Article

Application Integration for Sustainability Smart Tourism Model in Indonesia

Ruci Meiyanti[1], Harry Dhika[2], Riri Fajriyah[3], Nur Istiqamah Iskandar Alam[4]

[1,3,4] Information System, Faculty of Computer Science, Mercu Buana University
[2]Informatics, Faculty of Engineer, Indraprasta PGRI University

A B S T R A C T

The existence of the COVID-19 pandemic over the past few years has made the tourism world slump, and Indonesia is no exception. However, this creates a potential use of IT not only for managing tourism activities but also for managing risks and conflicts that arise due to pandemics or others. The existence of various integrated managements on the economic, socio-cultural, and ecological dimensions can create tourism sustainability that is supported by technological

advances. The purpose of this study is to provide a comprehensive and integrated model of sustainable tourism activities supported by the use of IS/IT infrastructure. The methods used in the formation of this model are Interpretative Structural Modeling (ISM) and smart thinking. From ISM, four key components are produced, namely innovation, local wisdom, local community resources, and revitalization of tourist destinations due to disasters. The results of this study are in the form of a smart tourism sustainability model in Indonesia which is supported by an integrated application derived from the four key components.

INTRODUCTION

Indonesia as a developing country still have a lot to improve in achieving a successful tourism like digital literature, multiculturalism, inadequate infrastructure, poor management, crisis management, tourism competitiveness management, data protection, and integrated tourism governance between the government and the private sector [1]. Meanwhile, there are many things that must be considered in tourism management such as the responsibilities carried out by stakeholders [2].

Especially after this COVID-19 pandemic smart tourism and sustainable city research has become a popular trend [3]. Covid-19 pandemic has not only become a national disaster but a worldwide disaster. The decline in the number of tourists, the decline in tourism sector income, the increase in the unemployment rate, and the bankruptcy of the tourism business are the things caused by the COVID-19 pandemic [4], [5], [6]. We need a system that can support sustainable tourism both socioeconomically and ecologically [7].

A post-disaster tourism strategy is needed to maintain tourism sustainability that carries the importance of local culture and religion in tourism recovery [8]. Therefore, handling tourism in Indonesia with all its characteristics requires professional and innovative management.

Meanwhile, tourism is said to be a complex system because of things that make tourism behavior uncontrollable such as disasters, epidemics, technological disruption, tourist behavior, and others [8]. To deal with complex and sustainable systems, it can be done by breaking down the system into sub-systems [9]. Starting from collecting various components that make up the system by using in-depth interviews and literature studies. Furthermore, determining key components that can be used as components that trigger the success of a system [10].

This study uses the ISM method in order to obtain the key components in the sustainability of smart tourism in Indonesia. These key components are then used as a reference in the formation of the model. The model was developed using the concept of systems thinking [11]. In this concept, relationship between the components which are interconnected and interdependent are manifested in the formation of the model. The model generated from this research is a model that visualizes various applications that support the sustainability components of smart tourism in Indonesia in an integrated manner.

I. LITERATURES REVIEW

1.1. The theory is related to the object of research

The basis or reference in research is based on theories from the results of previous research, which is very important information and can be used as supporting data in making a research. The research process was carried out based on previous studies which were used as a basis for building applications related to the QR Code. Therefore, as a basis for research and building an information system based on QR codes, the authors search for and retrieve several references and several previous research journals.

Referring to research conducted by (Ariska, 2016). The final result of the document validation application is in the form of a QR Code which is used to store the URL indicating that the document is indeed an official document. In this study, it is necessary to add features to display others so that the information obtained when doing the scanning is more complete and it is hoped that the features will be in the form of 3D to make them more attractive and detailed. In addition, this research is also based on research conducted by (Putra, 2018).

1.2. Theory about the system used

1.2.1. QRCode

QR Code is a two-dimensional matrix symbol consisting of a string of squares arranged in a larger square pattern. These square boxes are then referred to as modules. The width of the square pattern will determine the QR Code version (Saputra, 2021).

According to Musthofa, et al (2018) (Saputra, 2021), the QR Code is an extension of the Quick Response Code, the QR Codecano accommodates this type of information directly. To open the information provided by the QR Code requires a scanner to open it.

1.2.2. SDLC

The theory about SDLC is based on previous researchers (Nurhadi, 2018) Rosa & Shalahudin (2018) suggest that: SDLC or Software Development Life Cycle or often also called the System Development Life Cycle is the process of developing or changing a software system using models and the methodologies people used to develop previous software systems (based on base practice or well-tested ways).

