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Redesigning Driver's License Application Processes for Motorcycle in Indonesia (SIM-C): An IT-Based Process Architectural Approach in The Effort of Shortening the Process Time

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Abstract

Organizations nowadays constantly in search of brand-new management approaches to increase their competition related to rapid changes and technological developments. The same situation happens to government agencies in Indonesia, in this case, SATPAS office which handles the application of a new driver's license. When there was a leap of motorcycle ownership that happened in Indonesia during the last 20 years, the request for a motorcycle driver's license or SIM-C has also increased dramatically. It is only common to expect that chaos will come; long queues, long hours of waiting, unclear documents, are amongst the list of complaints that have happened when one person goes through the process of applying for SIM-C. This study attempts to minimize the processing time using Business Process Redesign (BPR). Many believes that successful BPR can result in an enormous reduction in cost or cycle time. It can also potentially create substantial improvement in quality, customer service, or other organizational objectives. The same situation and results have applied in this study. After using BPR with an architectural approach and gap analysis, we managed to shorten the processing time from 290 minutes or 4 hours 50 minutes to 228 minutes or 3 hours 48 minutes. There have been an 11.94%-time effectiveness within the activities, 42.70% within the buffer, and with a total of 21.38% for the whole process of activities and buffers. Lastly, we visualized all the suggested solutions using a wireframe of both web and mobile-based IT systems to create a clear reference for further studies.

Keywords: *SIM-C application, BPR, Process Architecture, Gap Analysis*

1. Introduction

Intense competition and challenges are inevitable in commercial organizations or government agencies activities [1], as they continuously attempt to be able to provide the best service to the society and have them to be the center of attention [2], as this has been recorded as a research as early as 1993[3]. For commercial organization, Business Process Redesign (BPR) has been known since more than 20 years ago[4], alongside with the wide-spread use of IT-enabled BPR [5] [6]. The importance of BPR is mainly used to reduce wait times or buffer times, as it was implemented at one of the hospitals in The Netherlands[7]. As a result, for gynecologic oncology patients, access time (from telephone call to first visit) was reduced from 14 days to < 7 days, and the proportion of patients who completed all diagnostic examinations within 14 days increased from 49% to 83%. For dyspnoea

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patients, access time was reduced to < 6 days, and the number of visits was reduced by half. The same case also happens within the government agencies, BPR comes as a tool to evaluate and then revise current processes into a new one, with certain goals to be met, especially to increase the level of services[8]. Thus, it is concluded that to a high extent, the quality of service to society is one of the success indicators of government administration[9]. Cases found in Ghana[10], Saudi Arabia[11], and Mexico[12], have proved that it was very important to asses those levels of services and maintain them at the highest level. Unfortunately, that is not the case that has been happening, even in a developed country such as the United States of America. "A point of confusion, stress, and impatience", that is how the society described their experiences interacting with the government agencies, in this case, the DMV[13]. The survey was conducted in the area of Washington DC. Some were unclear about what materials they needed to bring with them. Some were simply overwhelmed and frustrated by the arduous process of waiting hours upon hours at the crowded offices. They described these tasks as "time-consuming" and overall "unpleasant".

The same experience also happened in Indonesia, especially when it comes to applying a driver's license for a motorcycle (SIM-C). The impact of motorcycle sales booming of over 5 times within 20 years [14] has directly affected the number of (driver's) license applications throughout Indonesia. The making of a motorcycle driver's license has been carried out by the National Police for more than 50 years ago. It is the only agency that issues a SIM-C license. As known, driving license is a proof of registration and identification given by the National Police (under SATPAS OFFICE) to someone who has fulfilled their administrative requirements, whether the applicant is physically and mentally healthy, understands traffic rules, and having appropriate skills in driving a motorized vehicle. All of them are regulated in the police legislation based on the police chief regulation no. 9 of 2012 concerning Driving License, and Law no. 22 of 2009 concerning road traffic and transportation[15].

