INFORMATION TECHNOLOGY STRATEGIC PLAN USING WARD AND PEPPARD METHOD (A CASE STUDY OF THE DIPLOMA PROGRAM OF IPB UNIVERSITY)

PERENCANAAN STRATEGIS TEKNOLOGI INFORMASI MENGGUNAKAN METODE WARD AND PEPPARD (STUDI KASUS PROGRAM DIPLOMA INSTITUT PERTANIAN BOGOR)

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Abstract

Te Vocational School of IPB University has utilized information technology (IT) to support its business process. The problem is the existing information technology has not been effective in supporting the main business process. Improvements are needed for the components of data processing and information systems. Applying information technology aligned with the needs of business processes requires a plan to minimize the occurrence of failure in the implementation phase. IT strategic plan plays important role as guidelines and directions for IT operation in an organization. The stages of IT strategic plan are performed based on Ward and Peppard framework. IT strategic plan formulated in this study consists of some components such as application portfolio, IT management strategy, and IT architecture recommended for the Vocational School of IPB University .

Keywords: *information technology, information system, strategic plan, vocational college, Ward and Peppard.*

INTRODUCTION

The role of information technology (IT) is currently no longer limited to the support elements of business process, rather, it began to swift functions as an enabler for various efforts of quality, effectiveness, efficiency, and accountability improvements or enabler for the realization of the institutions' objectives. IT makes business process more effective in accomplishing missions and efficient in managing and using resources. IT also support the realization of institutions' vision (Oktavia et al. 2013). Ministry of Education and Culture data in 2018 (http://reference.data.kemdikbud.go.id/) shows that there are 2,776 higher educational institutions in Indonesia, both public and private. The data records that approximately 2,194 of the total educational institutions already utilize information technology, one of which in the form of a university website to support their business processes. The Webometrics (a ranking system for the world's universities based on their online publication through their websites) ranks IPB on the 4th position of Indonesian universities (http: //www.webometrics.info/en/Asia/indonesia). This indicates that IPB had been appropriately utilizing information technology to support its business activities. In this regards, the Diploma Program, as one of the working units of IPB University, plays a significant role in improving the quality of IPB university for one of the assessment criteria of the webometrics is how universities utilize online media to support their existing businesses process. In 2016, IPB university, through the DIDSI, has carried out evaluation of the performance of the website of the 12 implementation units of IPB

university which consists of 9 faculties, one graduate program, one school of business, and one diploma program. Utilization performance of IPB University Diploma Program's website was weighted 30.53 out of 100 points, placing it on the 12th position with the category of less performing website. This data has motivated the IPB University Diploma Program to improve the use of IT in supporting its business processes.

IPB University Diploma Program is one of IPB University's implementation units providing 18 programs of expertise. The Human Resources and Academic unit data of 2018 states that currently the IPB University Diploma Program has 6,767 active students, with 114 lecturers and 90 educational personnel. As an educational institution, the IPB University Diploma Program performs many business processes in its daily activities. The business process ranges from promotions to feedback gatherings from alumni and alumni users. Business process also covers the supporting of academic processes including management of assets, management of non-academic student activities, management of supporting facilities such as the library, clinic laboratory, and others. The evaluation of TESCA 2011 questionnaires resulted in early evaluation result of 31.9 percent which put the IPB University Diploma Program at the *pratama* level. At this level, IPB University Diploma Program has been able to provide value added to the process of education and learning through the use of IT, although its performance may have not been able to meet the expectation of its stakeholders.

Currently the IPB University Diploma Program has several information systems used to

support its business process, one of which in the implementation of the academic-related affairs. However, the implementation process is faced with many challenges, among other, data and information that is processed and produced from the existing systems are still scattered on the scope of the managers' internal unit. This condition hampered the process of information dissemination between units and stakeholders. The IT needs to be designed to be aligned with the organization's business process, this is a challenge that must be faced and supported by all parties within an institution (Jonkers et al. 2006, Chan and Reich 2007). This study generally uses the fishbone analysis to recognize and find out the problems occurred (Figure 1) .

This study aims to compile IT strategic planning documents for the IPB University Diploma Program with outputs in the form of proposed portfolio applications , IT infrastructure design, and IT management strategies. This document will be used as a guideline in developing IT that is aligned and supports the achievement of the objectives of the IPB University Diploma Program. This study on IT strategic plan for IPB

University Diploma Program is limited to the aspect that is associated with the business process and business process supporting aspects in the IPB University Diploma Program in accordance with its Standard Operating Procedures SOP). In the preparation of the strategic plan, the frameworks of Ward and Peppard (Ward and Peppard 2002) strategic planning is used.