This is also reinforced according to (Larasati, 2017) in Rosa & Shalahudin (2018) stating that "System Development Life Cycle (SDLC) is a methodology used to develop, maintain and use information systems".

The stages in SDLC globally according to (Sitinjak, 2020) in Rosa & Shalahudin (2018) are as follows:

1. Initiation

2. System Concept Development
3. Planning
4. Requirement Analysis
5. Design
6. Development
7. Integration and Test
8. Implementation
9. Operations and Maintenance
10. Disposition

1.2.3. Waterfall Model

In the research conducted (Rosadi, 2019) according to Sukamto & Shalahudin (2018), many SDLC waterfall models also call the Classic life Cycle model, and some even call it the sequential linear model.

And based on research (Handrianto, 2020) according to Sukamto & Shalahudin (2018), the waterfall model is a model flow that provides a software life flow approach with a sequential or systematic model flow starting from analysis, design, coding, and testing.

The stages in Waterfall are as follows:

1. Analysis

   Is a method used to analyze software requirements, both the functions and processes of the web created, as well as identify constraints in making the web, analyze the reliability that will occur, weaknesses, and the technology used.

2. Design

   In making a software design, there are several process stages or steps for making a program design in software including data structures, architectures, interface representations, and coding procedures. This stage is the stage for translating software requirements from the needs analysis stage to the design representation so that it can be implemented into a program at a later stage. After everything is arranged rapidly and measurably, both the results and the design, it is necessary to document the software that is made.

3. Coding

   The design must be translated into a software program. The design is made according to the existing design of the computer program. Or the author's stages of making a program with the programming language PHP, HTML, SCC, and others.

4. Testing

   Testing of the program that has been made needs to be validated whether it functions properly and is by the design and expectations. Where aims to find out the weak points and points of error in the program.

II. FRAMEWORK

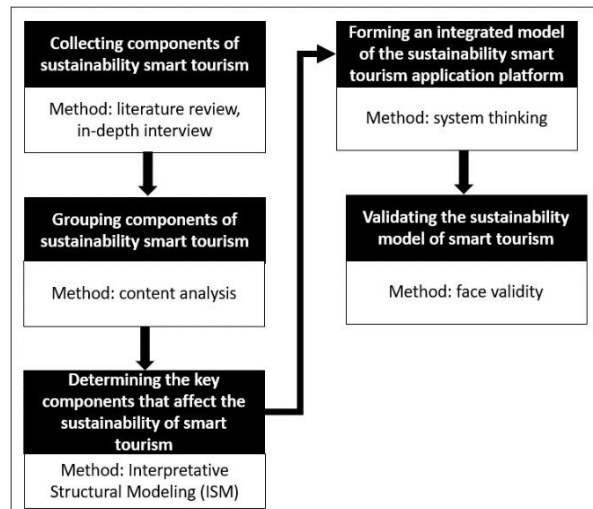In this study, the stages of research were carried out as shown in Figure 1.

Figure 1. Research Stages

2.1 Method of Obtaining Model Components

Firstly, we collected the supporting components for the sustainability of smart tourism. The components were obtained from various literature indexed by Scopus were collected from the year 2017 to 2022. At the same time, the components of tourism sustainability from in-depth interviews with tourism experts as the source person. The sustainability components that have been collected from literature study are shown in table 1.

Table 1. Components Obtained from Literature Study

No	Component	References
1	Business Process	[12], [13]
2	Local job	[14], [3]
3	Threatening sustainability	[14]
4	Regulation	[15], [16], [14]
5	Mitigation	[17]
6	Community leadership	[14], [18]
7	Capacity of destination management	[19], [20]
8	local community empowerment	[18], [21]
9	Open source platform	[22]
10	Technology socialization	[23], [24]
11	Collaboration of Stakeholders	[18], [25]
12	Competitive ability	[26], [27], [28]
13	Risk and conflict management	[29], [30]
14	Innovation	[31], [32]

15	Tourism Entrepreneur	[33], [34]
16	Local wisdom	[35], [36]
17	Analysis sentiment	[37], [38]
18	Internet facility	[24], [39]
19	Tourism digital startup	[40]
20	Accessibility ICT	[24], [39]

Secondly, we interviewed the experts from the academia, government, and industry working in the world of tourism. The result is the components that can support the sustainability of smart tourism as follow in table 2, table 3, and table 4.

