INTERNATIONAL JOURNAL ON INFORMATICS VISUALIZATION

Development of Inventory Information System Using Enterprise Architecture Planning Method

Muhammad Sobri[#], Poppy Indriani[*], Mohamad Taha Ijab[**], Isnawijani[***], Marlindawati[#]

[#] *Faculty of Vocational, Universitas Bina Darma, Indonesia*
[*] *Faculty of Economic and Business, Universitas Bina Darma, Indonesia*
[**] *Institute of Visual Informatics, National University of Malaysia, Malaysia*
[***] *Faculty of Communication Science, Universitas Bina Darma, Indonesia*

E-mail: sobri@binadarma.ac.id, poppy_ucat@binadarma.ac.id, taha@ukm.edu.my, isnawijayani@binadarma.ac.id, marlindawati@binadarma.ac.id

Abstract— **Universitas Bina Darma is a university that has a vision to become an international standard university driven by innovations in Information and Communication Technology (ICT). The aim of this research is to support the vision of Universitas Bina Darma by creating an inventory information system for the university-wide implementation. The research uses Enterprise Architecture Planning (EAP) which defines the data architecture, application architecture, technology architecture, and its implementation. EAP consists of four levels, where by the top level is planning initiation, the second level consists of two stages namely business modelling, and current systems and technology, the third level consists of three stages of data architecture, application architecture and technology architecture. Lastly, the bottom level is implementation or migration plans. The results of this research are in the form of the Inventory Information Systems that has several menus, among others: procurement menu, maintenance menu, move transfer menu, space menu, loan space menu, asset menu and request menu. This Inventory Information System facilitates the faster processing of inventory data so as to produce quality report that is timely available when needed by the leadership, as well as facilitates the supervision of existing inventory.**

Keywords— **University, Information and Communication Technology, Inventory Information System, Enterprise Architecture Planning, Organizational Strategy.**

I. INTRODUCTION

Information and Communication Technology (ICT) has developed very rapidly such that it affects the strategic, operational and tactical activities in corporate organizations, government agencies, as well as tertiary institutions to support the achievement of good vision, mission and strategic management [1],[2].

The role of information technology has become part of achieving institutional goals [3]. Universitas Bina Darma (UBD) is a university that has a vision to become an international standard university driven by ICT innovations. It has five lecture buildings consisting of nine faculties including postgraduate programs and 21 study programs and various work units [4]. Therefore, the management of UBD is in need of an inventory system that tracks activities related to all inventory data and to facilitate the management of existing inventory which will indirectly contribute towards strategic agenda of the university including on faculty rankings, study programs and work units.

UBD put the efforts to achieve the vision, mission and its strategic management by building an Inventory Information System so that it can produce a system that is effective, efficient and able to administer the inventory information in the good university governance [5].

Pertaining to good university governance practice especially on management of inventory data, it includes a very important role in achieving success in obtaining institutional accreditation with the existence of higher education in the form of document (hardcopy) and can be accessed on a computer using an inventory information system for better audit trail and assets tracking purposes [6].

In facing the challenges in effectively managing the assets and inventory of the university, thus, it is necessary to implement a strategy that requires integrated planning, implementation and control that is aligned with the organization's strategy [7]. This planning strategy can use the Enterprise Architecture Planning (EAP) methodology that defines data architecture, application architecture, technology architecture, and implementation of the developed Inventory Information System [8].

II. THE MATERIAL AND METHOD

This research method uses Enterprise Architecture Planning (EAP) which defines the data architecture, application architecture, technology architecture, and its implementation. EAP method consists of four levels with the top level is the planning initiation. This is followed by the second level which consists of two stages (i.e., business modeling, and current systems and technology), the third level consists of three stages (i.e., data architecture, application architecture, and technology architecture). The last and bottom level is the implementation or migration plans [9]. The EAP is shown in Fig. 1.
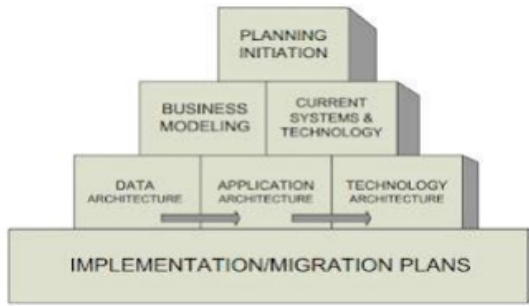

Fig. 1 Example of an unacceptable low-resolution image

2.1. Planning Initiation Level

In this planning initiation level, the research begins by conducting a survey and interview. The purpose of the survey and interview is to understand user experience and find out the field conditions that occur before developing the inventory information system.

