offices overseas. SIMKIM is collecting, verifying, and validating data of applicants for travel documents, visas, residence permits, movement alert lists, and the movement of people. Immigration clearance systems at airports, seaports, and border crossing stations (PLBN) in Indonesia include PMS or APK (Aplikasi Perlintasan Keimgirasian), movement alert list called ECS (Enhanced Cekal System), and I-24/7 system (interconnected with NCB Interpol). These three systems will verify and validate travelers, travel documents, visas, residence permits, alert lists, and overstay detection. The DGI has deployed an automated border control for Indonesian passport holders at Jakarta International Airport and Bali International Airport and foreign passport holders from twelve selected countries at the departure terminal of Bali International Airport. This self-operated immigration control, supervised by immigration officers, examines every visitor's travel documents and personalize their data upon arrival and departure. In the future, immigration officers will have been replaced by autogates to conduct an inspection of travel documents and their holders at borders.

On the other hand, there are challenges in the adoption of border technology and autogate in Indonesia. The DGI has not published rules, standards, and procedures about border technology of the immigration control system and autogate in Indonesia. APK and Autogate are not reading and recording the boarding pass of passengers or crews, and they have not interconnected one another. Autogate machine at international airports in Indonesia does not support visa or residence permit holders to pass through, and it is not suitable for children and disabled persons.

The adoption of border technology of immigration control in Australia, Hong Kong, Singapore, and the U.S. is a well-established integrated system. They apply a pre-clearance border, an e-visa, an e-residence permit, and an electronic travel document. A pre-clearance border is to detect an authorized arrival from their home or transit country before entering a jurisdiction. Pre-empting measures with the adoption of border technology have become the main priority of the immigration clearance process in these countries.

This paper recommends the border technology of the immigration control system in Indonesia, upgrading the capacity of speed, server, and bandwidth. The DGI should publish rules, standards, and procedures about border technology of the immigration control system and autogate. APK and Autogate must be interconnected, be able to read and record the boarding pass of passengers or crews so that SIMKIM will record the passenger's manifest and crew lists. Autogate shall be expanded to reading other types of visa holders, residence permit holders, and other subjects, including for child passengers and disabled persons. For further research, it is important to evaluate the adoption of border technology of the immigration control process in Indonesia and the evaluation of the deployment of autogate at two airports in Indonesia.

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