This process of SIM-C application has been automated using a nation-wide IT system. Nonetheless, we can safely say that it is still pretty much chaotic and took a long time to finish the process. Hence, the necessity to evaluate and suggest new business processes will come advantageous. IT-enabled BPR is a manifestation of this change and is only going to grow in importance [16]. To start revamping a certain system, one must start with the very basic, which is to evaluate the current business processes[17]. Typically, it involves the analysis of company workflows, finding processes that are sub-par or inefficient, and figuring out ways to get rid of them or change them. It is believed that the new business processes as a result of BPR will serve as a solid reference to further upgrade the current SIM-C registration systems.

2. Methods

We conduct the research using a process architecture approach (see figure 1), as it is explained by Laguna and Marklund (2013), in their book of "Business Process Modeling, Simulation, and Design", breaking down the process architecture into 5 determinants of inputs and outputs, flow units, network activities and buffers, resources, and information structure. Furthermore, we conduct a gap analysis and determined which area needs to improve along with the business processes. In the end, we create a new suggested process flow which is believed to have a more effective approach compared to the old one. To validate the findings, we also will calculate how many amounts of process time can be saved by implementing the new suggested process flow into the systems. Adding more value to this research, we also design a wireframe visualizing the improved business processes implemented in the information systems.

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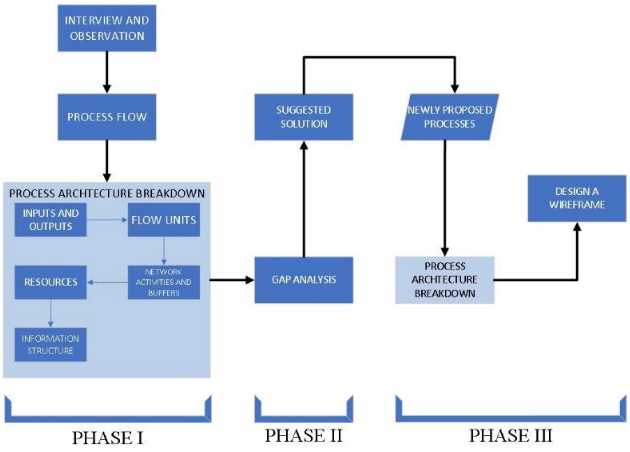

Figure 1. Research Phases

Data collection has been touted as one of the key elements of Business Process Redesign[18], and it is consisting of interviews and observations. The interview process took place at the Cimahi Regional Police Station (SATPAS Office), West Java, Indonesia and conducted on October 13 and 15, 2018; next on December 3 and 17, 2018; and lastly on January 15, 2019. Each interview took an average of 2 hours. At each meeting, we highlighted different topics such as the business process; organization profile with their structure, vision and mission; problems or needs within the processes that need to be addressed; and actors, their role in the processes, and specifically defined the information flow between each actor across the processes. Other than interviews, we also conduct observations that took place at the same place on the 3rd until the 9th of March 2019. This event highlighted more findings that were not mentioned by the interviewees earlier. We recorded and summarized our findings and validated them to the interviewees before we decide to put them all as facts of research.

2.1. Organizational Structure

Other than conducting interviews and observations, we also obtained an organizational structure from the SATPAS Cimahi POLRES office, as shown in Figure 2.

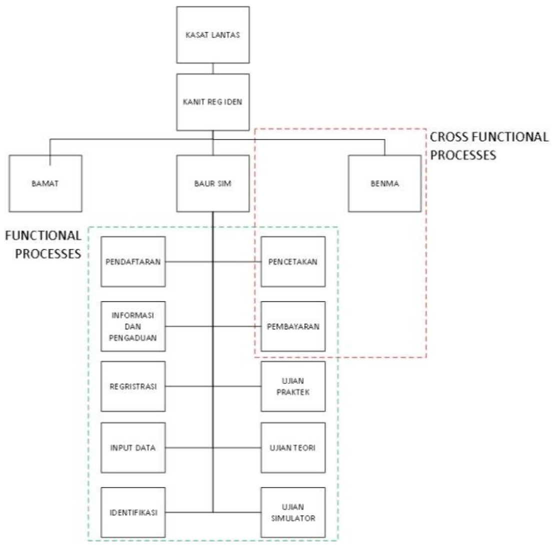

Figure 2. Organizational Structure of the SATPAS office

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Our research domain is visualized using the figure 2, which correlates with each part. From the registration to the printing department, there is a functional process, where all the counters are still in one department that is interconnected in the process. Other than that, BENMA and the payment and printing department create a cross-functional process.