Table 2. Components obtained from interviews with academics

No	Components Obtained
1	IT Infrastructure
2	Digitization of tourism services
3	Digital Literature
4	Stakeholder Collaboration
5	System Integration
6	Innovation
7	Virtual Experiences
8	Travel customization
9	Virtual Technology
10	Business Process
11	Destination management
12	Competitive Strategy
13	Integrated Technology

Table 3. Components obtained from interviews with government

No	Components Obtained
1	Consumer behaviour
2	Travel Products
3	Capacity, conditions and destination facilities
4	Market needs
5	Competitor destination strength
6	Tourist destination availability
7	Comprehensive integration
8	Data science tourism
9	Human resource for tourism
10	Risk management
11	Revitalization of tourism destination
12	Tourism sustainability

Table 4. Components obtained from interviews with people in the industry

No	Components Obtained
1	Open-source platform
2	IT Infrastructure
3	Tourist facilities and infrastructure
4	Market needs
5	Potential tourist destinations
6	Digitization of travel services
7	Tourism startups
8	Virtual travel experiences
9	Tourism data science

10	Quality tourism human resources
11	Integrated management
12	Government regulatory support

III. METHODS

From the results of the components collected both through literature studies and interviews with experts, we obtained components that can be used for tourism sustainability, including for the development of smart tourism sustainability. Therefore, it is necessary to re-analyze these components to determine the relationship between components and the role of components that can be used as key components or components that drive the success of integrated smart tourism development.

2.2. Components Analysis

The next stage is to conduct content analysis on the various components obtained. The components obtained from the literature study were collected together with the components obtained from interviews with experts from academia, government, and industry. Components are selected and grouped based on similar understanding or similar definitions. This process is carried out by a team.

After that, the components are inserted into three groups of dimensions of sustainable tourism. The three dimensions of sustainability used are (1) economy, (2) socio-cultural/community, and (3) environment or ecology.

There are 11 components of sustainable tourism in economic dimension namely (1) business processes, (2) competitiveness, (3) tourism products, (4) tourism capacities, (5) market analysis of tourism, (6) stakeholder collaboration, (7) innovation, (8) digital services, (9) an integrated system, (10) creativity of local residents, and (11) local entrepreneurs.

We obtained eight components of sustainable tourism in socio-cultural dimension of society namely (1) local culture, (2) local residents as human resources for tourism, (3) stakeholder collaboration, (4) innovation, (5) digital services, (6) integrated system, (7) creativity of local residents, and (8) local entrepreneurs.

Meanwhile we obtained nine components of sustainable tourism in ecology dimension namely (1) hygiene and sanitation management in tourist destinations, (2) preservation and conservation management of tourist destination areas, (3) restoration of tourist destinations due to disasters, (4) stakeholder collaboration, (5) innovation, (6) digital services, (7) an integrated system, (8) creativity of local residents, and (9) local entrepreneurs.

After being grouped into three dimensions, the components that intersect between dimensions and components that are only found in one dimension are shown in Figure 2. The intersecting components of the three dimensions are in a triangular image which consists of six components, namely (1) stakeholder collaboration, (2) innovation, (3) digital services, (4) integrated systems, (5) creativity of local residents, and (6) local entrepreneurs. In addition, each dimension has a distinctive component, the economic dimension has five distinctive components, namely (1) business processes, (2) competitiveness, (3) tourism products, (4) tourism capacities, and (5) market analysis of tourism. In the socio-cultural dimension, there are two distinctive components, namely (1) local culture and (2) local residents as human resources for tourism. Meanwhile, the environmental dimension has three distinctive components, namely (1) hygiene and sanitation management in tourist destinations, (2) preservation and conservation management of tourist destination areas, and (3) restoration of tourist destinations due to disasters.
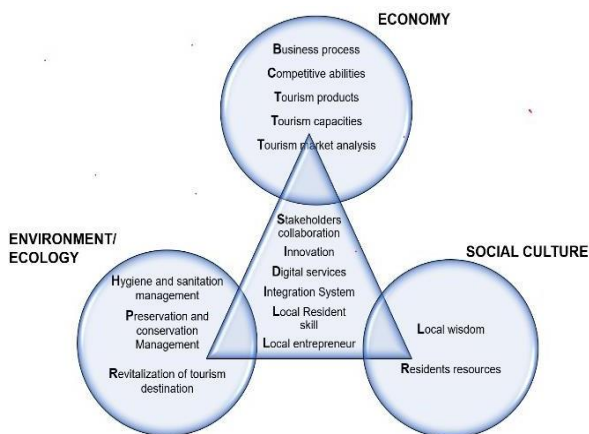