METHODOLOGY

This study uses the framework of Ward and Peppard IT strategic planning (Ward dan Peppard 2002) which comprises the following phases:

Internal Business Environment Analysis

This phase indentifies internal aspects to map the current organization and business strategy. The followings are matters related with the internal business environment analysis:

IPB University Diploma Program's Vision, Mission, and Business Strategy SW (Strength, Weakness) analysis

The analysis of IPB University Diploma Program's vision, mission, and goals is the initial step of strategic planning.
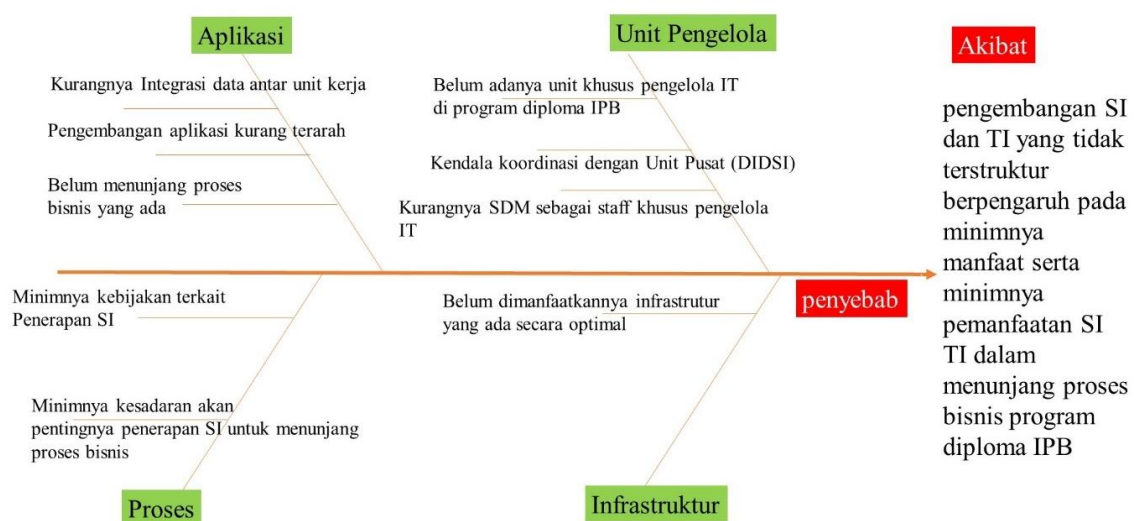
Gambar 1. Analisis *fishbone* permasalahan TI Program Diploma IPB

Internal business environment analysis using the analysis component of IPB University Diploma Program's strengths and weaknesses.

Value Chain Analysis

This concept was introduced by Michael Porter (1998), it depicts the organization's entire activities to support its product, both internal or external, and reveals the organization's competitive advantages or disadvantages. The analysis is carried out to map the entire business process that occurs in the IPB University Diploma Program into two categories of activity, namely the primary and support activities.

Critical Success Factor (CSF)

The CSF is aimed to have clearer interpretation of objects to determine which activities must be carried out and what information is needed (Ward and Peppard, 2002). CSF analysis is very useful when used in parallel with value chain analysis in identifying the most critical processes, as well as focusing on achieving goals through the most appropriate activities to be carried out (Zhang et al. 2013).

External Business Environment Analysis

In this phase, analysis is carried out regarding the organization's external factors which have potential influence on the organization's strategy using the OT (Opportunity, Threat) analysis.

Internal IT Environment Analysis

In this phase, analysis is carried out on the current conditions of the IT conditions used in

