Utilizing the Ward and Peppard Framework, Strategic Planning for Higher Education Information Systems

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Abstract. One of the main elements of the internet era is the full involvement or use of IS/IT in organizations to support business processes. But in practice, oftentimes the IS/IT that is applied actually backfires on business processes due to a lack of judgment, environmental knowledge, and unplanned purchases. The purpose of this research is to help find the right IS/IT portfolio that is structured according to the needs of the organization. In order to synchronize the business environment, we will conduct a case study at AUB Surakarta College. The environmental analysis tools used in this study were SWOT analysis, PEST analysis, Five Forces analysis, Porter's Value Chain Analysis, The application portfolio is structured using the McFarlan Strategic Grid. The results of the research will be able to help and direct the organization in the application of IS and IT as one of the main elements of business processes.

Key words: information systems strategic planning, portfolio, applications, Ward and Peppard Models.

Introduction

The development of the application of information systems and technology as the main support for business processes in a company is currently growing very rapidly, especially since the emergence of the internet and the smartphone era. Almost all professionals in the IS/IT field are competing to build a start-up that can help a company's business processes. However, there are also products that fail or actually hinder the business process, even though the costs incurred or invested in the system are very large. Based on this phenomenon, it appears that the unsuccessful implementation of IS/IT in an organization is due to several factors, namely the lack of end-user knowledge about the information technology to be applied, the lack of organizational knowledge about the needs of its business processes, and the immaturity of IS/IT strategic planning in the organization. which can be used as a reference for the development, purchase, or development of IS or IT in a company. Good information system strategic planning will influence the development of information systems (IS) and information technology (IT) within an organization (Agnes & Wijaya, 2021: 131–137). Information system strategic planning is the process of identifying a portfolio of computer-based information system applications that will support an organization in implementing its business plan and achieving its business objectives. This planning helps the organization choose strategic steps that are carried out in the long term and become more focused (Ferry et al., 2018: 39–44). Strategic planning describes various tools, techniques, and frameworks for management to align strategic information systems with business strategies, even seeking new opportunities through the application of innovative technologies (Johannis et al., 2019: 611–618). In developed countries, the application of computer-based information systems is prioritized as an important tool needed to improve company performance and competitiveness; these companies have proven their competitive advantage from the use of technology. A strategy needs to be made because usually the

resources (HR and capital) that are owned are limited, so they must be used as optimally as possible. The case study used in this study was at AUB Surakarta College using the Ward and Peppard Framework Approach (Nugraha & Manuputty, 2022: 416). This framework was chosen because it was created to focus on business needs by balancing between technology that is really necessary and useful for the running of an organization's business processes and technology that is ultimately useless or even detrimental to the company. The results of this study can be used by tertiary institutions to map their IS and IT needs. In the future, this strategic planning documentation is expected to be a reference for development in accordance with the times.

Literature Review

Research on information system strategic planning models has been carried out quite a lot, three of which are "Information System Strategic Planning Using the Ward and Peppard Method in Home Industry Sales," conducted by Manuputty in 2022 using IS/IT environmental analysis by applying the SWOT analysis method and Five Force analysis. Porter. In addition, application portfolios are created using the McFarlan Strategic Grid method. The results of this study map application portfolios such as SI Marketing, SI Warehouse, and SI Finance and the official website for home industry businesses, namely the Bakmi Phan food business (Tiyana & Manuputty, 2022: 1–16). In another study conducted by Christianto in 2022, "Information System Strategic Planning Using Ward and Peppard in Pharmaceutical Company," the SWOT, PEST, and balance sheet analysis methods were used. The portfolio is mapped using McFarlan's Strategic Grid. The results of the strategic analysis that has been carried out are aligned with the forms of the external environment and the forms of the internal environment, with the aim of the company being able to maintain its business continuity in the era of the COVID-19 pandemic. The results of this study are strategic designs of strategic information systems to increase company sales(Christianto et al., 2022). Triyuni conducted research in 2021 entitled "Strategic Planning for Information Systems Using the Ward and Peppard Methodology at SMPN 4 Salatiga." This study uses the Ward and Peppard framework with the tools of value chain analysis, SWOT analysis, and the McFarlan Strategic Grid to map the portfolio of current and future information system applications at SMP Negeri 4 Salatiga. The results of this study are information system recommendations and application implementation mapping based on priorities that can assist in making decisions and provide reference material for implementing future information system development.(Triyuni & Wijaya, 2021).

