International Journal of Information System & Technology
Akreditasi No. 158/E/KPT/2021 | Vol. 6, No. 2, (2022), pp. 236-247

Development of Mobile-Based Illegal Cigarette Data Management Using Rapid Application Model

Adam Bachtiar Maulachela[1], Jian Budiarto[2], Ahmad Ashril Rizal[3], Lalu Puji Indra Kharisma[4]*

[1]*Universitas Pendidikan Mandalika, Indonesia*
[2]*Universitas Nahdlatul Ulama Nusa Tenggara Barat, Indonesia*
[3]*Universitas Islam Negeri Mataram, Indonesia*
[4]*STMIK Syaikh Zainuddin Nahdlatul Wathan, Indonesia*

Corresponding Email : adambachtiar@undikma.ac.id

Abstract

Indonesia is one of the highest cigarette-consuming countries in the world. Therefore, the government is trying to control this through various efforts. One of them is by increasing the excise rate on tobacco products yearly with an average increase of 10.92 percent per year. However, this effort has not been able to reduce the number of smokers in Indonesia, which has increased by 8.8 million in the last ten years. This raises the fact that there is an increase in the circulation of illegal cigarettes in Indonesia. Therefore, the central and local governments formed task forces to control illegal cigarettes. This study aims to assist the task force in managing data on the circulation of illegal cigarettes by creating a data management application. This application was developed by implementing the Rapid Application Development (RAD) method. This method consists of four main stages: requirements engineering, system design, development, and implementation. This research has produced an Android-based mobile application that can assist the task force in managing illegal cigarette data. Based on the test results, this application has been declared successful through quality and functionality tests, so it is ready for use by the task force.

Keywords**:** *Illegal Cigarettes, Rapid Application Development, Application, Mobile, Android*

1. Introduction

Cigarettes have become part of the necessities of life for the world's citizens and do not embody Indonesia. According to the World Health Organization (WHO) report, in 2020, the number of active smokers will reach 991 million. Meanwhile, based on the GATS (Global Adult Tobacco Survey) survey conducted in 2021, there was a very significant increase in the number of adult smokers in Indonesia. 60.3 million smokers in 2011 increased by 8.8 million new smokers in 2021 to 69.1 million people. This is a setback for Indonesia in controlling smokers. This fact is in line with the volume of cigarette sales in Indonesia throughout 2021, recorded at 296.2 billion percent from 276.2 billion cigarettes in 2020. To control this fact, try to increase the excise rate on tobacco products. This strategy was chosen to suppress national cigarette consumption, but instead, it decreased. The sales volume increased as the facts above show. Another point is that cigarette sales significantly contribute to state revenue through customs and excise taxes [1]. Excise on tobacco products has become the backbone of national income until 2021 [2].

Since 2012 the government, together with the House of Representatives (DPR), has continuously increased the tariff for tobacco products. In the last seven years, the government and the DPR have asked to increase the tobacco product tariff by an average of 10.92 percent per year [3]. The function of the application of excise on tobacco

ISSN : 2580-7250

products has two main objectives: as a source of state revenue and as a means of government control to reduce the number of smokers in Indonesia [4].

Suppose it is seen from the government's consistency in increasing the excise rate on tobacco products. Still, it does not impact reducing the number of smokers in Indonesia. In that case, it may be able to bring up new facts. This indicates that many tobacco products or cigarettes consumed by the public are marketed illegally [4]. The creation of a black cigarette market is a form of avoiding taxes due to the high excise rate on tobacco products set by the government [5]. The number of illegal cigarettes in Indonesia experienced a downward trend from 2016 to 2019, at 3 percent. However, based on Yuli Nurhanisah's research, in 2020, the percentage of illegal cigarette circulation has increased to 4.9 percent. This could be due to global economic conditions and Indonesia experiencing a slowdown in growth due to the COVID-19 pandemic. As a result, people's purchasing power decreases, so people switch to buying cheaper but illegal cigarettes.