Gambar 2. *Value chain* Program Diploma IPB

Sumber: Hasil analisis
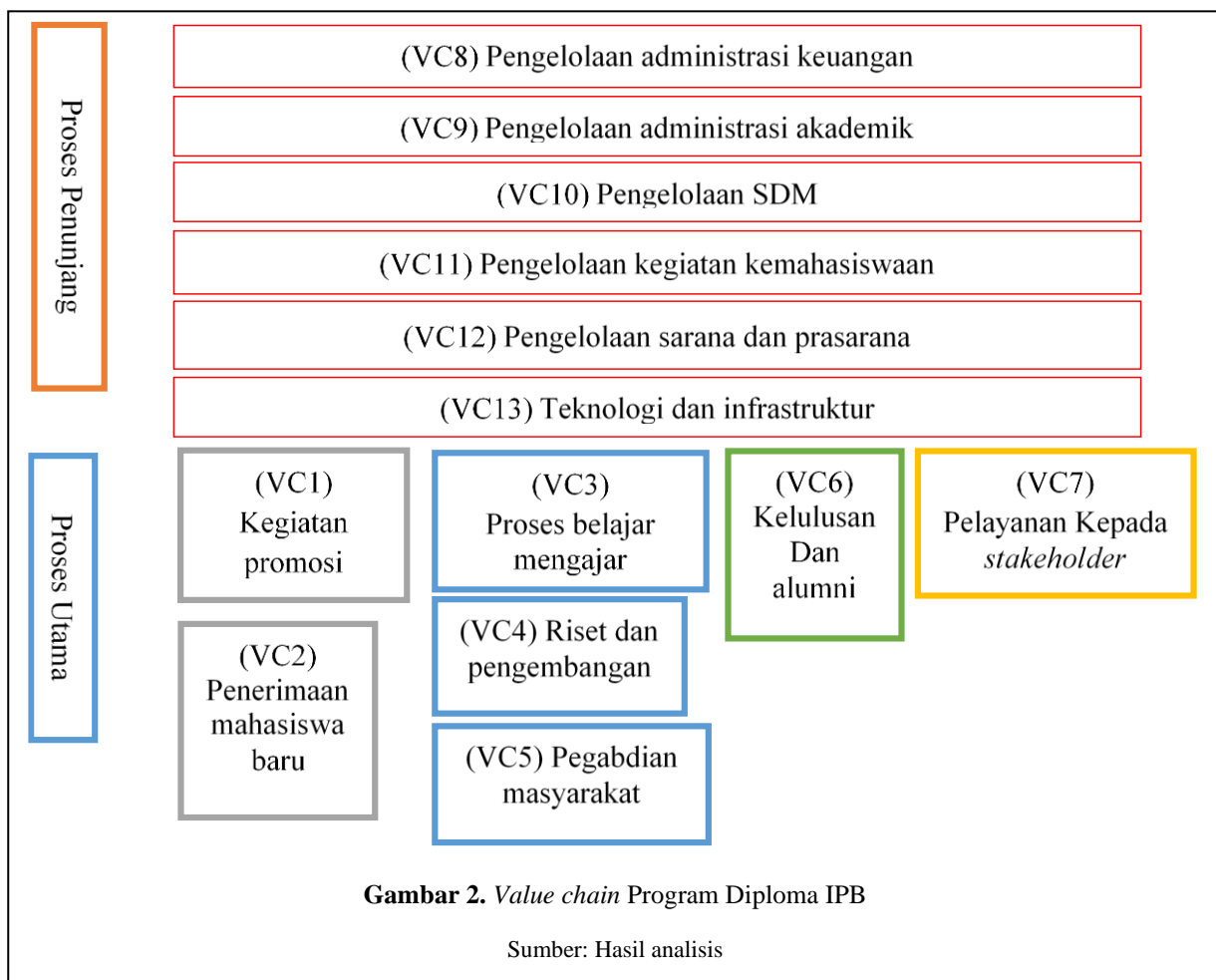
supporting IPB University Diploma Program operational activities. Results of this analysis are IT organizational structure and resources, IPB University Diploma Program's portfolio application which is presented in McFarlab Strategic Grid, business process analysis to determine the information needed in IPB University Diploma program's business process, and analysis of the organization's IT infrastructures (hardware, software, network).

External IT Environment Analysis

This phase indentifies the current IT development and future trends. The technology used by customers (students candidates, students, public, related institutions, business, and industries cooperating with IPB University Diploma Program), suppliers (lecturers), and competitors (similar educational institutions).

Recommendations of Strategy

This study suggests a number of recommendations. First, future information technology portfolio which is aligned with the needs of IPB University Diploma Program. The future portfolio reveals the investment priorities recommended to be made by the organization, as well as the applications that are potentially useful in the future for the organization. Second, IT infrastructures to support the future application portfolio. Third, IT management policies (resources, infrastructures, security).