System Development Life Cycle (SDLC)

Orlikowski thought, our society now considers technology to be important, and it permeates every area of daily life. Technologies continue to influence and alter how people and organizations work and think.(Spies et al., 2020: 397–408). The system life cycle is an evolutionary process that occurs within implementation of computer-based information systems and sub-systems starting from planning system requirements until operated for organizational activities. The waterfall model is one of the earliest SDLC techniques to be adopted among the many that have been created. Whatever the approach, the truth always comes first. The following actions fundamentally make up each stage of creating an information system (Gondodiyoto Sanyoto, 2007):

1) Feasibility Study: Determine whether or not the cost benefit is feasible proposed system.

2) Information Analysis: Exploring user needs.

3) System Design: Designing the user interface, file system, information processing function to be performed and so on.

4) Program Development: Designing, coding, compiling, testing and documenting programs.

5) Procedures and forms development: designing system procedures and the form to be used.

6) Acceptance Testing: final test, user acceptance.

7) Conversion: implementation, replacing the old system with the new system.

8) Operation and Maintenance: maintenance, repair, evaluation or suggestion a newer system later.

Information System Quality

In order for the system to do its job properly and correctly, several factors must be considered, such as the organizational environment, organizational structure, organizational culture, and politics, top management capabilities, organizational level, type of task assigned to the information system, and organizational history (Devi Yendrianof et all, 2022). According to DeLone & McLean, system quality is a mix or combination of hardware and software in an information system. The quality of the system is also a characteristic of the information system that is always attached to the system itself, such as the ease of use of the system, the reliability of the system, the sophistication of the system, and the system's response time. While the quality of information is the output of the information system used, Information quality can be expressed as output information, such as information that is simple to understand and has sufficient completeness and accuracy. Widodo et al. argued that an application system in the use of information technology must be able to provide information to be able to support decision-making for its users (Hidayatullah et al., 2020: 44–52).

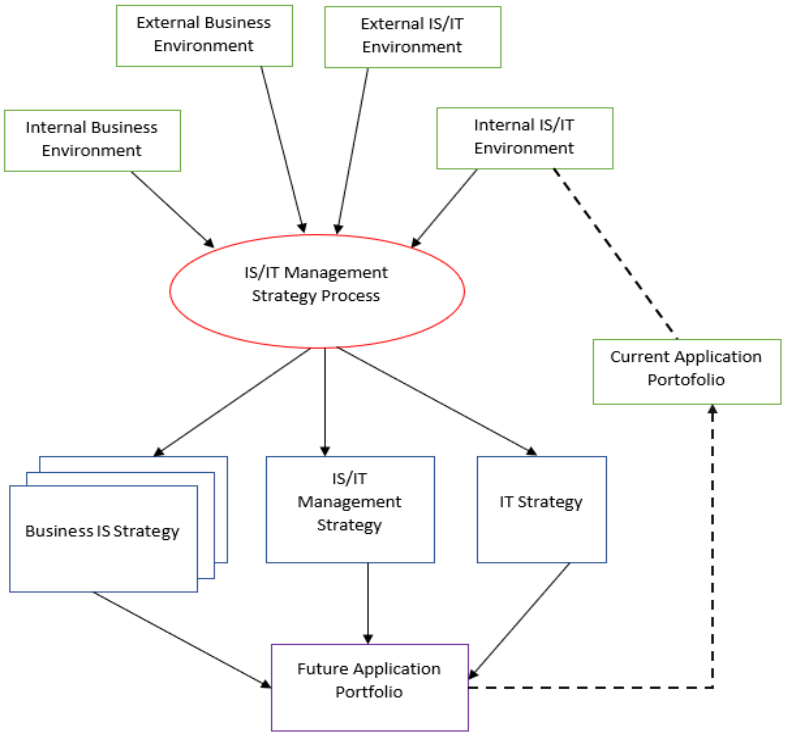

Fig. 1. Ward and Peppard's Strategic Model (Desyana & Sitokdana, 2022: 784)

