



# ICTS 2021

## ***PROCEEDINGS OF***

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on Information & Communication  
Technology and Systems  
(ICTS) 2021



Department of Informatics, Faculty of Information and Communication Technology  
Institut Teknologi Sepuluh Nopember (ITS)  
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**PROCEEDINGS OF**

**2021 13<sup>th</sup> INTERNATIONAL CONFERENCE ON INFORMATION &  
COMMUNICATION TECHNOLOGY AND SYSTEMS (ICTS)**

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**Organized by  
Department of Informatics  
Faculty of Information and Communication Technology  
Institut Teknologi Sepuluh Nopember (ITS)  
Surabaya, Indonesia**

**PROCEEDINGS OF**

**2021 INTERNATIONAL CONFERENCE ON INFORMATION &  
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## **PREFACE**

2021 13<sup>th</sup> International Conference on Information & Communication Technology and Systems (ICTS) is a technical co-sponsored IEEE conference and organized by the Department of Informatics, Institut Teknologi Sepuluh Nopember (ITS) Surabaya, Indonesia. This international forum provides the opportunity for the community of computer science, information and communication technology to discuss and exchange information and knowledge in their areas of research interest.

There are eight areas of research interest in this conference. The first area includes Computer Graphics and Game Technology. The second area covers Computer Network and Security. The third area consists of Software Engineering, E-learning, and Blockchain Technology. The fourth area is Image Processing. The fifth area is Pattern Recognition, Machine Learning, and Intelligent Systems. The sixth area includes Internet of Things, Robotics, and Communications. The seventh are Optimization and Operations Research. The last area is about Natural Language Processing.

The submitted papers are reviewed by two reviewers and the acceptance rate of the paper is 40.5%. Authors and reviewers come from Australia, Bangladesh, France, India, Indonesia, Iraq, Japan, Malaysia, Nepal, Netherlands, Pakistan, Philippines, Rwanda, Saudi Arabia, Sri Lanka, Taiwan, Thailand, United Arab Emirates, United States, and Vietnam. We would like to express our gratitude to all of the speakers and to all of the reviewers for their effort and support in this conference. In addition, our grateful expressions for the keynote speakers: Prof. Yu Tsao, Prof. Ferdous Sohel, and Prof Tohari Ahmad.

The credit for the success of the conference is to be shared with many colleagues and parties. Institut Teknologi Sepuluh Nopember for all of the support. IEEE Indonesia Section for the technical co-sponsorship. All of the scientific committee members who present their valuable contribution to this conference.

Finally, our great gratitude and appreciation for all parties who participate and support the ICTS 2021.

Organizing Committee of ICTS 2021

## TABLE OF CONTENTS

<b>PREFACE</b>	i
<b>TABLE OF CONTENTS</b>	ii
<b>ICTS RUNDOWN</b>	ix
<b>PARALLEL SESSION SCHEDULE</b>	xi
 <b>[KEYNOTE SPEECH] Deep-learning-based Speech Enhancement with Its Application to Assistive Oral Communications Devices</b> Professor Yu Tsao, Academia Sinica, Taiwan	xx
 <b>[KEYNOTE SPEECH] Deep Learning Models: Applications, Challenges, and Future</b> Professor Ferdous Sohel, Murdoch University, Australia	xxi
 <b>[KEYNOTE SPEECH] Reversible Data Hiding: An approach for Securing Private Data</b> Professor Tohari Ahmad, Institut Teknologi Sepuluh Nopember	xxii
 <b>Track 1: Computer Graphics and Game Technology</b>	1
 <b>[ID:1] Comparative Analysis of Hands-Free Mouse Controlling Based on Face Tracking</b> Salsabiil Hasanah, Aulia Teaku Nururrahmah and Darlis Herumurti	1
 <b>[ID:4] Website, AR, VR: Comparison for Learning Motivation</b> Mikhael Ming Khosasih and Darlis Herumurti	7
 <b>[ID:16] The Implementation of Augmented Reality in E-Commerce Customization: A Systematic Literature Review</b> Dhena Kamalia Fu'adi, Achmad Nizar Hidayanto, Dedi I. Inan and Kongkiti Phusavat	12
 <b>[ID:34] Evaluation on Purchase Intention of Electronic Devices in Web, AR, and VR Application with Technology Acceptance Model</b> Mikhael Ming Khosasih, Darlis Herumurti and Hadziq Fabroyir	18
 <b>[ID:70] Activity Design Using Innovation Profiling in Appreciative Learning Serious Game of Indonesian Pronunciation</b> Hanny Haryanto, Aripin and Indra Gamayanto	24
 <b>[ID:93] Dungeon's Room Generation Using Cellular Automata and Poisson Disk Sampling in Roguelike Game</b> Nur Muhammad Husnul Habib Yahya, Hadziq Fabroyir, Darlis Herumurti, Imam Kuswardayan and Siska Arifiani	29