The scope of this study consists of (i) procedure for filing inventory starting from before submission, submission process, submission that is approved or rejected, (ii) inventory filing and users involved in it who use this inventory information system consisting of rectorat, dean, head of the study program (head of study), head of the work unit, and head of division work unit as shown in Table 1.

TABLE 1
SURVEY AND INTERVIEW RESPONDENTS

No	Type of Respondent	Number of Respondents
1	Rectorat	3
2	Dean	8
3	Head of Study	19
4	Head of the Work Unit	13
5	Head of the Division Work Unit	30
	Total Responses	73

The interview uses open questions to find out user experience about inventory. The questions submitted to respondents are (i) the procedures for submitting inventory, (ii) the period of submission of inventory, and (iii) the archiving of inventory. Findings from this stage resulted in the field conditions that occur regarding inventory so that the findings are used to design the business process inventory information system being built.

2.2. The Stage of Business Modelling and Current System and Technology

At this stage, the researchers seek information to understand the business modelling needs of the organization and currect system and technology. The data collection covers: (i) studying supporting documents namely the existing Standard Operational Procedure (SOP) regarding inventory in the facilities and infrastructure section, (ii) conducting interviews with leaders, deans, heads of study programs, heads of work units and heads of facilities and infrastructure to find out the scope of work and existing inventory data, (iii) make observations on the facilities and infrastructure to see directly the processing of inventory data that exists today and collecting literature studies aimed at deepening the understanding of strategic planning to build an inventory information system.

The findings of this stage include the known SOPs regarding inventory processing at UBD which consist of 4 tasks: (i) submission of inventory data, (ii) inventorying process, (iii) data collection of inventory submission, and (iv) inventory report. From this stage a menu must be provided in the inventory information system built.

The findings are expanded into the business planning table. The table describes the questions of: What, How, Where, Who, When, Why as shown in Table 2. This is followed by the creation of the process matrix. Each task in the process matrix is filled with letters. For example, "C" (create) means the work unit that proposes or creates the inventory, and U (use) means the work unit that uses the inventory.

The process in the matrix is sorted according to the current business processes found in the administration of facilities and infrastructure shown in Table 3. Next, after the process matrix is made, the third level of Enterprise Architecture Planning is detailing the architectures of (i) data, (ii) application, and (iii) technology.

2.3. Data Architecture, Application Architecture, and Technology Architecture of Inventory Information System

Third level of EAP is architecture which consists of (i) data architecture, (ii) application architecture, and (iii) technology architecture. For the explanation of the three architectures as follows:

2.3.1. Data Architecture

The data architecture aims to define data requirements to be used in the application architecture and is consists of a list of entities data and entity relationship diagrams [11]. List of data entities identifies entities that exist in the inventory information system to be built while the entity relationship diagram is described using the Entity Relationship Diagram (ERD) shown in Fig. 3.

2.3.2. Application Architecture

The next stage after making data architecture, followed by application architecture planning whose functional requirements include: (i) able to collect inventory records from various work units, (ii) able to manage inventory data, (iii) can be shared by users at the same time, and (iv) confidentiality of inventory data is guaranteed.

2.3.3. Technology Architecture

Technology architecture combines data architecture and application architecture into a single entity in building an information system in the second level of EAP [12]. The last level or the bottom of EAP is implementation of the

inventory system. This is explained in the Results and Discussion section.

III. RESULTS AND DISCUSSION

Based on the finding of the interviews and observations conducted in the previous section, information is obtained about: (i) data entities as users of inventory information systems to be built, namely: rectorat, dean, head of the study program (head of study), head of the work unit, and head of division work unit while (ii) business processes consist of filing inventory, data collection of inventory submissions, inventory processes, and inventory reports.

This section will further discuss about (i) business processes, (ii) business planning model, (iii) process matrix, (iv) design of data architecture, (v) design of application architecture, (vi) design of technology architecture, and lastly (vii) implementation of inventory information system.