RESULTS AND DISCUSSIONS

Internal Business Environment Analysis

Value Chain Analysis

The value chain analysis results are obtained by referring to standard operational procedures that have been determined in the diploma program (SOP of Diploma IPB 2014). The 22 existing business processes in IPB University Diploma Program are divided into two categories, namely the main processes and support processes, which are described in the diagram value chain (Figure 3).

Critical Success Factor (CSF)

IPB University Diploma Program already has its documents of Internal Quality Assurance System and Quality Standards for Diploma Education Program which is established in the Regulation of the IPB Rector No. 06/IT3/DT/2013. The Quality Standards applied for IPB University Diploma Program is the critical factor to measure the successful operation of the program. IPB's quality standards refer to those standards and parameters used by the National Accreditation Agency for Higher Education (BAN-PT), the Education Quality Standards (EQS), and Quality Assurance System in Higher Education (SPMPT). In order to apply the SMM ISO 9001:2008, the IPB University Diploma Program has established 52 quality targets which include targets and measures of success for every target (SPMI Diploma IPB 2013).

SWOT Analysis

Based on the results of observations on the business processes conducted by each working units and results of in-depth interviews with each working units, the factors of strength, weaknesses, opportunities, and threats of the IPB University Diploma Program were identified (Table 1).

Table 1. SWOT Analysis of the IPB Univ. Diploma
Program's IT

Strength-opportunity strategies	*Strength-thread strategies*
- Building an integrated IT as support to existing business process. - Establishing a special unit of IT management for IPB Univ. Diploma Program - Adopting the existing IT application of IPB as Parent Institution. - Collaborating with center IT management (DIDSI) in developing IPB Univ. Diploma Program's IT	- Formulating a mature and sustainable plan in developing the IPB Univ. Diploma Program's IT to minimize failure in the implementation stage.
Weakness-opportunity strategies	*Weakness-threats strategies*
- Making optimal use of IPB Univ. Diploma Program's IT resources. - Establishing special policies related to IT governance - Increasing intra-institutional effectiveness and coordination i order to respond to the development of IT in the internal and external environments.	- Overcoming weaknesses in coordination and integration mechanism of data and information

Analysis of the IT conditions of IPB University Diploma Program's

Results of the analysis on the information systems currently owned by IPB University Diploma Program is summarized in the application portfolio using *McFarlan Strategic Grid* (Table 2).

Table 2. IPB Univ. Diploma Program's Current
Program Portfolio

Strategic	*High potential*
-	- IPB DIPLOMA's *Website*
Key operational	*Support*
- Academic Administration (*desktop*) - Employee Administration (*desktop*) - Financial Information System (*web-app*) - Information System of Online Survey for Graduates Satisfaction (*web-app*) - USMI computer application Package (*desktop*) - Information System for admission (*web-app*)	- *Finger print* (*desktop*) - CDS/ISIS (*desktop*) - *Online Public Access Catalogue* (*dekstop*) - Tamuk (*desktop*) - Diploma's clinic medical records application (*desktop*) - EPBM (*web-app*)

Most of the current existing applications were those developed in the beginning of the establishment of IPB University Diploma Program which are aimed to support its main process of academic activities. the current existing applications have not been optimally integrated. Each application generate separate information which are not yet connected. The 13 applications which are currently applied comprise of 8 desktop applications and 5 web-based applications. A number of computers are used as servers and function as storage media for data generated from

applications used. the server computers were located in each existing working units, namely academic, library, clinic, and computer laboratory. Current conditions has caused problems in related units and related stakeholders who need data or information.

Table 3. Application specifications of IPB Univ. Diploma Program

Application name	Information
Academic Administration	- *Platform windows* - *desktop applications* - LAN network - *User: academic staff and data* - academic administration data management function
Employee Administration	- *Platform windows* - *desktop applications* - LAN network - *User: H&R* staff members - employee data management function
Information System for Graduates Satisfaction Survey	- *Web-based* - *Link http://skw.ipb.ac.id/* - Internet network - *User:* alumni - Graduates satisfactory survey function - IPB University Quality management office managers.
USMI Computer application package (PAKU)	- *Platform windows* - *desktop application* - LAN network - *User:* Data staff member - IPB univ. Diploma program student candidate data management function
Finger print	- *Platform windows* - *desktop application* - LAN and internet networks - *User: employees of* IPB Univ. Diploma Program - attendance monitoring function
CDS/ISIS	- *Platform windows* - *desktop application* - LAN network - *User; library staff members*
	- library data management function
Online Public Access Catalogue	- *Platform windows* - *desktop application* - LAN network - *User*; library visitor - library data search function
Tamuk	- *Platform windows* - *desktop application* - LAN network - *User: library visitor* - Guest book function
IPB Univ. Diploma Program's clinic medical record application	- *Platform windows* - *desktop application* - *User: clinic staff members* - clinic patient data management function
Financial application	- *Web-based* - internet network - *User: financial staff members* - IPB Univ. Diploma Program financial data reporting function to central IPB
EPBM application	- *Web-based* - *Link http://skw.ipb.ac.id/* - internet network - *User: students* - learning and teaching evaluation function - IPB quality management office managers
Application for admission	- *Web-based* - *Link http://skw.ipb.ac.id/* - internet ntework - *User; student candidates* - admission process function