In collaboration with the regional government, the government formed a task force to suppress the growth rate of illegal cigarette circulation through the Directorate General of Customs and Excise. In 2020, the task force recorded actions against illegal cigarette dealers, which reached 9,014 steps. From these enforcement activities, 448.18 million cigarettes were confiscated, which resulted in state losses of 270.79 billion rupiah.
However, this effort has not been able to suppress the circulation of illegal cigarettes, especially in the regions, due to limited access and tools. Many of the findings of the task force in the areas could not be followed up because of the lack of evidence recording equipment. Ultimately, the task force could only provide counseling and socialization to individuals suspected of being dealers of illegal cigarettes. There were criminal sanctions for dealers or sellers of illegal cigarettes. The sanctions are enshrined in articles 54 and 56 of the Republic of Indonesia Law number 39 of 2007 concerning excise [6]. Therefore, this study aims to produce tools to facilitate the task force's work in controlling the circulation of illegal cigarettes. The tool created in this study is a mobile application-based data management application[7] for unlawful cigarette distribution. Utilizing this tool makes it easier for the task force to record findings in the field so that the task force can work efficiently.

Furthermore, this application can also be a source of foothold for higher stakeholders in efforts to take action against individuals who carry out illegal cigarette distribution activities. This application is equipped with a report in the form of a map of the distribution of illegal cigarettes so that it can be seen which areas or areas have the most distribution of illegal cigarettes. This will make it easier for the task force to plan socialization and prosecution activities.

2. Research Methodology

In conducting research, the authors carried out several stages including:

2.1. Research Stages

In general, this research was conducted using a software development approach. This approach is used because it corresponds to the main objective of this study. Rapid development, known as Rapid Application Development (RAD), is one of the software development models. This model has the advantage of a relatively faster development time. This is because each case in the application is developed in a prototype, so it is quicker to be tested on end-users [8]. Following the RAD model, this research has 4 (four) main stages, namely requirements engineering, system design and user feedback, development process, and the last is implementation. The steps of the RAD model used in this study are illustrated in the image below.

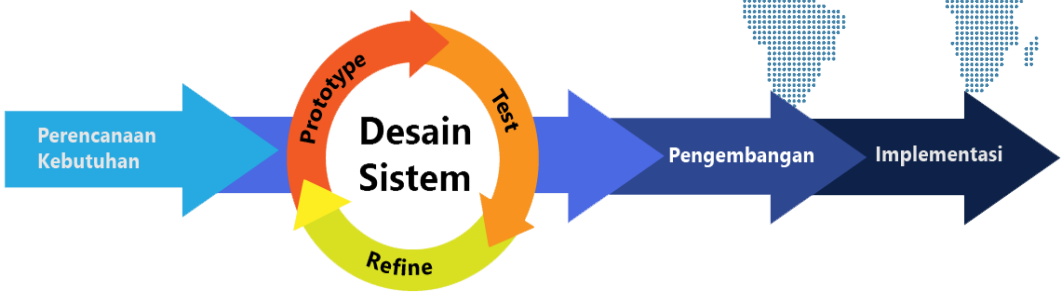

Figure 1. Stages of Rapid Application Development Model

As illustrated in the figure, the following is a detailed explanation of each stage, namely:

a) Requirements Engineering

This stage is the first stage of a series of steps in this research. At this stage, user requirements are collected and separated between functional and non-functional requirements. The involvement of end-users and stakeholders is significant, especially regarding success in software development. The application is developed with a clear and structured description of the needs of these stakeholders. The results of the activities at this stage are collected in a document called a software specification document. The document is then used in the system design stage next. In this document, the functional requirements are grouped into small use cases, then defined as application features. These features are then designed at a later stage.