Ward and Peppard Framework

Ward and Peppard's 2002 version of the methodology starts from the condition of past IS/IT investment, which was not useful for the organization's business goals, and captures business opportunities and phenomena, increasing the competitive advantage of an organization because it is able to make maximum use of IS/IT. There is little benefit from IS/IT investments for organizations due to IS/IT strategic planning that is more technology-oriented than based on business needs (Hidayatullah et al., 2020: 44–52).

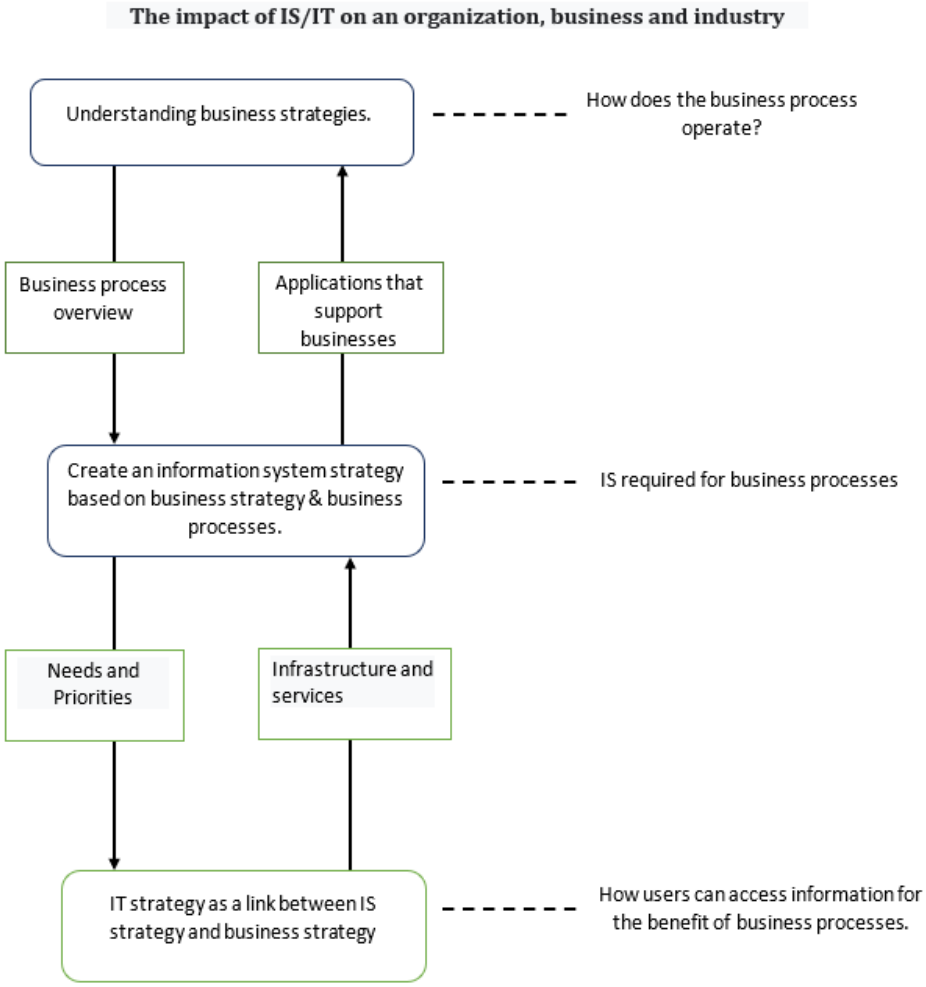

Fig. 2. Relationship between Business Strategy, IS Strategy, and IT Strategy Ward and Peppard

The input stage consists of (Peppard & Ward, 2016):