3.1. Business Processes

Based on the finding of the survey conducted, it can be seen that business processes in the procurement of facilities and infrastructure are the most important because in this part, the input, process and output of inventory data are carried out, processed and stored. The business process model for the procurement of facilities and infrastructure is shown in Fig. 2.
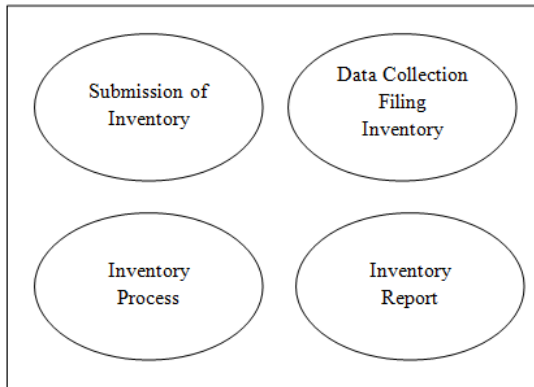
Fig. 2 Business Processes of Inventory Information System [13]

3.2. Business Planning Model

Based on the results of business processes that have been made, it is forwarded and explained into the business planning table model which contains a description of planning questions to make this inventory information system which consists of: What, How, Where, Who, When, Why and shown in Table 2.

TABLE II
BUSINESS PLANNING MODEL INVENTORY INFORMATION SYSTEM

Question	Description
What	This research is about making an inventory information system at Universitas Bina Darma
How	How to apply the EAP to build an inventory information system at Universitas Bina Darma
Where	This inventory information system is located in the Universitas Bina Darma main campus building
Who	Human resources who play a role in the use of this inventory information system consist of:
	leaders, deans, kaprodi, heads of work units and heads of facilities and infrastructure
When	This research was conducted for 2 years from 2017 to 2018
Why	To support the vision, mission and strategic management of Universitas Bina Darma

3.3. Process Matrix

Based on business processes and business planning models that have been created, continued and described in the process matrix. Each task in the process matrix is filled with letters, namely: "C" (create) means the work unit that proposes inventory and U (use) means the work unit that uses inventory. The process in the matrix is sorted according to the current business processes found in the administration of facilities and infrastructure. shown in Table 3.

TABLE III
PROCESS MATRIX INVENTORY INFORMATION SYSTEM

Inventory Process	Task	
	C (Create)	U (Use)
Submission of Inventory	Head of Infrastructure, Head of Work Unit, Dean and Kaprodi	Head of Infrastructure
Data Collection Filing Inventory	Head of Infrastructure	
Inventory Process	Head of Infrastructure	Head of Finance Section and leaders
Inventory Report	Head of Infrastructure	leader

3.4. Design of Data Architecture

The data architecture consists of business entities and data entities that are part of the planning architecture of the inventory information system to be built [14]. Data entities are part of a business entity consisting of tables containing fields and records of system data inventory information is displayed using Entity Relationship Diagram (ERD) (refer Fig. 3) while business entities are the design of menus of inventory information systems to be built. The data architecture design is shown in Table 4.

TABLE IV
DATA ARCHITECTURE INVENTORY INFORMATION SYSTEM

Business Entity	Data Entity
Operational Entity	1. Leader Entity 2. Dean Entity 3. Kaprodi Entity 4. Head of Work Unit Entity 5. Head of Unit Section Entity
Inventory Entity	6. Inventory Entity
Inventory Submission Entity	7. Inventory Submission Entity
Submission Process Entity	8. Submission Process Entity
Report Entity	9. Annual Report Entity 10. Semester Report Entity 11. Monthly Report Entity

As shown in Table 4 above, several business entities are contained in this inventory information system, while their functions are as follows: (i) Operational Entity: used to hold user data consisting of leader entity, dean entity, kaprodi entity, head of work unit entity and head of work unit section

entity, (ii) Inventory Entity: used to hold inventory data entity, (iii) Inventory Submission Entity used to hold inventory data filing entity, (iv) Submission Process Entity: used to hold process data entity, and lastly (v) Report Entity used to hold monthly reports entity, semester reports entity and annual reports entity.