b) System Design and User Feedback

This stage, referred to as system design, is because, at this stage, all the application's functional requirements are designed. This stage has 3 (three) main activities, namely (1) Prototype Development, (2) Prototype Testing, and (3) Refinement. In the first activity, all functional requirements collected in the previous stage are sorted by priority, then the application flow or business process is designed. Next, the prototype that has been developed is tested on end-users to get feedback. The results of end-user feedback are filtered to find discrepancies in the system design with user needs. This process is repeated until all system functional requirements have been stated according to end-user requirements. Furthermore, the plan is ready to be continued at the application development stage.

c) Development (Development)

The design results at the next stage are realized from a development version of the application to the release version. At this stage, the results of the development of each feature declared to be in the release version are integrated with other components. Then it is ready to be implemented to end-users. However, elements that have not been declared ready to be released are redeveloped by considering feedback from stakeholders.

d) Implementation

At this stage, the release version of the application is applied to the release server so that end users can use the application. Whenever a developed feature has passed the testing stage, it is implemented on the release server so that users will always get updated version information from the application.

3. Results and Discussion

To produce applications from this research, there are procedural steps in accordance with the stages in this research methodology. This stage starts from gathering requirements, then system design and user feedback, followed by the development stage consisting of software architecture, interface design or application interfaces.

3.1. Requirement Engineering Stage

The needs engineering activity involved various stakeholders, such as NTB Provincial Satpol PP representatives and Mataram City Customs. The involvement is to explore the

needs of stakeholders for implementing illegal cigarette data management. Based on the communication of stakeholder needs, functional requirements are obtained. In detail, these needs are described in Table 1 below.

Tabel 1. Functional and Non Functional Requirement

Requirement Code	Functional Requirement
REQ-01	Account Registration and Verification
REQ-02	Master data store
REQ-03	Record Findings
REQ-04	Record Evidence
REQ-05	Input Location By Map
REQ-06	Upload Photos of Evidence and Stores
REQ-07	Report Findings by Location
REQ-08	Finding Report by Date

The functional requirements obtained from the communication process with stakeholders are then illustrated in a use-case diagram presented in Figure 2 below.

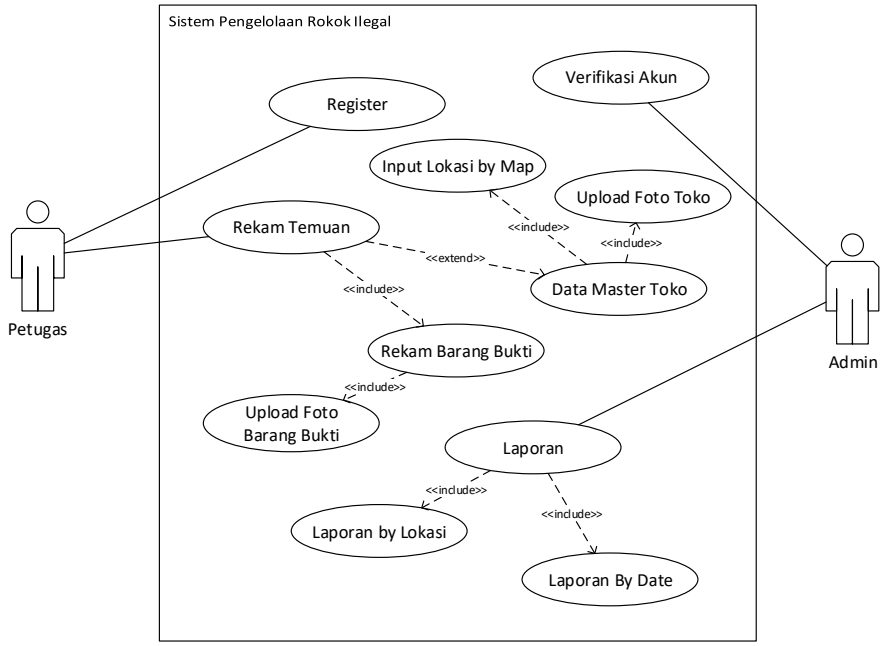

Figure 2. Use Case Diagram of Illegal Cigarette Data Management System

The use-case diagram shows that this application is designed to be managed by two types of users: field officers and administrators. Field officers are personnel in tracking activities carried out by the illegal cigarette task force of West Nusa Tenggara province. These field officers will use an android-based application to enter data on illegal cigarette findings. Meanwhile, the second actor is an administrator on duty in the office to verify the officer's account and recapitulate the findings report based on location and date.