<b>Track 2: Computer Network and Security</b>	<b>35</b>
<b>[ID:2] Port Knocking Implementation on Programmable Data Plane</b> Muhammad Arief Nugroho, Sidik Prabowo, Maman Abdurrohman and Masud Adi Saputra	<b>35</b>
<b>[ID:6] Analysis of Image Steganography using Wavelet and Cosine Transforms</b> Aulia Teaku Nururrahmah and Tohari Ahmad	<b>40</b>
<b>[ID:33] Variance Threshold as Early Screening to Boruta Feature Selection for Intrusion Detection System</b> Muhammad Al Fatih Abil Fida, Tohari Ahmad and Maurice Ntahobari	<b>46</b>
<b>[ID:38] Hiding Messages in Audio using Modulus Operation and Simple Partition</b> Ilyas Bintang Prayogi, Tohari Ahmad, Ntivuguruzwa Jean De La Croix and Pascal Maniriho	<b>51</b>
<b>[ID:65] Outlier Detection and Decision Tree for Wireless Sensor Network Fault Diagnosis</b> Irfanur Ilham Febriansyah, Whika Cahyo Saputro, Galih Ridha Achmadi, Fadila Arisha, Dara Tursina, Baskoro Adi Pratomo and Ary Mazharuddin Shiddiqi	<b>56</b>
<b>[ID:67] Ensemble Methods Classifier Comparison for Anomaly Based Intrusion Detection System on CIDDs-002 Dataset</b> Ainurrochman Ainurrochman, Raditia Wahyuwidayat, Arianto Nugroho, Muhamad Fauzi, M Febrianto Ramadhan, Santi Tiodora Sianturi, Baskoro Adi Pratomo and Ary Mazharuddin Shiddiqi	<b>62</b>
<b>[ID:84] Hybrid Quantum Deep Learning with Differential Privacy for Botnet DGA Detection</b> Hatma Suryotrisongko and Yasuo Musashi	<b>68</b>
<b>Track 3: Software Engineering, E-learning, and Blockchain Technology</b>	<b>73</b>
<b>[ID:3] Enterprise Architecture Planning (EAP) Using TOGAF-ADM at Fuel Supplier</b> Megawati Lestari Pasiak and Andi Wahyu Raharjo Emanuel	<b>73</b>
<b>[ID:11] Critical Success Factors Analysis of E-Government during Work from Home Implementation: A Case Study at Government Organization in Indonesia</b> Muhamad Dian Manunggal and Yova Ruldeviyani	<b>78</b>
<b>[ID:29] Ontology Design for Patient Medication Record</b> Siti Syahirah Ibrahim and Nur Atiqah Sia Abdullah	<b>84</b>
<b>[ID:39] Mining Collaboration Business Process Containing Invisible Task by Using Modified Alpha</b> Abdullah Faqih Septiyanto, Riyanarto Sarno and Kelly Rossa Sungkono	<b>90</b>

<b>[ID:73] News Verification using Ethereum Smart Contract and Inter Planetary File System (IPFS)</b>	96
Haekal Febriansyah Ramadhan, Fandi Aditya Putra and Riri Fitri Sari	
<b>[ID:86] Pedagogical Importance of Learner Interface in Web-Based e-Learning Content</b>	101
Choolangika Sirisuriya, Lochandaka Ranathunga, Shironica P. Karunanayaka and Nor Aniza Abdullah	
<b>[ID:91] Generating Team Quality Formula to Predict Product Quality in Software Engineering Project of College Students</b>	106
Umi Sa'adah, Maulidan Bagus Afridian Rasyid, Siti Rochimah and Umi Laili Yuhana	
<b>[ID:92] InVesa 1.0: The Conceptual Framework of Interactive Virtual Academic Advisor System based on Psychological Profiles</b>	112
Ahmad Sofian Shminan	
<b>Track 4: Image Processing</b>	118
<b>[ID:7] Automatic Segmentation of Optic Nerve Head by Median Filtering and Clustering Approach</b>	118
Anindita Septiarini, Hamdani Hamdani, Emy Setyaningsih, Edwanda Arisandy, Suyanto Suyanto and Edy Winarno	
<b>[ID:121] AI Driven Solution for the Detection of COVID-19 Using X-ray images</b>	123
Riya Singh, Shivani Wadkar, Semil Jain and Manisha Dodeja	
<b>[ID:124] Facial Biometric Identification in The Masked Face</b>	129
Ardiansyah Ardiansyah and Dewi Yanti Liliana	
<b>[ID:126] Sketch Generation From Real Object Images Using Generative Adversarial Network and Deep Reinforcement Learning</b>	134
Shintya Rezky Rahmayanti, Chastine Fatichah and Nanik Suciati	
<b>[ID:127] Implementation and Layout Optimization of Motion Sensor for Anomaly Detection in Daily Life of Elderly Persons</b>	140
Kosuke Shima, Takuma Kawamura, Masahiro Yamaguchi, Takumi Yoshida, and Takanobu Otsuka	
<b>[ID:130] Machine Learning Inspired Vision-based Drowsiness Detection using Eye and Body Motion Features</b>	146
Ali Ayub Sheikh and Junaid Mir	
<b>[ID:151] Video-Based License Plate Recognition Using Single Shot Detector and Recurrent Neural Network</b>	151
Dini Adni Navastara, Nuzha Musyafira, Chastine Fatichah and Safhira Maharani	
<b>[ID:152] Adaptive Skin Color Model for Clothing Genre Recognition via Particle Swarm Optimization</b>	155
Shintami Chusnul Hidayati, Erliyah Nurul Jannah and Yeni Anistyasari	