After creating data architectures that contain business entities and data entities, then each relation of the entity is described using Entity Relationship Diagram (ERD) shown in Fig. 3
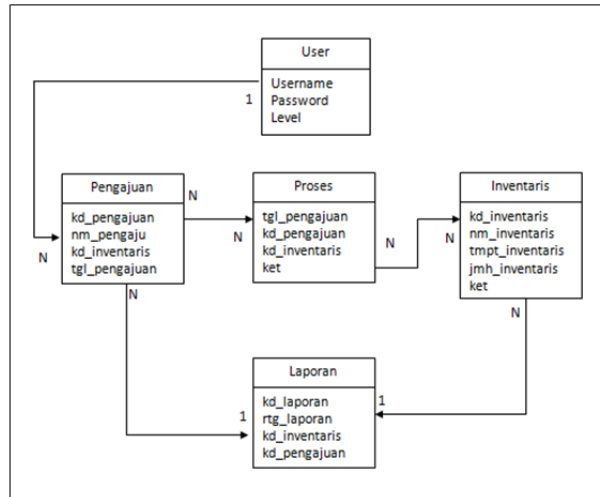
Fig. 3 ERD of Inventory Information System [13]

3.5. Design of Application Architecture

The next step after the design of data architecture is to design the application architecture. It consists of several menus, such as (i) procurement menu design to monitoring request items or equipment needed of each users (dean, head of the study program, head of the work unit, and head of division work unit), (ii) maintenance menu design to request improvements from existing inventory, (iii) transfer menu design to move inventory to another place, (iv) room menu design to record inform about inventory found in every room in UBD, (v) for loan room menu design to record about borrowing or reserving for example the auditorium to be used to carry out an activity such as a seminar, (vi) inventory menu design to record information about inventory details such as conditions, quantities and inventory reports, and (vii) request menu design to request items or equipment needed.

3.6. Design of Technology Architecture

The last step of design architecture is created is the depiction of a technology architecture that describes the data communication relationship in each entity or business process that has been described. Information technology strategy for the construction of network architecture inventory information system consists of (i) network requirements, using a LAN cable with good quality and speed of 1000Mbps for easy access, (ii) users using of inventory information system consist of 1 person leader, 8 deans, 19 kaprodi, 13 heads of work unit and 30 heads of section who are all use personal computers (PCs) or laptops to access inventory information system, and (iii) server allocation for inventory information system data. The design

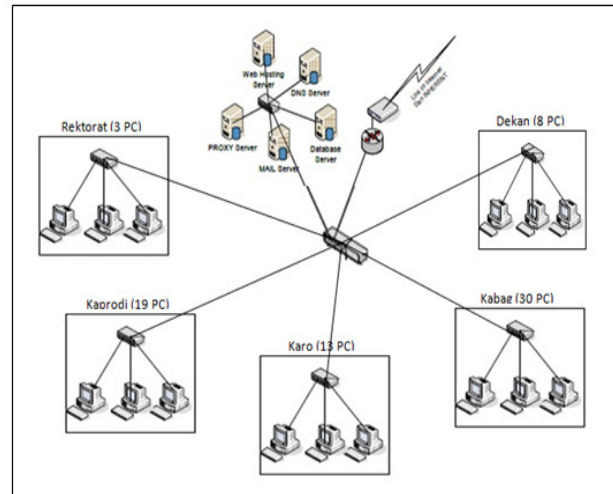of technology architecture of inventory information system is shown in Fig. 5

Fig. 4 Networking Architecture of Inventory Information System [13]

3.7. Implementation of Inventory Information System

The last step of EAP is implementation. Here, the system is developed using a programming language to create the inventory information system. The researchers use Macromedia Dreamweaver software with the PHP programming language and MySQL database.

This inventory information system has several menus including (i) procurement menu, (ii) maintenance menu, (iii) transfer menu (iv) room menu, (v) loan room menu, (vi) inventory menu and (vii) request menu.The main display of the inventory information system is shown in Fig. 6
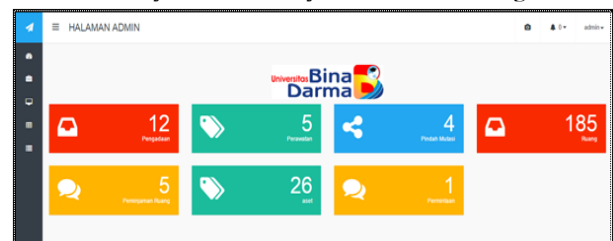

Fig. 6 Main Menu of Inventory Information System

Configuration in each menu for access rights and user facilities consists of several buttons, namely: (i) new button: used to add data and at the same time submission of inventory, (ii) save button: used to store inventory data, (iii) view button: used to view inventory data containing submission status consisting of: already sent to the leader, being studied by the leader, approved or not, (iv) edit button: used to edit inventory data in the event of errors in inputting inventory submissions, (v) delete button: used to delete unapproved inventory data; and (vi) print button: used to print an inventory data report.