2.2. Process Flow

The process flow of the making of a motorcycle driver's license (SIM-C) in Cimahi Police Resort 44 processes are resulting from our sets of interviews and observations. The processes start from 1) Applicants who want to make a SIM-C must prepare all the necessary documents, i.e.: a copy of ID, health certificate, attached to a single folder. 2) The applicant (TA) enters the registration window, providing the folder to the registration officer for making a new SIM-C. 3) TA will wait to be called by the officer 4) The new SIM-C registration officer (NSRO) checks all the requirements folder. Subject to meeting all the requirements, the same officer will stamp the folder. If the folder content is incomplete, then the request will be rejected. 5) NSRO will return the folder and provide a form to TA. 6) TA goes to the information and complaints counter, providing the folder of the requirements again to the information and complaints officer (ICO). 7) The applicant is waiting for the ICO to finish checking all documents. 8) ICO checks the requirements to ensure that nothing is missed. If there are requirements that have not been met, then the applicant must first complete these requirements. 9) After checking, the folder is returned and given a queue number to TA. 10) TA is waiting to be called according to the queue number while filling out the form. 11) After being called, TA goes to the registration counter and provides the requirements folder to the registration officer (RO). 12) RO will provide the registration number which is written on the requirements folder. 13) RO records the registration number to the registration book manually and stored it on the system, then returns the requirements folder to TA. 14) TA waits to get his turn to the data input window. 15) The Data Input Officer (DIO) called TA to the data input counter, to provide the requirements folder again. 16) DIO enters TA's identity from the ID card to the system using a computer. 17) DIO returns the requirements folder as well as the proof document in which there is a barcode identity to print the SIM-C. 18) TA goes to the identification counter and waiting to be called. 19) Upon calling by the Identification Officer (IO), TA then provides the proof document with the barcode in it. 20) IO scans the barcode contained on the proof paper and validate it. If validated, then they can continue to the photo-taking. 21) TA will be photographed using a DSLR camera, signatures using Signature Capture Pad, and fingerprint scans using Fingerprint Capture Pad. 22) IO returns the proof document to TA.

Next processes involve in doing the test which starts from 23) TA goes to the waiting room which they called the enlightenment room. In here, there are plenty of books on how to drive properly, to enlighten TA, and prepare for the written theory test. 24) TA waits for his turn to carry out the theory test. 25) After being called, TA enters the theory test room, where the test will be conducted by watching the instructions over the projector. 26) The theory test officer (TCO) explains the procedures in carrying out the theory test. 27) TA then takes the test with a maximum time of 30 minutes using the CBT Computer. 28) TA gets the results directly, as it appears on the TA's computer screen and is printed out and attached to the requirements folder. If TA does not pass the test, it can be repeated within the next 7 days. 29) Next, TA will take the simulation test using the simulator machine. 30) The simulator officer (SO) explains the procedures in carrying out the simulator test. 31) TA carries out the simulator test using a real motorcycle connected to the simulator machine. 32) SO provides the test results and attach them to the requirements folder. 33) Next, TA goes to the designated open field to take a practical exam. 34) Upon providing the requirements folder to the Practical Exam Officer (PEO), TA is asked to wait for his turn to carry out the practical examination. 35) PEO informs the exam rules using loudspeakers. 36) TA out a practical examination with a maximum

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time of 15 minutes using a vest, helmet, and motorcycle. If TA does not pass, then he/she can repeat the practice exam after 7 days. 37) PEO attaches the results of the practical exam to the requirements folder.