<b>Track 5: Pattern Recognition, Machine Learning, and Intelligent Systems 1</b>	<b>161</b>
<b>[ID:10] Classification and Gas Measurement of Human Axillary Odor Using Electronic Nose</b>	<b>161</b>
Shoffi Izza Sabilla, Malikhah Malikhah and Riyanarto Sarno	
<b>[ID:15] Detection of Covid-19 from Chest CT Images Using Deep Transfer Learning</b>	<b>167</b>
Akhmad Irsyad and Handayani Tjandrasa	
<b>[ID:17] A Machine Learning Approach to Study Tourist Interests and Predict Tourism Demand on Bonaire Island from Social Media Data</b>	<b>173</b>
Zakiul Fahmi Jailani, Peter Verweij, Jan Tjalling van der Wal and Ron van Lammeren	
<b>[ID:30] SER: Speech Emotion Recognition Application Based on Extreme Learning Machine</b>	<b>179</b>
Ainurrochman Ainurrochman, Irfanur Ilham Febriansyah and Umi Laili Yuhana	
<b>[ID:32] Checking Wrong Decision and Wrong Pattern by Using A Graph-based Method</b>	<b>184</b>
Kelly Rossa Sungkono, Erina Oktavia Putri, Habibatul Azkiyah and Riyanarto Sarno	
<b>[ID:40] Modelling Usage M-Learning Using Mamdani Fuzzy Logic System in Along Covid-19 Pandemic at ITS - Indonesia</b>	<b>190</b>
Syamsul Arifin, Aulia Siti Aisjah and Ferina Putri Suharsono	
<b>[ID:49] A Novel Approach on Conducting Reviewer Recommendations Based on Conflict of Interest</b>	<b>195</b>
Adi Setyo Nugroho, Aizul Faiz Iswafaza, Ratih Nur Esti Anggraini and Riyanarto Sarno	
<b>[ID:62] Machine Learning Approach For Stress Detection Based on Alpha-Beta and Theta-Beta Ratios of Eeg Signals</b>	<b>201</b>
Hunain Altaf, S Noorjannah Ibrahim, N.F.M. Azmin, Ani Liza Asnawi, Balqis Hanisah Binti Walid and N.H. Harun	
<b>[ID:64] Application of Data Mining Techniques in Diagnosing Various Thyroid Ailments: A Review</b>	<b>207</b>
Arjonel Mendoza and Rowell Hernandez	
<b>[ID:66] Comparative Study of Single-task and Multi-task Learning on Research Protocol Document Classification</b>	<b>213</b>
Abid Famasya Abdillah, Mohammad Zaenuddin Hamidi, Ratih Nur Esti Anggraeni and Riyanarto Sarno	
<b>[ID:77] Developing Accurate Predictive Model Using Computational Intelligence for Optimal Inventory Management</b>	<b>218</b>
Michael Siek and Kevin Guswanto	