3.2. System Design and Feedback Stage

Based on the use-case diagram above, this application database is designed according to the business process flow of illegal cigarette data management. The designed database consists of seven tables: the user table, kabkota, sub-district, kelurahan, shop, finding records, and the last table is the detailed table of findings. These tables are related, as illustrated in Figure 3 below.

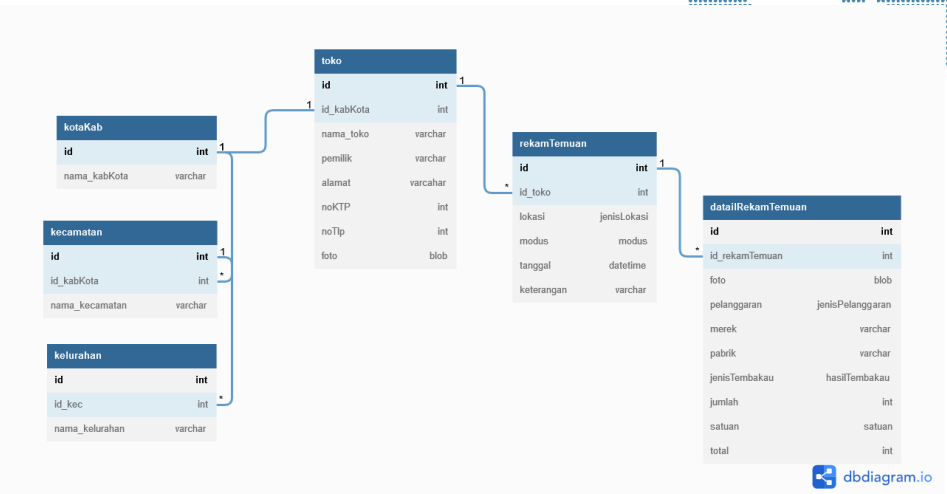

Figure 3. Database Design of Illegal Cigarette Data Management Applications.

From the database design above, it can be seen that an officer can record many findings of illegal cigarette violations. Each result can have many pieces of evidence, so the relationship between the FindRecord table and the FindRecord detail table is one to many. In addition to being able to record findings in the database above, a shop table is provided as well as a table for districts, districts, and villages to record store data along with their addresses and locations.

3.3. Development Stage

Furthermore, from the results of the requirements engineering and system design above, the application for data management of illegal cigarettes is in the development stage. The above procedure has two types of applications: Android-based mobile applications and web-based monitoring applications. An Android-based mobile application for field officers, while administrators use a web-based application to recapitulate recorded findings. The first activity of this development stage is to design a software architecture to facilitate the deployment or implementation process. In Figure 4, it can be seen that this application is designed in three main layers, namely (1) Service Layer, (2) Data Layer, and (3) Client Layer. At first glance, this application architecture is like a client-server architecture, with a server part, namely the service and data layers, and a client part. However, the main difference from this architecture lies in the existence of a web service, the REST API, which is an interface for data communication and business logic in this application. This application uses a microservice architecture that puts forward the MVC (Model, View, Controller) concept.

With this study's implementation of the microservice architecture, each layer is an independent service and does not affect the other layers [9].