The last part of the processes is the payment and printing the SIM-C. It starts from 38) TA goes to the bank payment counter to pay for the printed SIM- C at Rp. 100,000. 39) The Bank issued a proof of payment and deliver it to the TA and provides the copy to BENMA. 40) TA goes to the printing counter and provides all the document carried out from the beginning 41) Printing Officer (PO) checks all evidence and scan them using a barcode scanner. This served as a mandatory condition to print a SIM-C. 42) PO saves the file and saves the TA's required folder file. 43) PO prints TA's SIM-C using the SIM-C printer and reports the SIM-C issuance to BENMA. 44) TA receives a printed SIM-C.

2.3. Process Architecture

Process architecture applies to fields such as computers, business processes, and any other process system of varying degrees of complexity[19]. Processes are defined by Laguna and Marklund as having inputs, outputs, flow units, activities, buffers, resources, and information structure. In this research, we will breakdown the process flow from subsection 2.2 as a reference to create a gap analysis and redesign solution.

2.3.1. Input and Output (I/O): In the process of making a SIM-C, we first identify the inputs and outputs. Based on their nature, inputs and outputs are divided into two categories of tangible and intangible ones, as seen in table 1.

Table 1. Inputs and Outputs of SIM-C Application

	Input	Output
Tangible	Requirements Folder	Printed SIM-C
Intangible	Registration data and information	User Profile of SIM-C

This will clearly define the beginning and the end of the process.

2.3.2. Flow Unit: A unit of flow or flow unit can be defined as a transient entity that proceeds through various activities and finally exits the process as finished output. Within our scope of research, we then identify the flow unit of requirements folder as the input up until the printed SIM-C as the output.

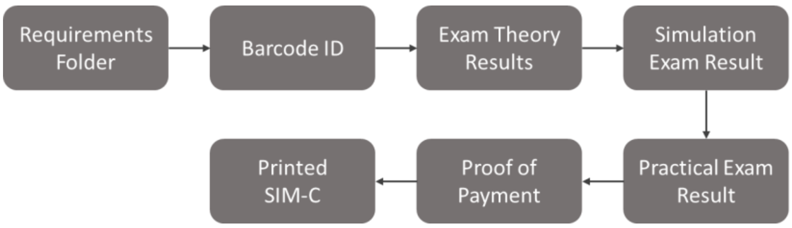

Figure 3. Flow units of the tangible input and output

Flow units are identified both upon the tangible and intangible I/O as depicted in Figures 3 and 4.

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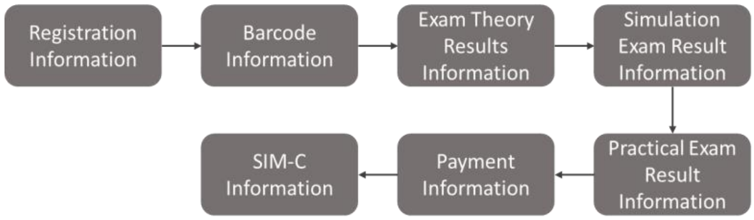

Figure 4. Flow units of the tangible input and output

The intangible flow units represent the transformation of information along the processes. Those movements of units will help us to identify the information structure, which is also one of the key elements in process architecture.

2.3.3. Network of Activities and Buffers: Identifying the amount of time in each activity and buffers are very important in this research. While activities serve as the actual work being done, buffers represent the waiting point where the work waits before moving on to the next ones. In this research, we have calculated the total network of activities and buffers according to the explanation in the process flow sub-section (2.2), which has a total number of 44. We also calculated the total time generated from all activities and buffers. The activities time is at 201 minutes, while the total buffer time is 89 minutes. Hence, the total network of activities and buffer time is at 290 minutes or 4 hours 50 minutes. If a person walks into the SATPAS OFFICE in Indonesia at 8.00 am, he or she will finish the whole process around 2.50 pm, adding a one-hour lunch break at the SATPAS OFFICE.