1. An analysis of the business environment that is internal to the organization, which includes aspects of the current business strategy, goals, and objectives, resources, processes, and the culture of the organization's business values.
2. Analysis of the external business environment, which includes economic, industry, and climate aspects as well as existing company competitions.
3. Analysis of the internal IS/IT environment, which consists of the condition of IS/IT in the organization from a business perspective, how mature it is, its contribution to the business, existing human resource skills, resources, and technology infrastructure, and the portfolio of existing IS/IT at the moment.
4. Analysis of the external IS/IT environment that includes current technology trends and takes advantage of existing opportunities, as well as the use of IS/IT by

competitors, customers, and suppliers. The output stage is the part that is carried out to produce an IS/IT strategic planning document consisting of:

a. A business IS strategy covering each unit or function that will utilize technology to achieve its business goals. An application portfolio overview and an information architecture overview.

b. IT strategy, which includes policies and strategies for managing IS/IT technology and human resources.

c. An IS/IT management strategy that includes general elements that are implemented by the organization to ensure consistency in the application of the required IS/IT policies.

The relationship between IT strategy, IS strategy, and business strategy is shown in the picture above. To determine an IS/IT strategy that can support the achievement of the organization's vision and mission, it is necessary to understand the organization's business strategy. An understanding of the organization's business strategy includes an explanation of the following: - why a business is run; - what the business's goals and direction are; - when the goal is achieved; - how to achieve the goal; - are there any changes to be made. So in building an IS/IT strategy, the central issue is the alignment of the IS/IT strategy with the organization's business strategy. This Ward and Peppard methodological approach begins with the condition of previous IS/IT investment that was ineffective for the organization's business goals and capturing business opportunities, as well as the phenomenon of increasing an organization's competitive advantage because it is able to make maximum use of IS/IT. The lack of usefulness of IS/IT investments for organizations is due to IS/IT strategic planning that is more focused on technology than business needs.

Methodology

The methodology used in this study is qualitative, with interviews and observations to related parties who use and require an information system to complete their work. The data source in this study is primary data, namely reviewing existing documentation at AUB College in the form of documentation of strategies, objectives, organizational structures, business processes, and IT policies. Interviews were also conducted with stakeholders involved in higher education business processes; as many as 60 data sources were interviewed both in person and online. SWOT, PEST, BSC, CSF, Value Chain, and McFarlane's Strategic Grid are the analytical tools used in this study.

According to Pearce and Robinson, SWOT stands for internal company strengths and weaknesses as well as environmental opportunities and threats faced by the company. SWOT analysis is a systematic way to identify factors and strategies that describe the best fit for the company. This analysis is based on the assumption that an effective strategy will maximize strengths and opportunities while minimizing weaknesses and threats. When applied accurately, this simple assumption can have a profound impact on the design of a successful strategy. SWOT analysis can logically help in the decision-making process. The decision-making process is related to the company's vision and mission as well as company goals. As a result, SWOT analysis can be used as an effective tool for analyzing the factors affecting the company and as a decision-making process for determining strategy (Rifa et al., 2022: 75–82).

PEST analysis aims to determine the external conditions of the organization. PEST stands for Political, Economic, Social, and Technological. The technology aspect of PEST analysis incorporates factors such as progress and development that change the way businesses operate and the way people involved in them live their lives. Organizations of

all types can use PEST analysis to measure current and future markets. Before making a business decision, it is highly recommended that you carry out a PEST analysis. All aspects can be studied with different intensities because some types of businesses focus more on one aspect than others (Febrianty, 2022).

Critical Success Factor (CSF) is an analysis method that develops strategies in information systems and also involves management that is able to make an effective contribution to a business process. Basically, this Critical Success Factor (CSF) analysis method is strongly bound and deeply rooted in a business process that provides promising solutions in business management for managers of businesses that are already oriented to information systems with critical success factors and business achievements. Achievement CSFs provide implementers with a better understanding of how to improve project outcomes(Alfiah et al., 2021: 13–23). Value chain analysis describes the activities in and around an organization and their nterrelationships. Porter argues that the ability to demonstrate specific activities and manage relationships between activities is a source of competitive advantage (Christianto et al., 2022: 34–41; Saputra & Tanaamah, 2022: 289−296).