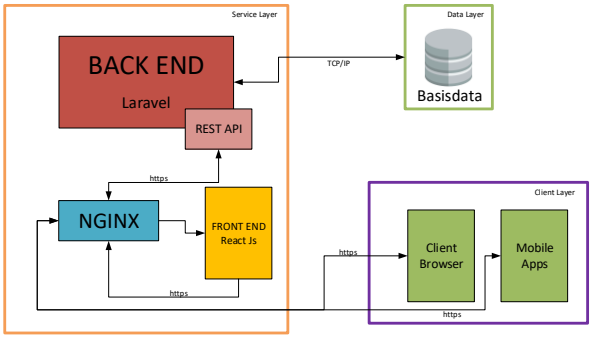

Figure 4. The architecture of Illegal Cigarette Data Management Applications

The application of this architecture in the application development process is essential because it can be done without disturbing the application being used [10]. This means that any changes that occur in the application's advanced development process will not affect the application currently being used by the end-user. Communication between the service layer and the client layer uses the HTTP protocol. Similarly, contact between components in the service layer communicates with the HTTP protocol. Meanwhile, communication between the service and data layers uses the TCP/IP protocol.

Furthermore, the application user interface design is also carried out at this development stage. This application interface was developed with a user-centered approach, where the involvement and experience of potential users are needed to get the interface that best suits the characteristics of the user [11]. The following is the result of the application development stage, which is presented in Figure 5.

Figure 5. Illegal Cigarette Data Management Application Login Interface

Figure 5 shows user interface displays for login and register activities. Officers whose accounts have been registered can enter their username and password directly to get through this page. Meanwhile, if the officer does not have an account, you can register first. Furthermore, if the officer has logged into the application, the officer will be presented with a finding record page, as shown in Figure 6. Figure 6a is the main menu of the illegal cigarette data management application activity because the activity on this menu is the primary purpose of this application. In the Record Findings menu, officers can enter data related to illegal cigarette findings in a location. One of the data that must be entered is store data, which can be searched through the store search facility on this page. However, if the store name is not found, the clerk can enter new store data by pressing the add button.

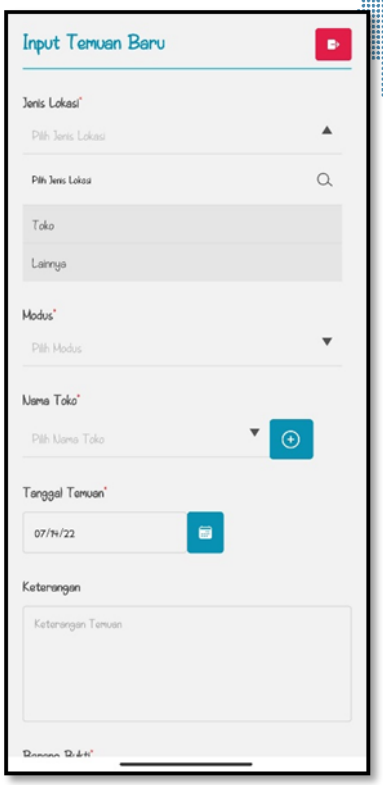

Figure 6a. Record Finding Interface

Then the clerk will be presented with a new store data input page, where the clerk can enter complete store data, including the store coordinates facilitated by google maps service, according to the display in Figure 6b.

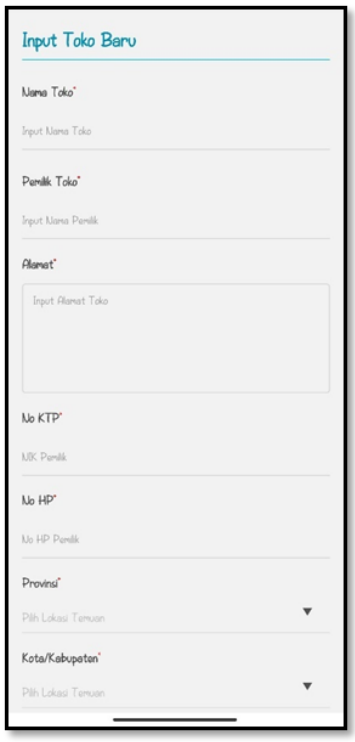

Figure 6b. Record Finding Interface

In addition, officers are also asked to upload photos of the shop as part of the completeness of the data. Next step, if the officer has finished entering the new store data, the officer can continue completing the findings record data. The central part of recording findings is entering evidence data. The evidence is in the form of cigarettes which are legally considered illegal. The illegal cigarette data was recorded using an application, as shown in Figure 7 below.