<b>[ID:83] FarmEasy: An Intelligent Platform to Empower Crops Prediction and Crops Marketing to Digitize the Farming System towards Digital Bangladesh</b> Md Ishak, Md Shahidur Rahaman and Tahasin Mahmud	224
<b>[ID:134] Human Activity Recognition in Smart Home using Deep Learning Techniques</b> Ranjit Kolkar and Geetha V	230
<b>[ID:135] Action Recognition using Transfer Learning and Majority Voting for CSGO</b> Tasnim Sakib Apon, Abrar Islam and Md. Golam Rabiul Alam	235
<b>[ID:140] Implementation and Evaluation of Learning Classifiers in Detecting Parkinson's Disease Using Extensive Speech Parameters</b> Matt Ervin Mital	241
<b>[ID:141] Detection of Parkinson's Disease Through Static and Dynamic Spiral Test Drawings: A Transfer Learning Approach</b> Matt Ervin Mital	247
<b>[ID:144] Graph Algorithm for Anomaly Prediction in East Java Student Admission System</b> Dwi Sunaryono, Annas Nuril Iman, Diana Purwitasari and Agus Budi Raharjo	252
<b>Track 6: Internet of Things, Robotics, and Communications</b>	258
<b>[ID:35] Tracking Position of Airborne Target on SPx-Radar-Simulator Using Probabilistic Data Association Filter</b> Mochammad Sahal, Zaidan Adenin Said, Rusdhianto Effendi Abdul Kadir, Zulkifli Hidayat, Yusuf Bilfaqih and Abdullah Alkaff	258
<b>[ID:96] Sensor Placement Strategy to Localize Leaks in Water Distribution Networks with Fluctuating Minimum Night Flow</b> Ary Mazharuddin Shiddiqi, Ervin Nurhayati, Agus Budi Raharjo and Deddy Aditya Permana	264
<b>[ID:110] e-Detect: Non-User Mask Detection Based on Image Processing Using Convolutional Neural Network Method</b> R. Wahyu Tri Hartono, Nadya Sarah, Regina Nur Shabrina and Evan Lokajaya	271
<b>[ID:110] An IoT-Based Real-Time Intelligent Irrigation System using Machine Learning</b> Saleh Mohammed Shahriar, Hasibul Islam Peyal, Md. Nahiduzzaman and Md. Abu Hanif Pramanik	277
<b>[ID:133] Performance Analysis of Task Allocation for Mobile Robot Exploration Under Energy Constraints</b> Ankit Soni	282

<b>[ID:137] IoT and Machine Learning System for Early/Late Blight Disease Severity Level Identification on Tomato Plants</b> Rafif Darmawan, Fauzan Rozin, Cynthia Evani, Irman Idris and Dadang Sumardi	288
<b>Track 7: Optimization and Operations Research</b>	294
<b>[ID:63] Contemporary Concepts, Descriptions and Language of Systems Using SBC Process Algebra</b> Wei-Ming Ma and William S. Chao	294
<b>[ID:100] Binary Chaotic Jaya Optimization for Cognitive State Assessment</b> Samrudhi Mohdiwale, Mridu Sahu and G R Sinha	301
<b>[ID:129] Discontinuity Preserving Optical Flow Based on Anisotropic Operator</b> Muzammil Khan and Pushpendra Kumar	306
<b>[ID:147] Power System Harmonics Estimation using Hybrid Archimedes Optimization Algorithm-based Least Square method</b> Hasan Jamil Apon, Md. Shadman Abid, Khandaker Adil Morshed, Mirza Muntasir Nishat, Fahim Faisal and Nchouwat Ndumgouo Ibrahim Moubarak	312
<b>[ID:155] Two Highest Penalties: A Modified Vogel's Approximation Method to Find Initial Basic Feasible Solution of Transportation Problem</b> Bilqis Amaliah, Chastine Fatichah and Erma Suryani	318
<b>Track 8: Natural Language Processing</b>	324
<b>[ID:48] Automatic Text Summarization using Maximum Marginal Relevance for Health Ethics Protocol Document in Bahasa</b> Doni Putra Purbawa, Malikhah Malikhah, Ratih Nur Esti Anggraini and Riyanarto Sarno	324
<b>[ID:79] Systematic Analysis of Hateful Text Detection Using Machine Learning Classifiers</b> Tanzina Akter Tani, Tabassum Islam, Sayed Atique Newaz and Nahida Sultana	330
<b>[ID:90] Evaluating The Preliminary Models to Identify Fake News on COVID-19 Tweets</b> Ayu Mutiara Sari, Nurul Fajrin Ariyani and Adhatus Solichah Ahmadiyah	336
<b>[ID:101] Feature Extraction Amazon Customer Review to Determine Topic on Smartphone Domain</b> Hendriyana Hendriyana, Arief Fatchul Huda and Zk Abdurahman Baizal	342
<b>[ID:136] Transfer Learning Approaches for Indonesian Biomedical Entity Recognition</b> Diana Purwitasari, Abid Famasya Abdillah, Safitri Juanita and Mauridhi Hery Purnomo	348