Figure 2. Components on the three dimensions of sustainability as well as the intersection of dimensions

Meanwhile, technology and its development become supporting tools needed to achieve success in each dimension or can be used on all dimensions in an integrated manner. Various IS/IT technologies that can be used in the sustainability of smart tourism include IT infrastructure including the availability of internet facilities, open-source platforms, digital startups for tourism application development, tourism business intelligence applications, travel experience applications in cyberspace with virtual technology.

Furthermore, the components are arranged in the form of an ISM questionnaire. The assessment of the questionnaire was carried out by experts. The results of the expert's assessment are then processed using ISM software to obtain results in the form of key components of each sustainability dimension.

IV. RESULT

3.1 Result of Key Components from ISM
For the sustainability in economic dimension based on figure 2, was gotten 11 components. The key component is obtained namely innovation which is the 7th variable as shown in Figure 3 in the form of an ISM graph.

Figure 3. ISM results for the sustainability in economic dimension

For the sustainability in socio-cultural dimension which has a total of eight components, the key components are local culture (1st variable), and local residents as human resources for tourism (2nd variable). This can be seen in Figure 4 which is a graph of the results of ISM from the socio-cultural dimension.
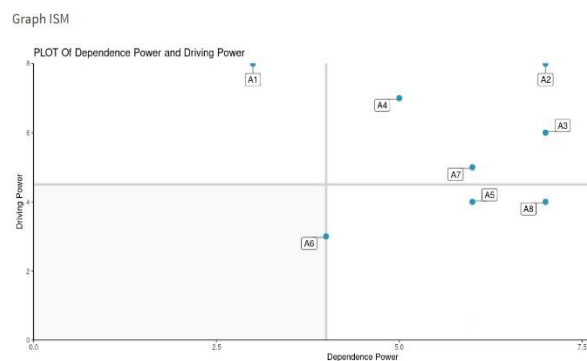

Figure 4. ISM results for the sustainability in socio-cultural dimension
Meanwhile for the sustainability in ecology or environment dimension has the total of nine components. The key component is revitalization of tourist destinations due to disasters (3rd variable) as shown in Figure 5 which is a graph of the results of ISM data processing on the environmental dimension.
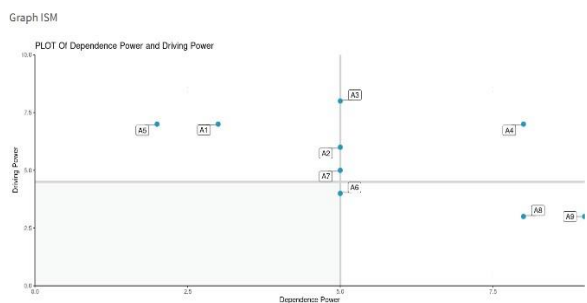
Figure 5. ISM results for the sustainability in ecology dimension
All components including key components (bold written in table 5) are developed into the form of developing sustainable smart tourism applications as shown in table 5.

Table 5. Components of sustainability dimensions in application development

Dimension	Components	Application Development
Economy	Business process Competitive abilities Tourism capacities	Smart business
	Tourism market analysis Tourism products	Smart marketing
Socio-cultural	**Local culture** **Resident resources**	Smart community
Environment/ ecology	Hygiene and sanitation management Preservation and conservation Management	Smart ecology
	Revitalization of tourism destination	
Dimension intersection	Stakeholder collaboration Integration system	Smart governance
	Innovation Local Resident skill Local entrepreneur Digital services	Smart enrichment

Furthermore, the application development is made in an integrated application platform model.