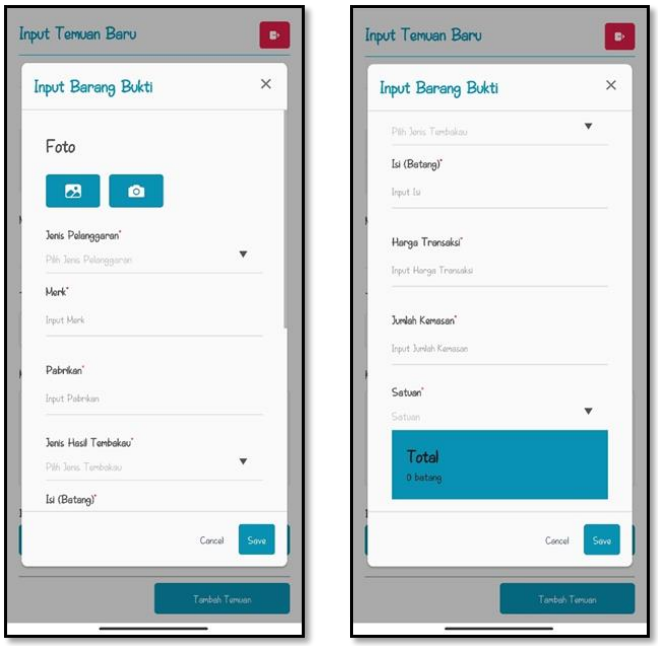

Figure 7. Input Data Evidence Interface

In this form, officers are asked to enter evidence data to support the recording of the findings. Officers are requested to enter data such as evidence photos and types of violations that officers can choose from. The types of violations consist of (1) Cigarettes Without Excise Tape, (2) Cigarettes With Fake Excise Tapes, (3) Cigarettes With Used Excise Tapes, and (4) Cigarettes With Different Excise Tapes. Furthermore, officers can enter the brand and manufacturer of cigarettes.

Next, the officer can enter the type of tobacco product with a choice of (1) Hand-rolled Cigarettes, (2) Machine-Made Cigarettes, (3) Machined White Cigarettes, (4) Klobot, (5) Slice Tobacco, (6) Cigars, (7) Cigarettes Filter Hand Cigarettes, and (8) Filter Hand White Cigarettes. Then the officer can enter the amount of evidence found. The number of evidence can be entered according to the choice of unit of goods. There are three types of units of goods, namely (1) Bal, (2) Slop, and (3) Wrap. In addition, officers can enter the number of packages found as evidence.

The final part of this activity is calculating the amount of evidence converted into total cigarettes based on the selected unit. The following is a way of converting the amount of evidence into total bars presented in Table 2 below.

Tabel 2. Conversion of Cigarette Units to Total Rods

Unit	Conversion
1 Bal	20 Slop
1 Slop	20 Packs
1 Packs	Optional depending on the number of contents (stems) entered

For example, if the officer finds 1 bale of illegal cigarettes, the system will display it in total sticks, calculating 1 bale x 20 slops x 10 packs = 200 packs. Then the number of 200

packs is multiplied by the number of cigarettes per pack previously entered. If 1 pack of cigarettes is inputted with as many as 16 cigarettes, then the total cigarettes obtained through the conversion are 3.200 cigarettes. This process of entering evidence can be repeated several times depending on how much evidence is found.

3.4. Implementation Stage

Testing is necessary to ensure that the developed application has met stakeholder expectations. To test the application, two test methods are the white box test and the black box test. Testing with the white box method aims to test and analyze the program algorithm whether it has efficient performance or vice versa [12]. Meanwhile, testing with the black box method seeks to find out whether all functional or features agreed with stakeholders have been fulfilled or not [13].

