IT Strategy Themes of Higher Education Institutions: A Literature Study

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Abstract—**Information technology (IT) strategy in higher education is necessary to improve educational and operational processes. Research on IT strategies in higher education is still limited and needs to be aligned with business strategies. This literature review provides general themes and ideas for IT strategies, which can be a reference or inspiration for higher education institutions. The Systematic Literature Review method searched documents or brochures from officially published universities in various countries. The search resulted in 30 IT strategy documents from various universities. The most commonly mentioned theme for IT strategy in higher education is teaching and learning excellence, while the least mentioned is information security. The most common theme groups are teaching and learning excellence, developing staff, emerging technologies, and global/external engagement. The dominant timeframe for implementing an IT strategy is five years. The result of this IT Strategy is the categorization of general themes, and the outcomes of these themes will be analyzed for frequently occurring and infrequently occurring data. Themes that frequently appear will be grouped, providing references and recommendations for universities in Asia when implementing IT strategies.**

Keywords— IT Strategy, Higher Education, Balanced Scorecard

I. INTRODUCTION

Every company must have a business strategy to achieve its goals. With the development of information systems, information technology (IT) plays a significant role in supporting that business strategy. In general, IT strategy is a set of plans on how to apply information technology to achieve a company's business goals [1]. An IT strategy is a document that provides detailed information on the investment and use of IT to support a company's business. The same goes for higher education institutions where an IT strategy is required to support all education processes. An IT strategy can positively impact the comfort and security of the teaching and learning process. It can also enhance specific values that provide a competitive advantage to higher education institutions.

Out of around 3000 higher education institutions in Indonesia, only about 60 have researched IT strategy. Out of these 60 studies, 34 were selected based on the completeness of their framework. According to Agustiyono, only 4 of the 34 studies align IT and business strategies [2]. This finding reflects the need for more research on IT strategy planning in Indonesian public universities and the level of alignment between IT strategy planning and business strategy. According to Ward and Peppard, as quoted by Bachtiar and Hasanah, there are three main targets of information technology (IT) implementation efforts in an organization [3]. The three targets are: firstly, to improve work efficiency by automating various information management processes;

secondly, to enhance management effectiveness in obtaining information for strategic decision-making; and thirdly, to increase organizational competitiveness or competitive advantage by transforming business style and approach.

Based on the above issue, this research includes a literature review to provide a general theme and idea of IT strategy, which can serve as a reference or inspiration for use in higher education institutions. The general theme and concept of IT strategy in universities can be seen in documents or brochures of IT strategic plans that universities in several countries have widely published.

The above issue will be addressed using the Balanced Scorecard approach to assess the progress of the education process in Indonesian higher education institutions. The IT Balanced Scorecard approach offers a comprehensive perspective that aligns IT initiatives with broader business goals, ensuring a holistic and synergistic approach to technology implementation. The inclusion of the IT Balanced Scorecard as the theme for categorizing ideas is strategically justified due to its inherent alignment with the core concept of integrating IT strategies with business objectives. Some ways to advance higher education in Indonesia include learning from universities abroad and seeking and studying examples of IT strategy themes aligned with the university's business, vision, and mission. The IT Balanced Scorecard will play a role in finding general themes and ideas that are expected to be able to develop all operational processes, human resources, and business in higher education institutions.

II. LITERATURE REVIEW

A. IT Balanced Scorecard

The IT Balanced Scorecard (IT-BSC) is one of the original frameworks of the Balanced Scorecard that has been modified to incorporate the IT perspective. Information technology has become an increasingly important factor in the business world, and there is a need for a framework that can measure IT performance within the context of a broader strategy [4].

The IT Balanced Scorecard can be used to develop, design, and implement IT strategies. IT-BSC is intended to achieve better performance in a company so that the implementation is aligned with the established strategy. In addition, IT-BSC involves creating a strategy map that helps managers determine the contributions they can make to advance the organization more effectively [5].

To create higher education that aligns with technological developments, enhances academic quality, and increases research knowledge, higher education institutions create priority strategies to address these issues. One of these priority strategies is to use IT-BSC as a tool to determine IT strategies so that the benefits and objectives of IT usage can be

understood, and higher education institutions can identify outputs when they establish specific strategies, especially in the field of information technology [6].
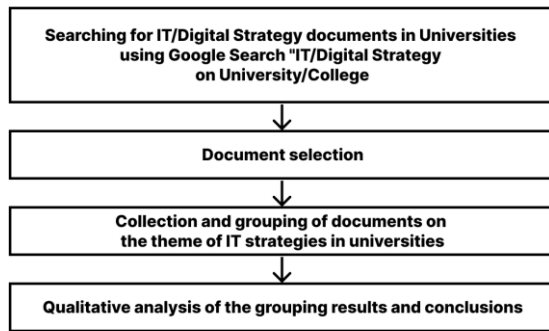
III. METHODOLOGY

Fig. 1. Flowchart of Literature Review

The literature review method used in the study follows the procedure proposed by Webster and Watson as cited by Uhlig and Remane, which is the Systematic Literature Review [7] Fig 1 shows the four stages of research, which consist of:

A. Establishing the search context involves documents with keywords in a Google Search like "IT/Digital Strategy on University/College filetype pdf." The search aims to find documents in the form of brochures, presentations, or PDFs that have been officially published by universities or colleges.