3.2 Result of Model
The model generated by using an understanding of the concept of systems thinking is then validated by experts to state the accuracy and suitability of the needs in achieving the success of smart tourism sustainability.
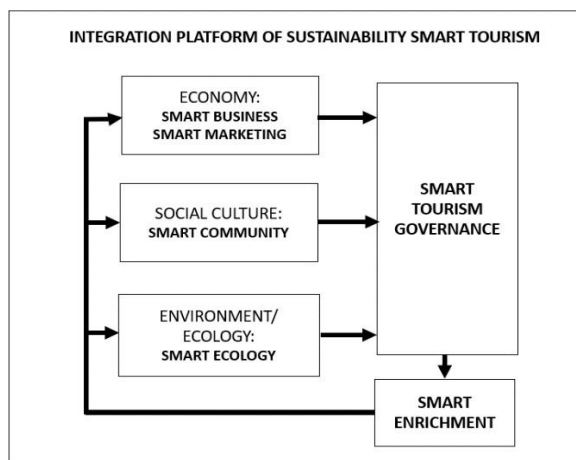

Figure 6. Integration of the application platform on the sustainable model of smart tourism

The resulting model is shown in Figure 6. It appears that the role of IS/IT is involved in efforts to develop sustainability in the form of a sustainable smart tourism application platform.

In the economic dimension, applications that consist of smart business and smart marketing can be developed. Meanwhile, in the socio-cultural dimension which has key components of local culture and local community resources, a smart community is developed. In the environmental/ecological dimension, smart ecology applications can be developed.

Meanwhile, there are intersecting components of the three dimensions. These components have the same function but different development objects adjust to the dimensions that underlie them. These components are stakeholder collaboration, integrated systems, innovation, creativity of local residents, local entrepreneurs, and digital services. Customer satisfaction coupled with application performance makes the management of information systems quality

For this reason, in this section, smart governance and smart enrichment applications can be developed.
Each dimension is connected by arrows pointing to the dimensions of the slice. This means that the components in each dimension can be implemented in a system that is integrated with the personnel of the collaborating stakeholders. Next, the arrow returns to each dimension, meaning that the innovation or skills produced by the smart enrichment will be used for the sustainability development of each dimension.

The model has been validated using face validity by government experts and academics. They stated that the components have been adequately represented in the development of sustainable smart tourism.

V. DISCUSSION

Based on the key components of innovation, smart enrichment is made. Smart enrichment is expected to be able to encourage the success of smart business and smart marketing in the economic dimension. Innovation is expected to support the economic dimension of the sustainability of smart tourism.

Dynamic innovations must be able to meet the needs of tourist visitors and these innovations can always adapt to the development of the period and technology [31].

Meanwhile, smart communities which have key components in the form of local culture and local residents as human resources make the development of smart tourism applications for the socio-cultural dimension very meaningful for tourism sustainability.

Local culture coupled with the human resources of the local residents will further add to the value of the competitiveness of tourism in the destination [36].

In the post-pandemic period, the revitalization of tourist destinations is the main thing to pay attention. Smart ecology with a key component in the form of destination recovery due to disasters is the right thing to be developed so that tourism can quickly rise from adversity and grow significantly [41].

Meanwhile, in smart governance, the collaboration of stakeholders [14], [18] and this integrated system further encourage the creation of integrated digital services [42], [43] on the three dimensions of tourism sustainability. The existence of smart governance is expected to strengthen smart enrichment by creating new innovations that can encourage the improvement of local community's skills and motivate them to become entrepreneurs. This is what drives the dynamics of the tourism system so as to create a sustainable tourism smart system.

VI. CONCLUSION

By eliminating the redundancy of components contained in each dimension, this study obtained 16 components of sustainability smart tourism. Meanwhile, four key components, namely (1) innovation, (2) local culture, (3) local community resources, and (4) revitalization of tourist destinations due to disasters will serve as a driving force for other components to trigger the success of the sustainability of smart tourism applications.

These key components can trigger the formation of several applications that are integrated in an application model platform of smart tourism sustainability. Several applications that are formed from the key components are the application of (1) smart enrichment in which there is an innovation component (2), smart community in which there are the components of local culture and local community resources, (5) smart ecology in which there are key components for the revitalization of tourist destinations due to disasters. Meanwhile, other components that are not key components are included in the application but they support the success of sustainable smart tourism. They are smart business, smart marketing, and smart governance.

Due to limited time, effort, and cost, in-depth interviews were conducted online with several experts from academia, government, and industry. Research suggestions, for future research, it is hoped that research can be carried out on various tourist destinations in Indonesia from various types of tourism so that various sustainability components can be obtained.