The balanced scorecard is a performance measurement system that does not only focus on financial aspects but also considers non-financial aspects of an organization (Hoque, 2003). Introduced by Kaplan and Norton in 1992, the balanced scorecard includes four different perspectives for measuring performance (Karathanos & Karathanos, 2005; Kaplan, 2009; and Hoque, 2003). Kaplan (2009) explains that the four perspectives in the balanced scorecard are mutually supportive of one another in an effort to achieve the long-term goals of the organization. The four perspectives of the balanced scorecard include a financial perspective, a customer perspective, an internal business perspective, and a learning and growth perspective (Novitasari, 2019: 152–165).

McFarlan's strategic grid is a mapping of information system applications based on their contribution to the organization. The mapping includes four quadrants: strategic, high potential, key operations, and support. From the results of the mapping, the contribution of an information system application to the organization and its long-term development can be described. The following is an explanation of the four quadrants above described by John Ward and Joe Peppard: 1. Strategic. It is an application that is critical to future business success. These applications create or support changes to how an organization does business by providing a competitive advantage. 2. High Potential. is an innovative application that may create opportunities for profit in the future. 3. Key Operations. is an application that supports the organization's current business operations, runs them, and avoids unfavorable conditions. 4.Support. It is a valuable application that can improve the efficiency of business performance and management effectiveness, but its existence does not support business processes or provide an organization with a competitive advantage (Yenni et al., 2021).

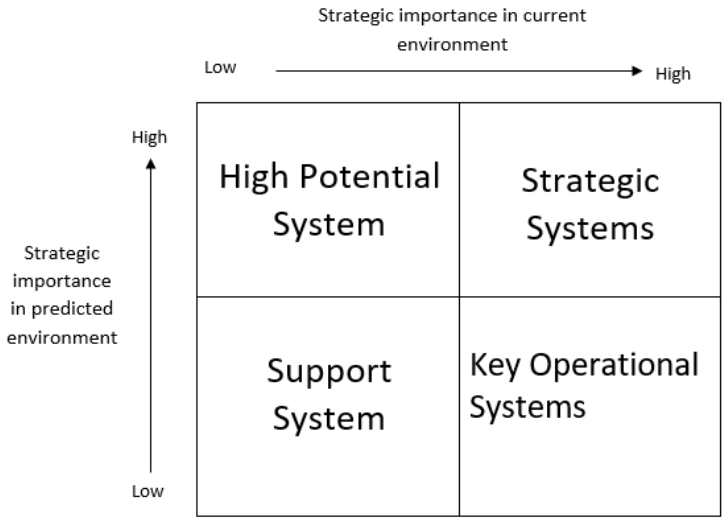

Fig. 3. McFarlan's Strategic Grid (Prambayun, A., & Maharani, 2021: 750–760)

Results

PEST Analysis

The results of the PEST analysis, it was found that the assessment activities through accreditation affect eligibility and the level of achievement of the quality of study programs and universities. AUB is one of Central Java's universities, and its quality is monitored by LLDIKTI Region VI, which uses digital or computer-based work methods. All higher education policies are governed by Education High Law No. 12 of 2012 and Minister of Education and Culture No. 50 of 2014. There is increasing public interest in getting an education level, and the study program that tends to be chosen is a bachelor's degree. AUB College has a brand image because he often sends his students to take part in various kinds of events and championships. Currently, technology is growing very rapidly because of the internet, and the government has also made a large-scale migration from manual work to a way of working involving technology. All data reporting and monitoring of college data periodically must be updated through a system built by the government with data collected by the college itself in real time.

CSF, Balanced Score Card and Value Chain Analysis

According to the Critical success factor, Balanced score card and value chain analysis, there are three business focuses at the university level, namely the realization of information systems and technology that can be applied in an integrated information system to support learning activities. Realization of technology research and development programs, as well as community service information technology. realization of the implementation of soft skill development programs and student activity.