In this study, the testing process is only focused on testing application functionality using the black box test method. Testing with this method is carried out on five cases, namely (1) Login and registration, (2) record findings, (3) record evidence, (4) store master data input, and (5) Reports. This method's testing process has two scenarios: testing using the correct data and procedures. The second scenario is testing with the wrong data and functions. These two scenarios have different purposes. The first scenario aims to test whether the application runs according to the scenario case or not. At the same time, the second scenario is to determine whether the application can respond to human errors when the application is used. In addition, to find out whether in the application there are still errors, bugs, and defects [14][15].

Tabel 3. Recapitulation of Test Results on Four Application Cases

Test Code	Test Case	Test Result	Status
TS-01A	User login	The system displays an error message when the user enters an incorrect or unregistered profile account. The system displays the findings record page if the profile account entered is correct by validating it with the user database.	Success
TS-01B	Registration	The system will display an error message if the data for the new account is the same as the data in the application database. While the system will display and send a message to the user's email if the new account data is not in the database	Success
TS-02	Record Findings	The system will display an error message if the data entered by the user is empty or does not match the data request before the user saves the findings. Meanwhile the system will display a success message if the user enters mandatory data	Success
TS-03	Record Evidence	The system correctly displays information on finding illegal cigarettes in the total cigarettes if the user enters data on the number of packages, units, and contents (stems). Meanwhile, the system cannot display information on illegal cigarette findings if one of these data is not inputted. In addition, the system cannot save data even though the user presses the save button if the total data for cigarettes has not been filled, by displaying an error message	Success
TS-04	Store Master Data Input	The system will display an error message if the user's internet connection is unavailable	Success

Test Code	Test Case	Test Result	Status
		when the user takes the store's location based on the map.	
TS-05	Report	The system displays data recording findings made through a mobile application. The system can recapitulate the record data of results based on location and the recording date. In addition, the system can display a map of the distribution of illegal cigarettes based on districts and cities in the province of NTB	Success

Table 3 shows the test results with two scenarios following the predetermined test plan. Based on the results of the two scenarios above, testing using the black box method shows that the application can work well. Therefore, it can be concluded that the application has fulfilled all its functions following what was specified at the requirements engineering stage.

4. Conclusion

The development of illegal cigarette data management applications has resulted in an Android-based mobile application. The application can record data on illegal cigarettes along with evidence of violations. The test results show that the application can run well, and all functionality is met. When recording the evidence, the application produced a good unit data conversion. It is evident from the test results that the application can display the total cigarettes by entering the unit data, the number of packages, and the contents (stems) per pack. The application produced in this study only serves as a data recording of illegal cigarette circulation. For future researchers, this research can be equipped with other additional functions following the activities of prosecuting illegal cigarette violations.

Acknowledgements

Thank you to the Head of NTB Provincial Satpol PP and the Head of the Customs and Excise Supervision and Service Office of Type C Intermediate Customs, Mataram City, for their support in completing this research. In addition, thanks are extended to various parties, especially the universities where the author is based, who provide a space for literary expression to produce this publication.

References

[1] B. A. Nafi'ah, "Strategi Kebijakan Kenaikan Tarif Cukai Hasil Tembakau Dalam Rangka Menekan Konsumsi Rokok Indonesia," *J. Gov. Adm. Reform*, vol. 2, no. 1, pp. 61–81, 2021.

[2] I. Antonius, "Persen Penerimanaan Cukai Masih Disumbang dari Industri Hasil Tembakau." 2021.

[3] K. DJBC, "BPK Apresiasi Kinerja Bea Cukai Dalam Menjaga Penerimaan Negara Dari Sektor Cukai," *https://www.beacukai.go.id/*, 2020. https://www.beacukai.go.id/berita/bpk- apresiasi-kinerja-bea-cukai-dalam-menjaga-penerimaan-negara-dari-sektor- cukai.html (accessed May 28, 2021).