<b>[ID:143] Topic Detection in Sentiment Analysis of Twitter Texts for Understanding The COVID-19 Effect in Local Economic Activities</b> Apriantoni Apriantoni, Hazna At Thooriqoh, Chastine Fatichah and Diana Purwitasari	354
<b>[ID:146] Bilingual Question Answering System Using Bidirectional Encoder Representations from Transformers and Best Matching Method</b> Dini Adni Navastara, Ihdiannaja Ihdiannaja and Agus Zainal Arifin	360



# Enterprise Architecture Planning (EAP) Using TOGAF-ADM at Fuel Supplier

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**Abstract**—Enterprise Architecture Planning (EAP) has been widely used in various types of businesses. Such as government organizations, agriculture, the banking industry, and companies. This study focuses on creating an EAP for the "Pangkalan BBM Dedi" using the TOGAF ADM framework. Through this research, we succeeded in making the architectural design of the business. The current business processes and processes are identified when a system or application is implemented at the business architecture phase. At the data, the architecture stage resulted in three main activities with seven data entities. The application architecture resulted in recommendations for information systems that can accommodate business needs. The architectural technology stage consists of designing a hardware device and a network that can accommodate application architecture. Overall, there are two business processes whose function is maintained as before, four business processes that the system will replace, and one business process which can be added later.

**Keywords**—Enterprise Architecture Planning (EAP), TOGAF ADM, Fuel Supplier

## I. INTRODUCTION

The development of information technology continuously occurs and begins to spread to various aspects of life, in contrast to the conditions at the beginning of information technology, which was only used for military purposes. Many organizations carry out information system architectural design activities, such as Enterprise Architecture Planning (EAP), before application development activities. These areas such as government organizations [1][2], banking industry [3], cooperatives [4], hospitals [5], education [6]–[9], the agricultural sector [10], [11] and the company [12], [13]. When application development is carried out, there is no redundancy of data and integrity between business units. When data and reports rotate, it does not cause risks that impact business operations [14]. An application or information system's design and development activities must follow its business objectives. It aims to process data and information owned by the organization to achieve organizational goals [1].

Enterprise Architecture Planning (EAP) is a management practice pursuing organizational resources, investing in information technology, and designing and building applications or information systems. Enterprise Architecture Planning (EAP) describes the organization's structure, components, properties, and relationships between each element [15]. Based on this, it is necessary to do Enterprise Architecture Planning (EAP) activities in every organization or company before developing an information system, including the "Pangkalan BBM Dedi." This organization is a company whose primary business process distributes fuel (BBM) directly to the public. The organization, which was only established in early 2020 with 4,000 transactions per month, has realized the critical role of information technology in improving and enhancing business performance. The business process, which consists of selling products, checking stock, and requesting product stock from suppliers, is still being carried out manually. Therefore it is necessary to design an architecture for information systems and applications to handle all business processes.

This study aims to do an Enterprise Architecture Planning at "Pangkalan BBM Dedi." EAP using the TOGAF ADM framework as a guide in carrying out architectural design. The use of the TOGAF ADM framework is flexible. It provides a systematic method and complete stages to design, build, implement and manage information systems or information technology in an organization or company [1].

## II. LITERATURE REVIEW

Enterprise Architecture (EA) is a method that uses a framework such as TOGAF ADM, COBIT, ITIL, ITSM, etc., to maximize business strategy, strategy in a company or organization [16], [17]. The existence of EA can provide an overview or blueprint of the current state of the company or organization and the organization's targets in the future so that there can be alignment between business strategy and IT strategy [18].

This study uses the TOGAF framework as a guide in designing EA. TOGAF ADM is a framework that can accommodate designing, implementing, and controlling every blueprint produced [19]. Figure 1 shows all the stages of the TOGAF ADM framework. These stages consist of;

Preliminary, Phase A (Architecture Vision), Phase B (Business Architecture), Phase C (Information System Architecture), Phase D (Technology Architecture), Phase E (Opportunities and Solutions), Phase F (Migration Planning), Phase G (Implementation Governance) and Phase H (Architecture Change Management). There are a total of nine steps in the TOGAF ADM framework [20].

There are three primary domains related to architecture: business architecture, information systems architecture, and technology architecture [16]. This study focuses on architectural design up to the opportunities and solution stages. The stages of TOGAF ADM that are carried out are as follows:

#### Preliminary

It is an initiation stage, namely preparation for a company or organization to implement the development/development of the TOGAF ADM architecture.

#### Phase B

This stage aims to define the business architecture of a company or organization [16]. Business architecture in this context refers to the development to be made on business architecture.

#### Phase C

Designing an information system or application is a step, including data architecture following business architectures or business needs [20].