In terms of IT infrastructure availability, the diploma program already has IT infrastructure and support facilities which are categorized as: computers, servers, and internet. the diploma program has approximately 500 computer units which are actively used for computer laboratory, lecturers, employees, as well as top managers. According to data from Directorate of Data Integration and Information System (DIDSI), currently all IPB's intranet are using the fiber optic (FO) technology, twisted-pair, and wireless local area network (WLAN). IPB has a cisco

technology-based FO for its core link and distribution which has been utilized for various other technologies including intranet and Voice over internet protocol (VoIP). FO technology is also used for the interconnection in IPB campuses located outside Darmaga, namely Baranangsiang Campus, Cilibende Campus (Diploma), and Gunung Gede Campus (MB). Figure 4 displays the network typology of the IPB University Diploma Program which is designed based on direct

observation. the bandwidth allocation for the IPB University Diploma Program is 400Mbps with 200Mbps uploads and 200Mbps downloads. Most of the computer facilities in the diploma program have been connected to LAN networks, especially computers located in the computer laboratory.
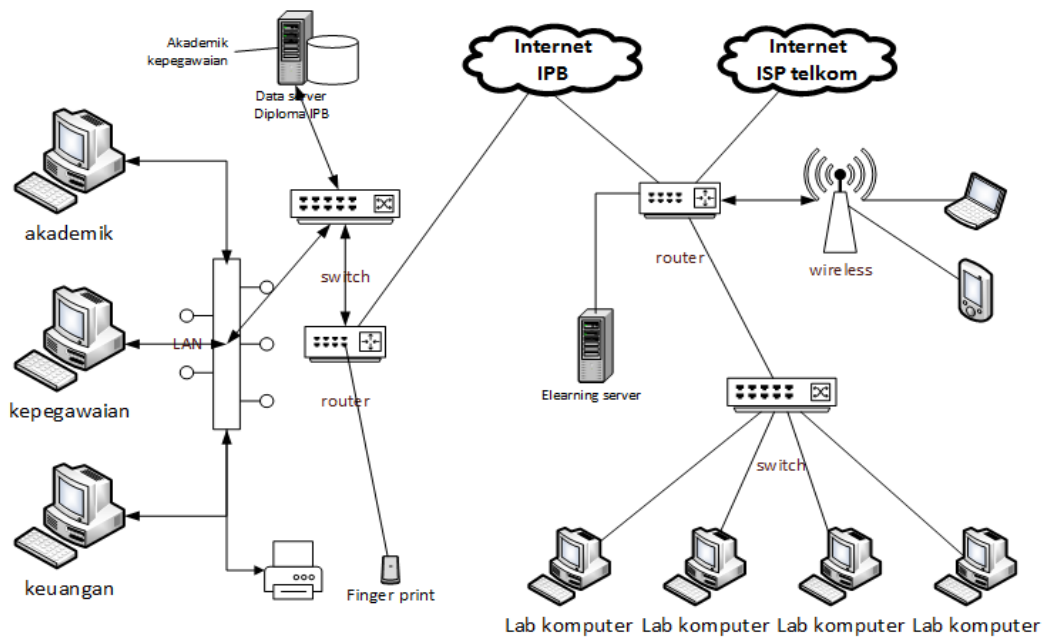

Figure 3. Current architecture of network of IPB Univ. Diploma Program
Source: Analysis results