Measurement of the sustainability index of a tourist destination can also be developed into an application that can help increase the competitive advantage of tourist destinations in Indonesia

VII. ACKNOWLEDGEMENT

REFERENCES

Agustina, W. S. (2017). Application of Intranet-Based QR Code Labeling Techniques in Hospital Asset Management Information Systems. *R. Syamsudin, SH. Sukabumi. SWABUMI Journal, Vol. 5 No. 2 September 2017, pp. 181~194. ISSN : 2355-990X , E-ISSN : 2549-5178.*

Amarta, R. P. (2021). Development of a QR Code-Based Library Information System (Quick Response Code). (Case Study of the Library of the Faculty of Engineering, University of Majalengka). *Presiding the National Seminar on Science and Technology Applications (SNAST) 2021, Yogyakarta, 20 March 2021. ISSN: 1979-911X.*

Ariska, J. (2016). Design and Build a School Asset Management Information System Using the QR Code

Labeling Technique (Case Study: MAN 2 Model Pekanbaru). *Journal of Information Systems Engineering and Management, Vol. 2, No. 2, August 2016. e-ISSN : 2502-8995 , ISSN : 2460-8181.*

Handrianto, Y. (2020). The Waterfall Model in Designing Information Systems for Ordering Products and Web-Based Outlets. *Journal of Informatics Innovation (JII) Pradita University, Volume: 5, Number: 2, September 2020. e-Issn : 2686-1615 , p-Issn : 2527-4007.*

Hidayat, E. A. (2019). Designing a QR Code-Based Information System to Display Collection Data at Balekambang Park, Surakarta. Muhammadiyah Surakarta university. *Jurnal.*

Huda, N. (2020). Implementation of Goods Inventory Information System at PT. PLN (Persero) Palembang. *SISFOKOM Journal (Information and Computer Systems), volume 9, number 1, pp 13 - 19, p-ISSN 2301-7988 , e-ISSN 2581-0588.*

Indartono, K. (2019). Car Security System Prototype Using Android And Arduino Based Quick Response Code. *Journal of Information Technology and Computer Science (JTIIK), DOI : 10.25126/jtiik. 20186964. Vol. 6, No. 3, June 2019, p. 235-244, p-ISSN 2355-7699 , e-ISSN 2528-6579, KEMENRISTEKDIKTI Accreditation, No. 30/E/KPT/2018.*

Kadarisman, E. P. (2019). QR Code-Based Batik Collection Information Display System in Siti Walidah Muhammadiyah Surakarta Seminar Building. *Sinus Scientific Journal (JIS) Vol. 7, No. 1, January 2019. ISSN (print) : 1693-1173 , ISSN (online) : 2548-4028.*

Larasati, H. (2017). Analysis and Design of a GRC Purchasing Information System Using the Waterfall Method. . *Pilar Nusa Mandiri Journal, Vol. 13, No. 2,*

September 2017. P-ISSN: 1978-1946 | E-ISSN: 2527-6514 | Analysis And Design.

Nurhadi, A. (2018). Application of the Waterfall Method in the Online Household Assistant Provider Information System. *Equator Journal of Informatics, Vol. VII, No. 2, December 2018. p-ISSN : 2339-1928 , e-ISSN : 2579-633X.*

Putra, I. N. (2018). Development of a QR Code-Based Inventory System Using a Web Service in the Field of Facilities and Infrastructure for STMIK STIKOM Indonesia. *National Journal of Informatics Engineering Education, Volume 7, Number 3, December 2018. ISSN 2089-8673 (print) | ISSN 2548-4265 (online).*

Rosadi. (2019). Web-Based Employee Performance Assessment Information System at the Kasih Suwitno Foundation. *SATIN-Science and Information Technology, Vol. 5, No. 2, December 2019.*

Saputra, A. (2021). Application of the QR Code for the Web-Based Bengkalis State Polytechnic Goods Asset Information System. Bengkalis State Polytechnic. *Journal.*

Sitinjak, D. D. (2020). Analysis and Design of English Course Administrative Information Systems in the Intensive English Course in Ciledug, Tangerang. *IPSIKOM Journal, Vol. 8, No. 1, June 2020. ISSN : 2338-4093 , E-ISSN : 2686-6382.*

Sutisna, A. (2022). Designing Goods Recording Applications Using Barcodes and QR Codes at Kuningan Guest House. *Journal of Social Cyber Systems (JSS), Vol. 1 No. 1 (2022) 16-24. ISSN: 2808-8239.*

Teddy, F. (2013). Development of QR Code-Based Ticketing Applications with Encrypted Data for Gelora Bung Karno Stadium. Yogyakarta Atma Jaya University. *Journal.*