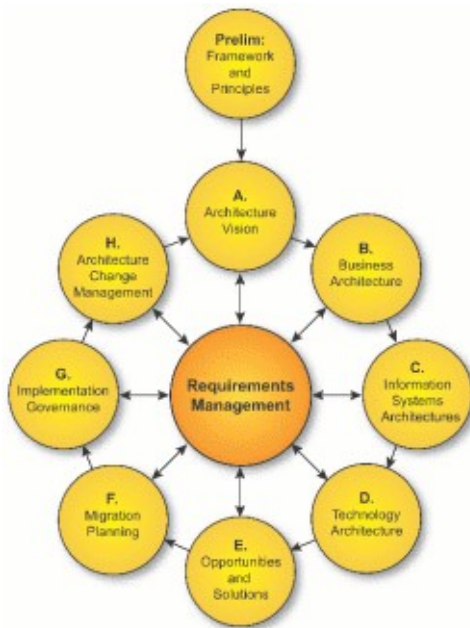


Figure 1. TOGAF ADM Phase[21]

#### Phase D

It is a stage for designing a technology architecture to support the information system architecture. The technology architecture in this context is an overview related to hardware and software infrastructure [8].

#### Phase E

This stage refers to Opportunities and solutions on the condition of the company[22].

### III. RESEARCH METHOD

This study aims to carry out an Enterprise Architecture Planning [16] (EAP) at the Pangkalan BBM Dedi, located in the Mamahan village of Talaud Islands Regency. This study follows the previous research conducted by Gomantara Alfredo & Emanuel AWR [10] except for the application design. The phase of this research is shown in Figure 2.

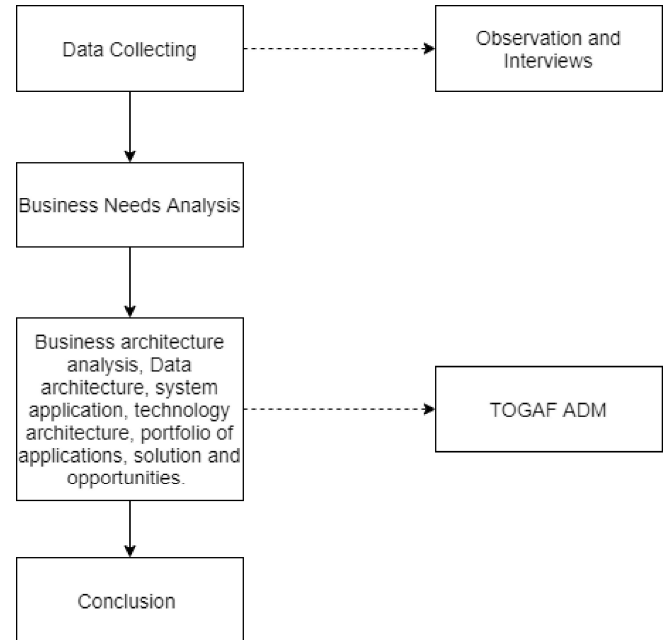


Figure 2. Research Phase

Figure 2 shows that the stages in research consist of four main steps. The first stage is the Data Collection is carried out using observation and interviews. Evidenced by analyzing business needs, the stages in TOGAF (Business Architecture, Data Architecture, portfolio of application, Technology Architecture and Opportunities and Solutions) end with conclusions.

Business operations are shown before and after implementing the system or application in the Business Architecture phase, followed by a Data Architecture. The data Architecture stage aims to define the entities and the attributes used for each business activity. Once the data architecture is successfully defined, it continues at the stage of creating the application portfolio. The application portfolio contains the types of systems or applications required by the company and the definition of each application's functionality. Technology Architecture includes an architect design that involves hardware and network components such as PCs, printers, routers, switches, servers, and the internet. The opportunities and Solutions stage is done using Matrix Gap Analysis. Such analysis aims to see the Gap between the company's current condition "Solutions" and the conditions in the future, which is an "Opportunities."

Although the TOGAF Framework has many stages, this study only focused on the stage of "Opportunities and Solutions." It's based on the condition of the organization.

After observation and interview, it was found that the commitment of business owners has not reached the next stage.

#### IV. RESULT AND DISCUSSION

##### A. Need Analysis and Data Collection

The process of collecting data and analyzing business needs is carried out by observing and interviewing business owners. The interview was conducted to explore the business process's details, plans for the business, and the company's current needs. Simultaneously, the observation activity aims to observe the business processes carried out by employees in business operational activities. Interview and observation activities resulted in the following findings:

1. All business operational activities are still carried out manually using notes. Sales recapitulation is carried out manually to cause errors when calculating or reporting from operating activities.
2. Recording and reporting activities are only carried out when the store is closed after being executed and carried out by employees. The owner can only monitor sales when the report has been submitted.
3. All documents that record customer purchases or stock purchases from suppliers are done by registering them in a book (manual). The data collected is not integrated with the data on the sales process the previous day, which results in the owner not seeing the sales chart in one month of operational activities.