External IT Development Analysis

There has been a very rapid development of the current trends of technology. Various fields, including education, government, or corporations strive to improve their respective services quality by utilizing information technology. There are various solutions that may be used by institutions in implementing information technology, starting from developing the system from zero to collaborating with vendors of information technology service providers appropriate to the needs of related institutions. Each option comes

with its advantages and disadvantages. Development of applications from zero requires a very mature planning including on long-term planning for support infrastructures in order to be able to support the development of a sustainable system. in addition, competent experts are needed to develop the planned system.
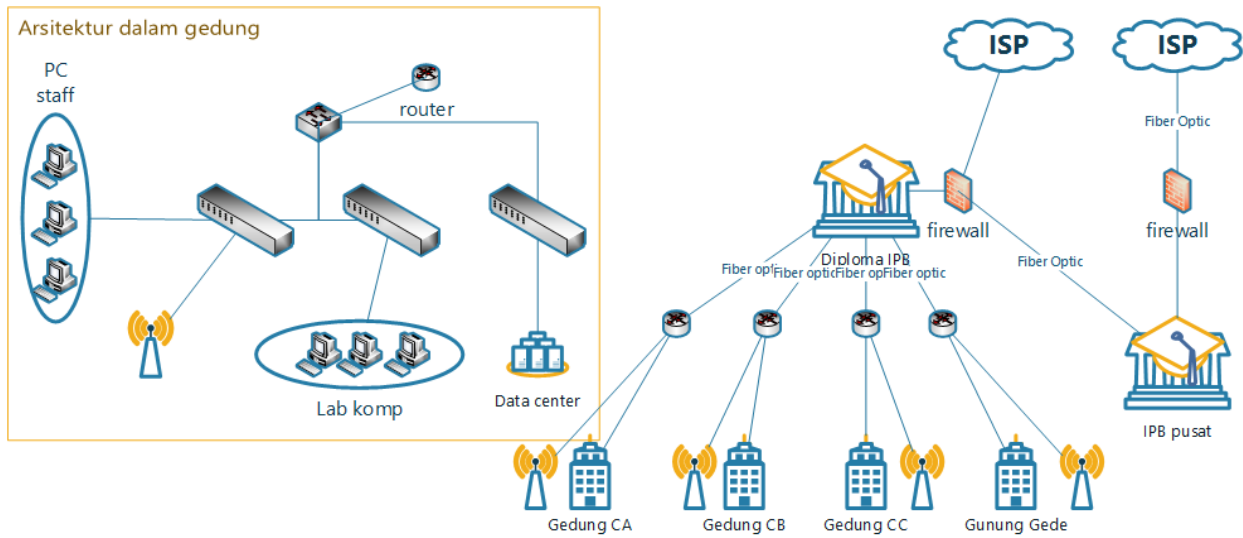
Another trend currently developing is that there is a multitude of business which prefer to partner with third parties (IT services provider vendors) to manage the information systems they use by utilizing the cloud computing technology

rather that develop their own desired information technology. Ease of implementation and maintenance as well as guarantee of data security offered become main points of considerations (Maimunah 2012).

IT Strategy Recommendations

Data and Information Architecture

There is a significant need for data and information architecture in the development of IPB University Diploma Program's information system which will serve as a foundation to facilitate future data integration and mutation. This study recommends a network architecture for IPB University Diploma Program as shown in Figure 5. While recommendation for the organization's data and information architecture is shown in figure 6.