[4] E. N. Azizah and A. S. Purwana, "Pengaruh Kebijakan Tarif Cukai Hasil tembakau dan Aktivitas Pengawasan Terhadap Peredaran Hasil Tembakau Ilegal," *J. Perspekt. BEA DAN CUKAI*, vol. 5, no. 1, pp. 63–78, 2021.

[5] F. J. Chaloupka, A. Yurekli, and G. T. Fong, "Tobacco taxes as a tobacco control strategy," *Tob. Control*, vol. 21, no. 2, pp. 172–180, 2012.

[6] D. T. E. Widodo, A. Bidasari, and S. Suciati, "Implementasi Undang–undang

Nomor 39 Tahun 2007 Tentang Cukai Terhadap Produk Hasil Pengolahan Tembakau Lainnya Berupa Liquid Personal Vaporizer yang tidak Dilengkapi oleh Pita Cukai," *J. Panor. Huk.*, vol. 6, no. 1, pp. 68–74, 2021.

[7] I. G. I. Sudipa, I. N. S. W. Wijaya, M. L. Radhitya, I. M. A. Mahawan, and I. N. A. Arsana, "An android-based application to predict student with extraordinary academic achievement," in *Journal of Physics: Conference Series*, 2020, vol. 1469, no. 1. doi: 10.1088/1742-6596/1469/1/012043.

[8] and A. B. M. Tajuddin, Muhammad, *Sistem Informasi*. Yogyakarta: Deepublish, 2020.

[9] S. Daya *et al.*, *Microservices from theory to practice: creating applications in IBM Bluemix using the microservices approach*. IBM Redbooks, 2016.

[10] A. Z. Awalwi, M. W. M. Akbar, N. Nabila, and S. Sundari, "Aplikasi Pengajuan Beasiswa Mahasiswa Politeknik Negeri Bandung," in *Prosiding Industrial Research Workshop and National Seminar*, 2020, vol. 11, no. 1, pp. 517–523.

[11] K. Angelina, E. Sutomo, and V. Nurcahyawati, "Desain UI UX Aplikasi Penjualan dengan Menyelaraskan Kebutuhan Bisnis menggunakan Pendekatan Design Thinking," *Temat. J. Teknol. Inf. Komun.*, vol. 9, no. 1, pp. 70–78, 2022.

[12] C. T. Pratala, E. M. Asyer, I. Prayudi, and A. Saifudin, "Pengujian White Box pada Aplikasi Cash Flow Berbasis Android Menggunakan Teknik Basis Path," *J. Inform. Univ. Pamulang*, vol. 5, no. 2, pp. 111–119, 2020.

[13] R. Setyawati and A. B. Maulachela, "Penerapan Algoritma Dynamic Priority Scheduling pada Antrian Pencucian Mobil," *JTIM J. Teknol. Inf. dan Multimed.*, vol. 2, no. 1, pp. 29–35, 2020.

[14] H. Bhasin and E. Khanna, "Black box testing based on requirement analysis and design specifications," *Int. J. Comput. Appl.*, vol. 87, no. 18, 2014.

[15] S. Nidhra and J. Dondeti, "Black box and white box testing techniques-a literature review," *Int. J. Embed. Syst. Appl.*, vol. 2, no. 2, pp. 29–50, 2012.

Authors

1st Author
Adam Bachtiar Maulachela
Universitas Pendidikan Mandalika, Mataram, Indonesia

2nd Author
Jian Budiarto
Universitas Nahdlatul Ulama Nusa Tenggara Barat, Indonesia

3th Author
Ahmad Ashril Rizal
Universitas Islam Negeri Mataram, Indonesia

4th Author
Lalu Puji Indra Kharisma
STMIK Syaikh Zainuddin NW Anjani, Lombok Timur, Indonesia