The following is an explanation of each menu. (1) Procurement menu used to monitoring request items or equipment needed of each users and have user facilities consists of (i) search button, (ii) detail button, (iii) edit button, (iv) delete button, and (v) print button as shown in Fig. 7
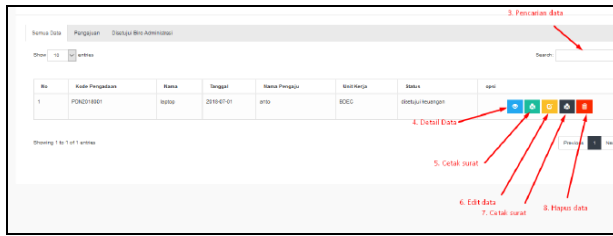
Fig. 7 Procurement Menu of Inventory Information System

(2) Maintenance menu used to request improvements from existing inventory and have user facilities consists of (i) search button, (ii) detail button, (iii) edit button, (iv) delete button, and (v) print button as shown in Fig. 8
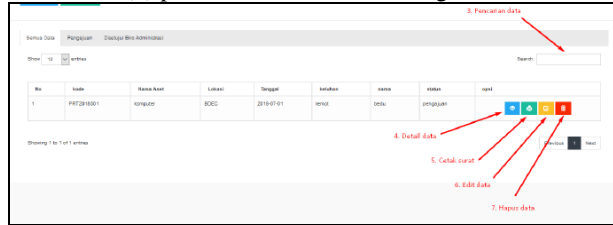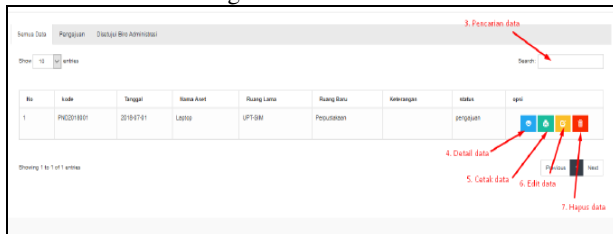

Fig. 8 Maintenance Menu of Inventory Information System

(3) Transfer menu used to move inventory to another place and have user facilities consists of (i) search button, (ii) detail button, (iii) edit button, (iv) delete button, and (v) print button as shown in Fig. 9

Fig. 9 Transfer Menu of Inventory Information System

(4) Room menu of inventory information system have record inform about inventory found in every room in UBD and have user facilities consists of (i) edit button and (ii) delete button as shown in Fig. 10

Fig. 10 Room Menu of Inventory Information System

(5) For loan room menu used to record about borrowing or reserving for example the auditorium to be used to carry out an activity such as a seminar and have user facilities consists of (i) search button, (ii) detail button, (iii) edit button, (iv) delete button, and (v) print button as shown in Fig. 11
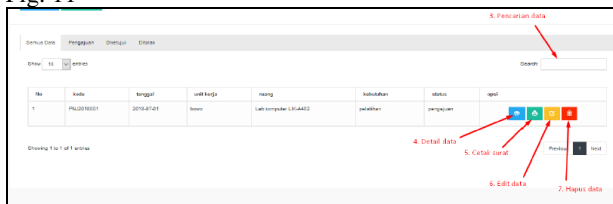

Fig. 11 For Room Menu of Inventory Information System

(6) There are three types of reports, namely: (i) monthly inventory report, (ii) annual inventory report, and (iii) annual inventory report. The display of inventory data menu as shown in Fig. 12
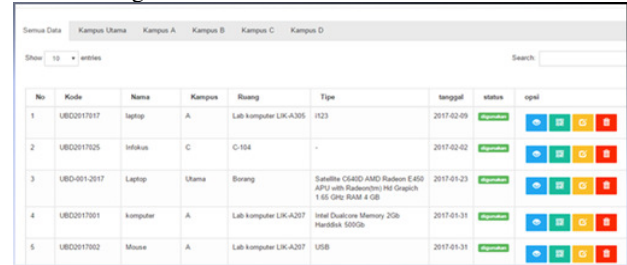