SWOT

From the results of the SWOT analysis there are 4 points of strength, 5 points of weakness, 3 points of opportunity and 4 points of threat currently detected. From the spread ratio it can be seen that universities are in a very bad situation difficult to maintain its existence. Therefore the SWOT analysis provides a matrix that can be used to overcome this difficult situation.

Table 1. SWOT Matrix Analysis

Internal / Eksternal	Strengths	Weaknesses
Opportunities	**S2-O1**: take advantage of e-leadership leaders who care about the maximum use of information technology by appointing a CIO & his team to handle IT/IS in the company. **S3 –O2**: take advantage of awareness of the benefits of IS/IT to map the types of IS/IT product requirements for business process needs **S1-O3**: take advantage of the ease of implementing internal networks combined with HR awareness so that digital data is neat and easy to obtain when needed.	**O1-W1**: utilize resources and improve the ability of skilled human resources by providing training and facilities to increase work capabilities to the fullest **.O2–W3**: take advantage of existing convenience facilities so that business processes can run more efficiently. **O3 – W2**: take advantage of existing convenience facilities, especially for communication and easy access to data between sections so that miss communication does not occur. **O2 – W5:** improve IT development and maintenance systems as well as data management that are not yet fully integrated and reliable by taking advantage of technological advances.
Threats	**S1-T1:** Take advantage of the leader's e-leadership character in order to direct HR to realize the importance of neatly stored digital big data for customer relationship management. **S3-T4**: take advantage of the availability of free facilities from digital vendors that are commonly used every day to assist employee work processes in serving the needs of the academic community. **S4-T2** optimizing the cloud database function so that the process of sharing data and information within the company becomes easier so that there is no miss communication between departments.	**T2-W1:** HR can give mastery of the latest technology and which is being applied to current business processes. **T4- W2**: avoid mistakes in HR placement and improper use of IS/IT within the company to reduce the impact of existing developments. **T4- W5**: avoid system weaknesses and data management that is not yet integrated and reliable to reduce customer dissatisfaction and provide accurate product information for HR and customers. **T3 – W3:** Assign technological intellectual assets in the organization to share basic knowledge about operating and maximizing technology resources that are currently owned or implemented so that they can be optimally utilized.

Strategy and Portfolio

From the results of analysis and observation, applications that have been implemented at AUB colleges can be mapped into application portfolios by measuring through the level of IS usability according to Ward & Peppard which can be seen in the following Tables 2-5.

Table 2. Information System Usefulness Grade Question of Ward and Peppard

	Question	Yes / No
A	The result is obvious for the competitive advantage of the business?	
B	Allows for achievement of specific business objectives or critical success factors?	
C	Overcome business losses related to competitors?	
D	Avoiding business risks that have been examined and become a major problem in the near future?	
E	Increase business productivity thereby reducing long-term costs?	
F	Enable the organization to comply with applicable legal requirements?	
G	Allows for advantages that haven't been seen until now? [the result is like point a & b]	

Table 3. The result of Information System Usefulness Grade Question

	IS/IT requirements	"Yes" answer						
		a	b	c	d	e	f	g
1	Human Resource Management Information System		√					
2	Finance Information System		√					
3	Accounting Information System				√			√
4	Academic Information System		√				√	
5	PMB Information System (Admission of new students)		√			√		
6	LPPM Information System (For research)		√					√
7	Student activity information system	√	√					√
8	Information system facilities and infrastructure		√			√		

Table 4. Application Interpretation Guide

Question	High Potensial	Strategic	Key Operational	Support
A		Y (i)		
B		Y (i)		
C			Y	
D			Y	
E				Y
F			Y(ii)	Y(ii)
G	Y			

(i) If it is implemented, is there a clear profit in business and how to get it? (Y-Strategic, N-High Potential)

(ii) (ii) If it fails to fulfill, can it bring risks to the business, state the risks clearly? (Y-Key Operational, N-Support)

Table 5. AUB's College Application Portfolio currently uses Mc.Farlan's Strategic Grid