B. In the document selection phase, a search strategy is needed using keywords such as "service," "collaborate," "resource," "people," "financial," "business," "operational," "security", etc. Subsequently, the obtained articles are selected using inclusion and exclusion criteria. Inclusion criteria refer to:

- Presentations or brochures that describe the university's profile in English.
- The document provides an explanation of the IT strategy or digital transformation plan of the university.
- The document specifies a timeline for the realization of the IT plan or digitalization.

On the other hand, documents that do not meet these criteria will be excluded:

- Presentations or brochures that describe the university's profile in languages other than English.
- The document does not provide an explanation of the IT strategy or digital transformation plan of the university.
- The document does not specify a timeline for the realization of the IT plan or digitalization.

C. The collected documents will be organized in a format using an Excel sheet. Each obtained document will be carefully read one by one to identify keywords and priority plan themes for the university's IT strategy. fter that, each keyword related to the IT strategy themes is collected and grouped into a map of the main themes of the planned IT strategy to be implemented by the university.

D. In the next step, qualitative document analysis is conducted with the following questions:

- What is the most frequently mentioned theme of IT strategy?
- What is the least frequently mentioned theme of IT strategy?
- What is the most common group of IT strategy themes? How long is the implementation of the most common IT strategy?

IV. RESULTS

Based on the search results, around 33 documents or brochures were found from higher education institutions, but only 30 met the criteria. The other four documents needed to be more detailed and were not strategic plans but rather reports that had already been worked on. The collection of 30 IT strategy or digital strategy documents from higher education institutions in several countries includes 16 universities in the United States/Canada, nine from universities in Europe, and five from universities in Australia. These documents outline IT strategy themes in higher education institutions that can be grouped into six general themes:

A. Developing Staff

This theme is aligned with developing human resources, including educators, with proficiency in applying IT in higher education to achieve a more modern, digital, and automated academic atmosphere. Some examples of strategies under this theme include rewarding staff who have advanced the faculty in terms of IT implementation[11], providing talented staff to deliver quality campus services [25], and enhancing the literacy and training of staff in information, data, and media [33] [34] [35].

B. Emerging Technologies

This theme emphasizes plans to improve IT infrastructure and upgrade to better IT systems, developing and implementing hardware and application systems to make the educational process faster. The improvement is also helpful in providing a more modern image of the higher education institution. Some examples of strategies under this theme include developing the use of technology[9] [26], adopting digital solution [18] [37], conducting digital transformation and automation using technology[27] [33] , and innovating the university using technology[35] [36].

C. Supporting Research and Innovation

The IT development plan in higher education also focuses on the research process. The research process is expected to be faster and more thorough, supported by improved documentation and administration with the help of IT. Some examples of strategies under this theme include enabling sharing and collaboration among researchers on their work[10] [20] [22] [35], implementing technology and data

architecture to support research[12] [19] [23] [26] [32], and creating research community [26].

D. Information Security

Data circulating within the higher education environment must ensure the information's security. Protecting the copyrights or patents issued by the higher education institution is necessary. Examples of strategies under this theme include ensuring all data is secured[14] [21], providing two-factor authentication for access data [32], building a culture within the institution that is aware of risk-awareness[19] [26] [32], ensuring data security [26] [28], and designing systems with cyber solid security measures [30] [35].

E. Global/External Engagement

This strategy aims to establish a cooperation network among universities to support each other in education. This strategy also aims to make universities more accessible and promote their brand, which supports the business aspects of universities. Some examples for this theme include partnering with international offices for publication data [13], and providing and developing digital service programs for alumni relations and development [13] [22] [24] [35]. creating an integrated system to manage external relationships [27] [36], and collaborating with professionals [30].