All operational activities in the "Pangkalan BBM Dedi" business are shown by the business processes flow in Figure 3.

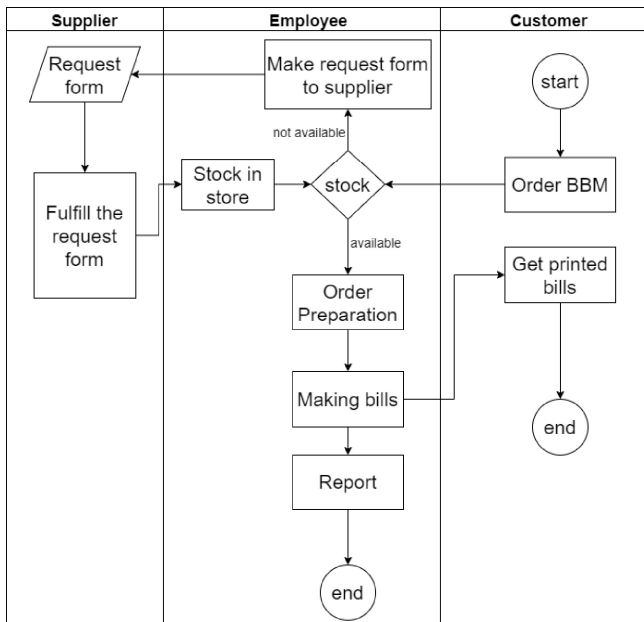


Figure 3. Current Business Process

All activities will operate in the event of a purchase transaction by the customer. They were followed by processing purchase transactions by employees who were on duty at the store. The purchase transaction process ends when

the customer has received the purchase note. After the purchase transaction process has been carried out, the transaction data will be processed into a sales report.

##### B. TOGAF ADM

###### 1. Business Architecture

This stage shows the business architecture operating in the "Pangkalan BBM Dedi" business. Figure 4 shows the business process after implementing the system in operational business processes. Based on Figure 4, it can be seen that there are significant differences in the process flow using the system when compared to the previous business process flow.

If Figure 3 shows the processing of purchase transactions, orders to suppliers, and making reports by employees, then Figure 4 shows the system's processing of these transactions in the business process. The system's use can reduce employees' workload who previously had to process every transaction turned into a single process, namely the data entry process at the beginning of the transaction. These changes can have an impact on the data obtained to be integrated.

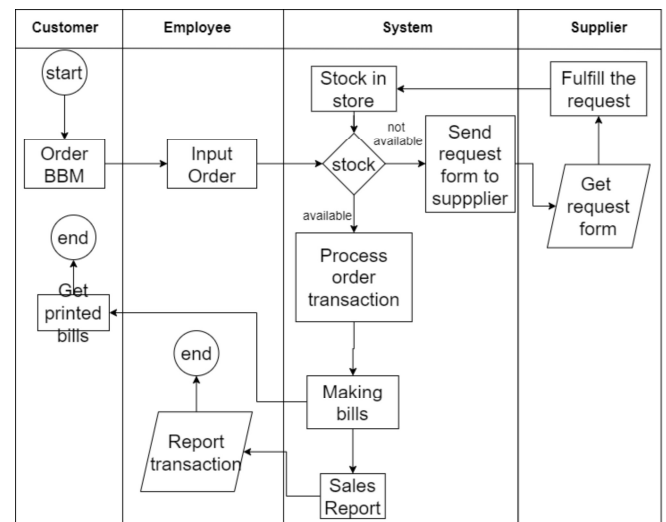


Figure 4. Future Business Process

###### 2. Data Architecture

Designing and building a system in an organization or company is intended to accommodate every critical data. Based on this, the interview and observation process tends to discover essential data or information contained in the business. The interviews and observations show that there are currently three main activities: product sales, inventory, and reporting, with data or information related to business processes. Table 1 shows the seven data entities that were successfully transferred during the interview.

Each entity has data attributes that are identified through interview activities as well. However, data entities and attributes can increase or decrease if, during application development, there are changes in the organization's business processes.

Table 1. Data Architecture

Activities	Entities	Attributes
Product Sale	Product	id_, nama_barang, kode_barang
	Sale transaction	id_transaksi, tgl_transaksi,
	Admin	id_admin, nama_admin, shift kerja
Inventory	Stock	id_stock, jumlah_stock
	Product ordering	id_pemesanan, jumlah_pesanan, nama_supplier
Report	Sales report	id_laporan_penjualan, tgl_laporan_penjualan
	Financial report	id_laporan_keuangan, tgl_laporan_keuangan

### 3. Application Architecture

Table 2 shows that three applications can help using a system or application, namely product sales, inventors, and reporting. Each of these applications has a function that can accommodate business operational activities. In this study, an analysis was carried out to see which systems are close to or adjust the three proposed applications. The interviews and observations show that several activities with data entities can be supported by applying the system, as in Table 2. Based on the research results, it is found that the Point Of Sales (POS) system is a system that can address today's business needs.