High Potensial	Strategic
➢ Student activity information system ➢ LPPM Information System (For research)	➢ SI kegiatan mahasiswa ➢ SI LPPM ➢ Human Resource Management Information System ➢ Finance Information System
➢ PMB Information System (Admission of new students) ➢ Information system facilities and infrastructure	➢ Accounting Information System ➢ Academic Information System
Support	Key Operational

IS Strategy

For information system development, the top priority is an information system that is in a strategic quadrant. The information systems in this quadrant are the Human Resource Management Information System and the Finance Information System. Then proceed with the development of information systems that are in the key operational quadrant. The information systems in this quadrant are the Accounting Information System (SI Accounting) and the Academic Information System (SI Academic). The next stage is to develop an information system that is in the support and high potential quadrants. After carrying out the several steps above, an evaluation must be carried out to determine whether the implementation of this plan is in accordance with the plan, and the results of the evaluation will be used as material for changes to the system if this is necessary.

IS management strategy

The fundamental stage in the IS management strategy is to prepare IT human resources to manage the existing IS and network infrastructure. The readiness of human resources is the main key that initiates the development of IS that will be carried out so that this becomes a top priority. *Policies related to B2B (business-to-business):*

a. Make rules regarding the duties and responsibilities of each work unit. rights and obligations of each work unit to the facilities owned Confidential information classification based on request and public domain.

b. Conduct outreach regarding existing information systems and their development and dissemination.

c. Improving HR capabilities in the field of IT related to information systems and IT infrastructure that will be used, offline or online.

d. utilizing existing electronic and print media in order to improve HR capabilities regarding IT in general.

Policies related to B2C (business-to-consumer):

a. Make rules about what information can be published;

b. The use of internet technology as a medium of communication.

c. Make rules about the legitimacy of the use of digital files. standardization of data exchange.

d. Collaborating with external parties to market the product.

IT Strategy

Policies related to B2B (business to business):

a. Provide supporting infrastructure by procuring hardware and other supporting devices if needed by the company.

b. Coordinate the development of information systems across all work units by establishing standard protocols for data exchange.

c. Provide an adequate LAN network to support the gradual development of IS.

d. providing information system applications for each unit that requires them in stages.

e. Provide infrastructure for each work unit that is connected by an external network.

Policies related to B2C (business-to-consumer) include:

a. Providing networks, servers, computers, internet access, and various other supporting equipment.

b. Collaborate with external service providers who also need facilities to facilitate transactions.

c. Collaborate with third parties to process transactions online.

d. Develop integrated back-end and front-end system applications.

Table 6. Development Stage Priority Scale (Road Map) of IS/IT Strategic Planning

Year	Activity
1st Year	1. Preparing IT HR 2. Improved technical and network infrastructure 3. Strategic quadrant SI development 4. Development of SI Key Operations
2nd year	1. Recruitment of human resources if still needed to support the IS development process. 2. Development of IS Support 3. Development of SI High Potential
3rd Year	Evaluation

Conclusion

1. AUB Higher Education already has an academic portal, but its results have been disappointing, and it has not been able to assist students in completing academic tasks to the best of their abilities.

2. Strategies for HR placement and regular training to formulate information system development are also lacking.

3. In order for the academic portal services of AUB Surakarta Higher Education to increase significantly, the tertiary institutions are advised to improve the program flow according to the analysis results obtained from this study and build mobile and integrated applications so that they are easily accessed by the academic community that needs them in real time.

4. Recommendations given by researchers based on the results of this research are in the form of documentation of IS/IT development plans and program interface designs that can be used as a reference for developers from tertiary institutions to repair the old academic portal.

For the next round of research, suggested that be able to re-evaluate whether this strategic plan is working well. If several information systems are realized, their performance is evaluated using an information system evaluation model to minimize the system deficiency gap. This research was conducted to the extent of strategic planning and interface design; the factors supporting the successful implementation of the strategic plan played a major role in the success of this strategic plan, therefore the implementation of the success factors also needs to be evaluated. The strategic design of information systems is urgently needed at AUB universities, so it is necessary to develop research on the overall strategic design of information systems on a regular basis so that the entire system can later be properly integrated as needed.

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