Gambar 4. Recommendation for network architecture for IPB Univ. Diploma Program
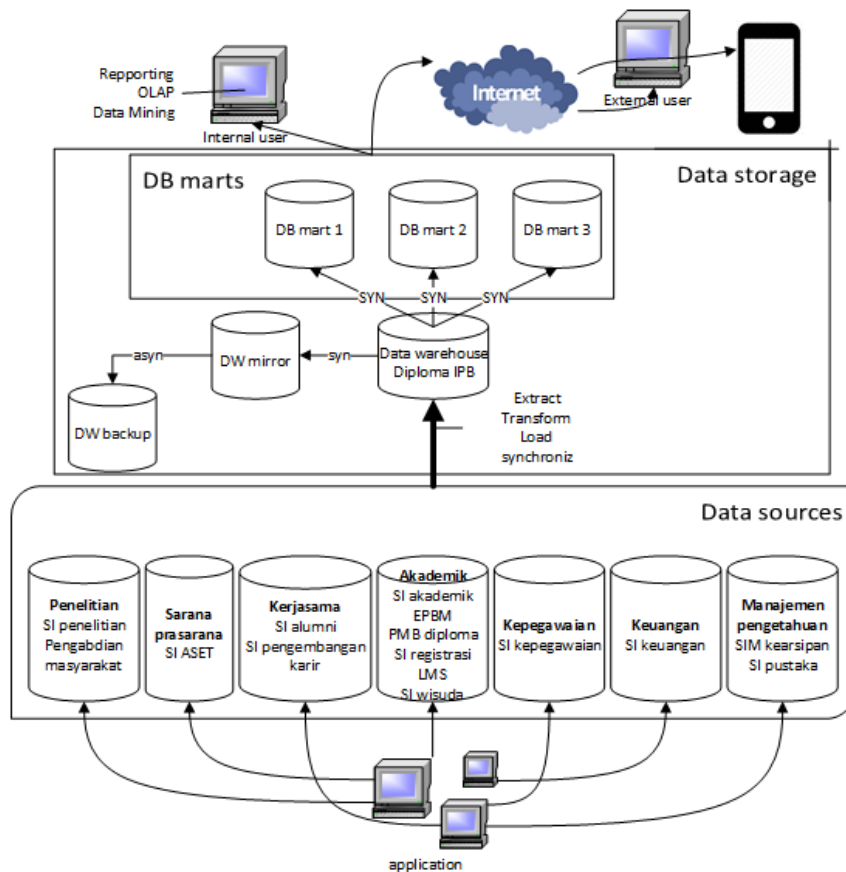
Gambar 5. Recommendation for information and data architecture for IPB Univ. Diploma Program

Application Portfolio

Based on the results of the analysis of the information needed, this study recommends information system solution to be developed in IPB University Diploma Program as shown in Table 3. Not all applications are included in the table due to limited space. Applications in the key operational quadrant will become the main priority for implementation stage. The applications are identified as priority since they play important roles in the continuity of business process in the organization.

The application portfolio (Table 4) reveals an analysis gap between the current information system and the information system in the suggested organization's strategic plan. The

analysis gap can be seen in Table 5.

Table 4. Recommendation o application portfolio for IPB University Diploma Program

Strategic	*High potential*
Executive IS (*web-app*)	- IPB DIPLOMA website - collaboration IS
Key operational	*Support*
- Academic administration - Employee administration - Financial information system - Admission Information System - Registration IS (new and old students) - Graduation IS - Administrative documents management and archive IS	- Alumni association forum IS - Carrier development IS - Research and development IS - Facilities and Infrastructures IS - Scholarship IS - EPBM - Library IS
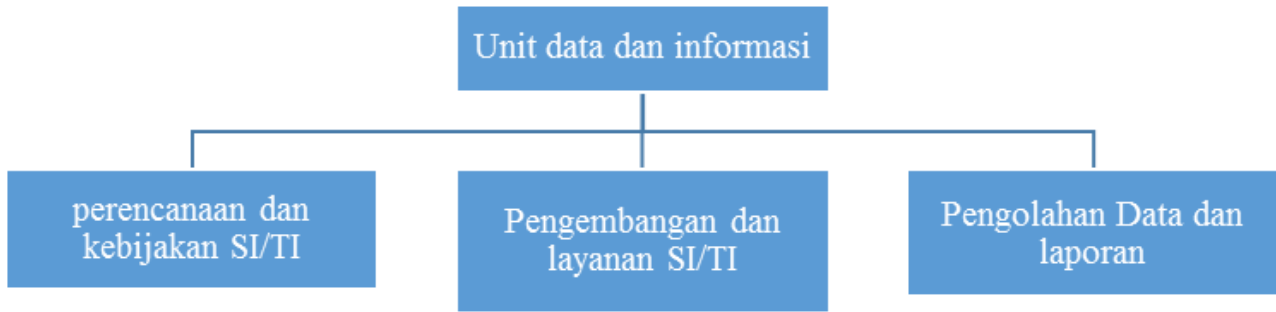
Gambar 6. Recommendation of IT organizational structure of IPB Univ. Diploma Program

Tabel 5. Alaysis Gap of application portfolio

	Optimized	*Developed*	*Retained*	*Replaced*
Academic Applications group				
IPB Univ. Diploma Program Academic IS				√
IPB Univ. Diploma Program Registration and Admissions Test IS	√			
IPB Univ. Diploma Program Student Registration IS		√		
Graduation IS		√		
EPBM	√			
Employment application group				
Employee administration IS				√
Financial application group				
Financial IS	√			
Facilities and Infrastructure application group				
Facilities and infrastructure IS		√		
Library IS	√			
Research and Community Service application group				
Research and Community Service IS		√		
Administrative Document Management and Archive IS		√		
Executive IS		√		
Collaboration application group				
Alumni IS		√		
Carrie Development IS		√		
Scholarship IS		√		
Total	**4**	**9**		**2**