Table 2. Application Architecture

Application	Function	Identified System
Product sale	The application functions to record and recap every transaction that occurs in the organization	<i>Point Of Sales (POS)</i>
Inventory	This application serves to check product availability. If the product is not available, it will automatically send a request form to the Supplier.	
Report	This application serves to recap every transaction that has been made by the product sales application in the form of sales and financial reports.	

### 4. Technology Architecture

Figure 5 shows the technology architecture, especially the role of hardware and networks applied to the EAP system in this study. Figure 5 shows the technology architecture consists of 1 printer, 2 PC clients, one switch, and one router. 2 PC Clients are located in the store and can be used during business operations.

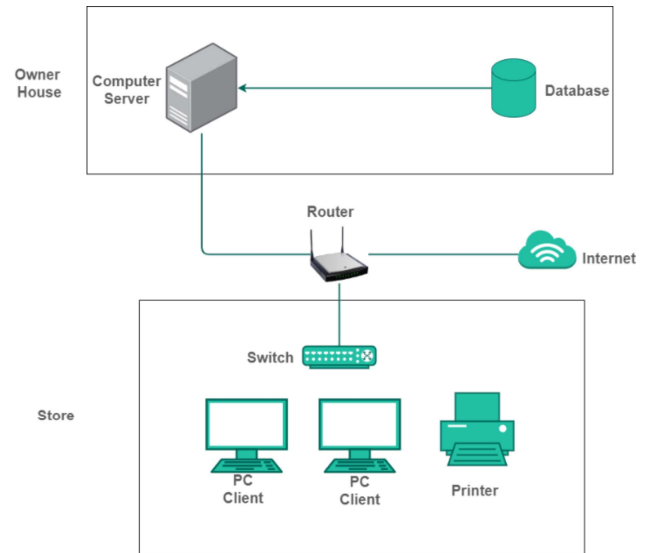


Figure 5. Technology Architecture

Both PC Clients are integrated into the system database. The computer Server is located in the owner's house, making it easier for the business owner to control the activity or transaction and enter the system by the employee on duty.

### 5. Opportunities and Solutions

#### GAP Analysis

Gap analysis is used to see gaps in the business architecture, data architecture, application architecture, and technology architecture that has been designed. Gap analysis is made so that the application or system's architectural design is made according to the target before the implementation process is carried out in the business unit. Table 3 and Table 4 show the gap analysis matrix carried out in this study.

Table 3. Matrix Gap Analysis

Future Now	Order BBM	Preparation Order	Bill Making	Stock Request to Supplier
Order BBM	RT			
Preparation Order		RT		
Bill Making			RE	
Stock Request to Supplier				RE
Financial Report				
Sales Report				
Online Order and Delivery				

Table 4. Matrix Gap Analysis

Future Now	Financial Report	Sales Report	Online Order and Delivery
Order BBM			
Preparation Order			
Bill Making			
Stock Request to Supplier			
Financial Report	RE		
Sales Report		RE	
Online Order and Delivery			ADD

**RT : Retain**

**RE : Replace**

**RM : Remove**

**ADD: Additional**

Table 3 shows that business process activities are maintained, such as "BBM Orders" and "Preparation Orders." At the same time, the business processes "Bill Making," "Stock Request to Supplier," "Financial Report," and "Sales Report" are replaced by the system recommended in Table 2. There is an opportunity to develop new business process activities in the business unit when all actions have been accommodated by the system, namely ordering and delivering ordered products.

## V. CONCLUSION

This research produces an architectural design at "Pangkalan BBM Dedi." The invention results consist of business architecture, data architecture, application portfolio, and technology architecture. After implementing an information system or application successfully identifies its current business processes and processes at the business architecture stage. The data architecture results in three main activities with seven data entities. The application architecture produces three recommendations for information systems or applications that can accommodate business needs. The three applications consist of product sales, inventory, and reporting. The architectural technology stage consists of designing hardware devices and networks that can accommodate application recommendations. Overall, there are two business processes whose function is maintained as before, four business processes that the system will replace, and one business process added later.

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# CERTIFICATE OF PARTICIPATION

Awarded to

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As author of paper entitled

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20-21 October, 2021



A handwritten signature in black ink, appearing to read "H. Studiawan".

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General Chair of ICTS 2021