2.3.4. Resources: Resources are being used when inputs both tangible or intangible are transformed into another unit up until it becomes the output. It can be divided into Capital Assets (CA) such as real estate, machinery, equipment, IT systems, and Labour (LR), such as people with their knowledge and skills running the processes. Resources are clearly defined in the process flow, among them are computers (CA – no. 16), barcode scanners (CA – no. 20), fingerprint (CA – no. 21), The Applicant (LR), The new SIM-C registration officer (LR). We discovered 17 items of capital assets being used throughout the process flow and identified 12 labors working on within the processes.

2.3.5. Information Structure: The last element needed to describe the process architecture is the information structure. The information structure specifies which information is required and which is available to make the decisions necessary for performing the activities in a process. We have identified the information structure within the SIM-C processes and can be seen in Table 2 below.

Table 2. Information Structure of SIM-C Application

No	Document Name	Attributes
1.	Registration	Id_init_reg, date_reg, id_reg, type_sim
2.	TA-ID	id_reg, nik_TA, name_TA, DOB_TA, addr_TA
3.	Scan Form	id_scan, date_scan, id_reg, sign, photo_TA, fingp_id
4.	Theory Result	id_reg, id_ttest, name_TA, date_ttest, tscore, tstatus, remarks
5.	Simulator Result	id_reg, id_stest, name_TA, date_stest, sscore, sstatus, remarks
6.	Practical Result	id_reg, id_ptest, name_TA, date_ptest, pscore, pstatus, remarks
7.	Payment	Id_payment, no_ref, name_TA, amount
8.	SIM-C	Id_sim, date_of_making, name_TA, sign, fingerp_id, photo_TA

3. Results and Discussions

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We continue our research and resulted in being able to identify the gaps, give suggestions of solutions, proposed new process flow, and creating the wireframe of the future systems.

3.1. Gap Analysis

The gap analysis method is used as a business evaluation tool that focuses on the current performance gap of the company with previously targeted performance[20]. Based on the existing process flow, we identified 7 gaps that need to be resolved:

1. Online SIM-C registration system that is still rarely used because there are unmet needs.
2. Checking the applicant's requirements is still done by human (manual).
3. The SIM-C exam system is not integrated with the SIM-C registration system.
4. Applicants need to wait or take turns (with uncertain time) if they are to conduct a theory test.
5. The assessment simulator exam result still done manually by printing the result.
6. The practice exam scores are still manual and is not connected to the systems.
7. There is no integrated system with the same data storage.

3.2. Suggested Solutions

Details of the solutions for each gap that have been determined are as follows:

1. Adding ‘validation’ and ‘add files’ feature to the existing online SIM-C registration system.
2. Adding a ‘scan tool’ function that can check/compare all the applicant's requirements.
3. Link the SIM-C test system with the online SIM registration system.
4. Create a mobile-based theory test module locally.
5. It provides a local network on the premise (SATPAS) to enhance the system’s performance.
6. Adding a test system module that stores applicant's scores automatically.
7. Installed a sensor stakes for the practice test system to determined TA’s driving performance.
8. Adding a practice test module that is connected to the sensor stake.

All suggestions are in accordance to the gaps, while there are also limitations since some procedures and bureaucracy still needs to be there thus cannot be changed.

3.3. Redesign the Process

Business process Redesign aims to decrease the amount of activity time and/or reduce the buffer time of the SIM-C processing time. Consequently, it will decrease the total process time, resulting in a more effective process. As we focus on the time to process, we limit our research results and discussions within the scope of process flow and the activity and buffer, omitting the discussion of other process architecture such as input and output, flow units, resources, and information structure.

3.3.1. Process Flow: The process flow has been redesigned into only 32 processes. The trimmed process is mainly part of the registration process and information because it has been replaced by an updated online SIM registration system. For example, we suggest that applicants can register and be validated online instead of directly coming to the SATPAS OFFICE and register themselves. Furthermore, we suggest the theory test is done using a smartphone, as this will reduce the buffer time for more than 30 minutes.