IT Management Strategy

From the IPB University Diploma Program IT strategy identification phase, a number of strategies are recommended to be implemented including designing IT development vision and missions, IT policies planning, as well as IS and IT organization structure formulation. In principle, the IT vision and missions must be aligned with the vision and missions of IPB University Diploma Program. in order to support the achievement of the IT implementation vision and missions, a special unit of information management need to be established to assume the tasks of material collection, research,

implementation, and evaluation of management of system, network, sites, information presentation, and periodical reports on the implementations of tasks. The unit is expected to be able to increase the IT development management and coordination in IPB University Diploma Program in the determination of policy and coordination related to IT development and management in IPB University Diploma Program. Figure 7 shows the recommended structure of special unit for IS/IT management of the organization.

Roadmap of IT implementation of IPB University Diploma Program

The roadmap of IT implementation is shown in Table 4. The roadmap is based on the designed information system of IPB University Diploma Program. IT implementation is carried out in four stages, namely preparation, planning, stabilization, and implementation.

Tabel 6. Roadmap of IT implementation of IPB University Diploma Program

	Year			
	2018	2019	2020	2021
Database and migration process architecture design	1,2,3,4			
Academic application group				
- IPB University Diploma Program Academic IS (main module of expertise program management, academic administration support data, curriculum, student data, general reports, student portal, lecturer portal, DIKTI reporting)	1,2,3,4			
- IPB University Diploma Program Admission and Admission tests IS (main module of online registration, payment process, schedule arrangement, test location, test results management, results announcement)	1,2	3,4		
- IPB University Diploma Program Student Registration IS (main module of registration data of new and old students)	1,2	3,4		
- Graduation IS (Main module of graduation registration and information on the organization of graduation)	1,2	3,4		
Employment application group Employment administration IS (major data collection of employee, employee history, and other functions related to the process of employment data management process)		1,2	3,4	
Financial application group Financial IS (main module of recording, management, and reports of financial budget allocation)	1	2	3	4
Facilities and infrastructure application group				
- Facilities and infrastructure IS (main module of physical assets owned by IPB University Diploma Program)		1,2	3,4	
- Library IS (module of management of library asset, management of members, transactions)			1,2	3,4
Research and service application group Research and community service IS(Main module of menegement of research and community service activities)			1,2	3,4

	Year			
	2018	2019	2020	2021
Knowledge management application group				
- Administration documents management and archive IS (main module of internal documents management)		1,2	3,4	
- Executive IS (main module of management of comprehensive reports of the existing business process including academic, students, research, human resources, financial, library, and clinic)			1,2	3,4
Cooperation application group				
- Alumni IS (main module of alumni management, *tracer study*)			1,2	3,4
- Carrier development IS (main module of carrier management, partner company module)			1,2	3,4
- Scholarship IS (main module of scholarship, sholarship application)			1,2	3,4

1. Preparation 2. Plannig 3. Stabilizing 4. implementation

CONCLUSIONS

The study on the information technology strategic plan of the IPB University Diploma Program resulted in recommendations of application portfolio, data and information architecture design, and information technology management strategy. In the application portfolio, there are 12 applications recommended to be developed and 5 existing applications recommended to be improved in order to provide maximum support to the IPB University Diploma Program business process.

In terms of information technology support infrastructure which consists of hardware and computer networks, the study suggests a modification of network architecture for data and information. The modification is aimed at better integration of developed applications to provide more optimum flow of data and information to meet stakeholders' data need.

Meanwhile, for the IPB University Diploma Program IT management strategy, it is recommended that a special unit of information management be established to carry out the tasks of material collection, research, implementation, and evaluation of management of system, network, sites, information presentation, and periodical reports on the implementations of tasks. The unit is expected to be able to increase coordination with Central IPB IT management unit namely the DIDSI in improving the quality of information technology of the diploma program.

For further study, a detailed information technology architecture for IPB University Diploma Program needs to be designed as a technical reference for the implementation stage of the developed strategic plan. In addition to architecture design, it is also necessary to undertake an assessment on the maturity level of the IT implementation in the organization that can be used as a foundation for the development of IT quality in the organization.

ACKNOWLEDGMENT

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