Fig. 12 Inventory Data Menu of Inventory Information System

(7) Last menu is request menu used to request items or equipment needed and have user facilities consists of (i) search button, (ii) detail button, (iii) edit button, (iv) delete button, and (v) print button as shown in Fig. 13
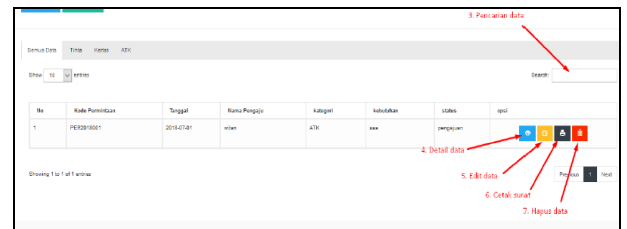

Fig. 13 Inventory Data Menu of Inventory Information System

IV. CONCLUSIONS

Based on the results of research conducted at Universitas Bina Darma (UBD) to support effectiveness and improve the efficiency of UBD business processes, it can be concluded as follows: (i) the inventory information system that has been built is expected to help UBD in managing and monitoring inventory data, and (ii) it is also expected that UBD leadership can as certain and monitor the existing inventory conditions using this inventory information system. For further research, evaluation of the usability, effectiveness and user satisfaction of the built inventory information system is planned.

REFERENCES

[1] R. E. Indrajit, Teknologi Informasi dan Perguruan Tinggi: Menjawab Tantangan Pendidikan Abad ke-21, no. 289. APTIKOM, 2013.
[2] Rosmalina, "Model Rencana Strategis Sistem Informasi di Universitas Bale Bandung (UNIBBA)," pp. 1–17, 2014.
[3] M. Dyah Retno Hapsari Husadani, S. Paulus Insap, and E. Nugroho, "Model Perencanaan Strategis Sistem Informasi," in Seminar Nasional Ilmu Komputer, 2015, pp. 153–158.
[4] M. Sobri, P. Indriani, and Marlindawati, "Perancangan Sistem Informasi Perawatan dan Inventaris Menggunakan Metode Enterprise

Architecture Planning Studi Kasus Universitas Bina Darma," in Seminar Nasional Teknologi Informasi dan Komputasi, 2017.

[5]   B. Widodo and Suharjito, "Pengembangan Blueprint IT dengan Zachman Framework di STP Trisakti," J. Sist. Inf. (Journal, vol. 12, pp. 49–66, 2016.

[6]   K. Mutyarini and J. Sembiring, "Arsitektur Sistem Informasi untuk Institusi Perguruan Tinggi di Indonesia," in Konferensi Nasional Teknologi Informasi dan Komunikasi untuk Indonesia, 2006, pp. 102–107.

[7]   L. Y. Astri and F. L. Gaol, "Information System Strategic Planning With Enterprise Architecture Planning," Int. J. Commun. Inf. Technol., vol. 7, no. 1, pp. 23–27, 2013.

[8]   K. Surendro, "Pemanfaatan Enterprise Architecture Planning untuk Perencanaan Strategis Sistem Informasi," J. Inform., vol. 8, no. 1, pp. 1–9, 2007.

[9]   S. H. Spewak and S. C. Hill, Enterprise architecture planning : developing a blueprint for data, applications, and technology. Wiley Publishing, 1993.

[10]   S. J. Nugroho, "Enterprise Architecture Planning Sistem Informasi Rsia Andini Dengan Menggunakan Togaf," Universitas Islam Negeri Sultan Syarif Kasim Riau, 2012.

[11]   Suhendri, "Perancangan Arsitektur Sistem Informasi Sekolah dengan The Open Group Architecture Framework (Togaf) (Studi Kasus : Pondok Pesantren Ar-Rahmat)," Infotech J., vol. 1, no. 2, pp. 40–47, 2016.

[12]   A. Solichin and Z. A. Hasibuan, "Pemodelan Arsitektur Teknologi Informasi Berbasis Cloud Computing untuk Institusi Perguruan Tinggi di Indonesia," in SEMANTIK, 2012, pp. 10–16.

[13]   P. Indriani, Isnawijani, Marlindawati, and M. Sobri, "Implementation of Enterprise Architecture Planning For Designing Inventory Information Systems," J. Ilm. PPI-UKM, vol. 5, no. 2, 2018.

[14]   T. Suryana, "Perancangan Arsitektur Teknologi Informasi dengan Pendekatan Enterprise Architecture Planning," Maj. Ilm. UNIKOM, vol. 10, no. 2, pp. 223–236, 2012.