3.3.2. Activity and Buffer: After redesigning the whole process, the total activity time can be reduced from 201 minutes to 177 minutes, while there is also a decrease in the

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total buffer time, from 89 minutes to 51 minutes. Hence, the total process will take 228 minutes or 3 hours 48 minutes. There have been an 11.94%-time effectiveness within the activities, 42.70% within the buffer, and with a total of 21.38% for the whole process of activities and buffers.

3.4. Wireframe and System Architecture

To finalize the Redesign, we visualize the solution with a wireframe and system architecture as a reference for the development team when revamping the system.

3.4.1. Registration Wireframe: We add ‘validation’ functions and ‘add files’ feature to the existing online SIM registration system and connect to the existing system at the SATPAS office. The front-end wireframes are as shown in figure 5.

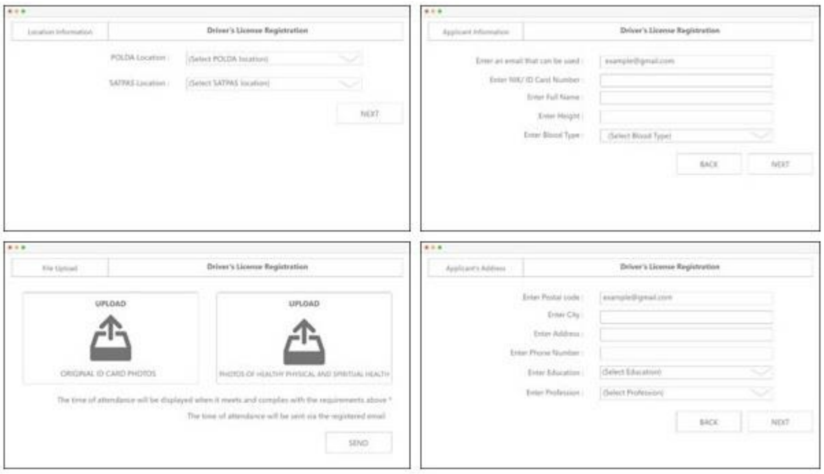

Figure 5. Registration Wireframes (Front End)

We have 4 tabs of location information, applicant’s information, applicant’s address, and uploading applicant’s ID and proof of health. Upon successful registration, TA will receive an email notification as shown in figure 6.

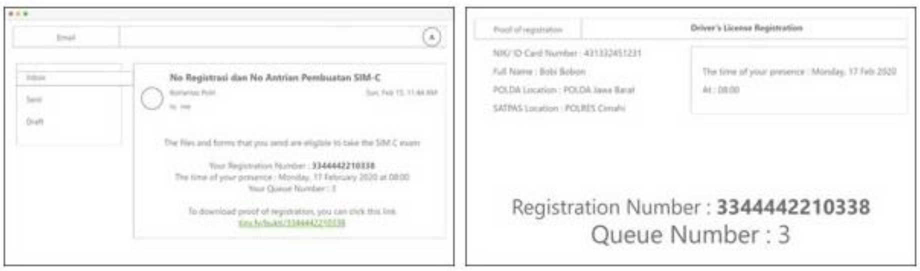

Figure 6. Notification Wireframes

3.4.2. Scan Tool Wireframe: The purpose of this function is to check/compare all the applicant's requirements, as it is shown in figure 7.

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Figure 7. Scan Tool Wireframe

The Identification Officer will have this interface and check the originality of both documents. We proposed to have this directly linked with the municipality systems which already exist at this moment.

3.4.3. Mobile Based Theory Test Wireframes: As a result of applicants need to wait or take turns (with uncertain time) if they are to conduct a theory test, we suggested to create a mobile-based theory test module, installed by the applicant and connected to the applicant's data system locally. This will eliminate the problem and make use of applicants' resources of a mobile phone.

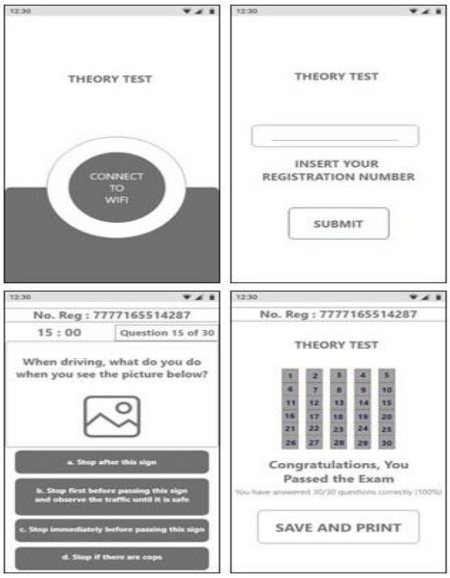

Figure 8. Mobile Based Theory Test Wireframes

Applicants will connect to a local wifi and then setting up the secured connection using their registration number. The test will begin and end simultaneously at a given time. Applicants will get an instant result of the test and do not need to carry out the printed document to the next window.

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3.4.4. System Architecture: One of the key elements that is missing in the previous systems is the integration part. Our suggestion is to integrate all the tests and also to deploy an IoT-Based sensor stakes for the practice test as shown in figure 9.

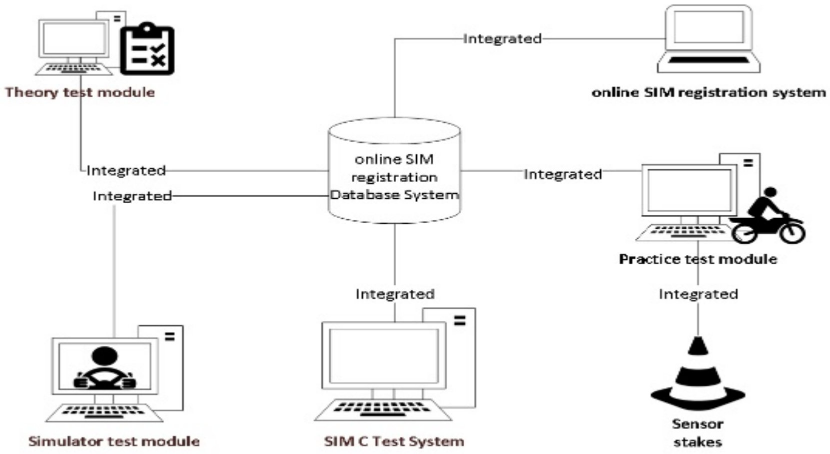

Figure 9. Suggested System Architecture of SIM-C Test Application

This integration will allow test results rolled out instantly and will save a lot of buffer time. Furthermore, the integrated test systems can minimize fraud practices as it is already connected directly to its registrar.

4. Conclusions

The research presented in this study corroborates the importance of business process Redesign projects for improving the management of public agencies, in this case the SATPAS OFFICE of Cimahi, West Java, Indonesia. These processes go through different areas in the organization, thus generating a chain of values that various stakeholders, especially the applicants should experience a high level of satisfaction. In this regard, this paper illustrates that the areas of opportunity for improvements of strategic processes are there, though it is not vast since we have to also consider the level of bureaucracy at the SATPAS OFFICE. Tools, such as business process Redesign and gap analysis are correlating to one another in creating a solid reference to the redesigning process.

Out of all the gaps identified, most of them can be resolved by implementing new modules and technological platforms while and those that cannot are kept there. The initial total processing time that is of 290 minutes or 4 hours 50 minutes, were reduced to 228 minutes or 3 hours 48 minutes. There have been an 11.94%-time effectiveness within the activities, 42.70% within the buffer, and with a total of 21.38% for the whole process of activities and buffers. Lastly, we visualized all the suggested solutions using a wireframe of both web and mobile-based IT systems.

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2. Head of SATPAS office, for validating our findings and conclusions, in which this research will be brought up as an official business processes Redesign proposal from Cimahi SATPAS Office to the National Police headquarters.

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