TABLE I.   SUMMARY OF IT STRATEGY THEMES IN HIGHER EDUCATION INSTITUTIONS

No.	University/ Collage	Country	Year	TLE	Stf	Ete	SRI	ISe	GEE	Span
1	The University of Newcastle [8]	Callaghan, Australia	2021	X	X	X	X			5
2	Fashion Institute of Technology [9]	New York City, USA	2018	X	X	X		X		3
3	Athabasca University[10]	Alberta, Canada	2018	X	X	X	X	X		5
4	Auburn University [11]	Alabama, USA	2019	X	X	X	X		X	5
5	University College Dublin [12]	Dublin, Ireland	2020	X	X	X	X		X	5
6	University of Ottawa [13]	Ontario, Canada	2021	X		X	X		X	5
7	University of Wolverhampton [14]	Wolverhampton, UK	2015	X	X	X	X	X		5
8	Humber College [15]	Orangeville, Canada	2015	X	X		X		X	5
9	University of South Australia [16]	Adelaide, Australia	2015	X	X	X			X	5
10	La Trobe University [17]	Melbourne, Australia	2015	X	X	X			X	3
11	University of Nottingham [18]	Nottingham, UK	2021	X	X	X	X	X	X	5
12	Aberystwyth University [19]	Wales, UK	2021	X	X	X	X	X	X	5
13	University of Edinburgh [20]	Edinburgh, UK	2017	X	X	X			X	5
14	Ulster University [21]	Coleraine, Ireland	2020	X	X	X		X	X	4
15	University of Auckland [22]	Auckland, New Zealand	2018	X	X	X	X		X	3
16	University of Georgia [23]	Georgia, USA	2020	X	X	X	X		X	5
17	University of Cincinnati [24]	Ohio, USA	2017	X	X	X			X	4
18	University of Oswego [25]	New York, USA	2015	X	X	X				4
19	Boston College [26]	Massachusetts, USA	2015	X	X	X	X			3
20	St Cloud University [27]	Minnesota, USA	2018	X	X	X		X	X	5
21	University of Mary Washington [28]	Virginia, USA	2015	X	X	X		X	X	5
22	University Nebraska Omaha [29]	Nebraska, USA	2017	X	X	X			X	5
23	Australia National University [30]	Canberra, Australia	2021	X	X	X	X	X	X	5
24	Seneca College [31]	Toronto, Canada	2018	X	X	X			X	4
25	York University [32]	Toronto, Canada	2019	X	X	X			X	5
26	University of Leicester [33]	Leicester, UK	2016	X	X	X	X	X		5
27	Wilfrid Laurier University [34]	Waterloo, Canada	2021	X	X		X		X	3
28	McGill University [35]	Montreal, Canada	2020	X	X	X	X	X		5
29	West College Scotland [36]	Clydebank, UK	2021	X	X	X			X	4
30	Dudley College [37]	Dudley, UK	2021	X	X		X	X		3

TLE = teaching/learning excellence, DSt = developing staff, ETe = emerging technology, SRI = supporting research and innovation, ISe = information security, GEE = global/external engagement, Span = span time/period (years)

V. DISCUSSION

In general, universities that have published their IT strategy on a publicly accessible website implicitly state their commitment to implementing digitalization, automation, modernization, or digital transformation. Based on the collection and grouping of IT strategy documents in universities, a qualitative analysis is conducted using specific questions as a basis.

A. What is the most frequently mentioned theme?

Out of 30 universities, all have set targets to improve Teaching-Learning excellence. This theme is at the core of the education process in higher education. The assessment of a university or campus is based mainly on its teaching and learning process. This theme emphasizes open, interactive, and online learning. It also facilitates two-way communication between students and teachers. In addition, administrative procedures related to education, such as attendance, course registration, and obtaining information about lectures or exam grades, are also a focus.

In the second place, the most common theme is developing staff, with 29 out of 30 universities' IT strategies focusing on staff development. This theme supports a modern campus environment where staff and faculty can adapt to technological systems. Universities support the learning and growth of their employees to provide the best service to students. Following in third place is emerging technologies. This theme complements the staff development theme by updating adequate IT infrastructure. Universities targeting this theme demonstrate a willingness to invest in IT infrastructure.

In practical terms, The emphasis on this theme reflects the pivotal role of teaching and learning processes as the

yardstick for evaluating a university's overall performance and reputation. Moreover, this theme's focus on open, interactive, and online learning methodologies not only aligns with contemporary educational trends but also fosters dynamic student-teacher engagement.

B. What is the least frequently mentioned theme?

Out of 30 universities, only 13 focus on information security. Universities usually target improving information security focused on patents and technology. The practical implication of these findings is the urgent need for higher education institutions to take information security more seriously, especially considering that only 13 out of 30 universities focus on information security. The theme of enhancing information security, commonly targeted by universities, particularly those focusing on patents and technology, highlights the urgency for more proactive measures in safeguarding sensitive data and intellectual property. The significance of patent and technological security, particularly in universities operating in arts or engineering fields, underscores the necessity for more proactive steps to protect artistic creations and technological innovations from potential misuse by unauthorized parties.

Furthermore, only 18 universities focus on supporting research/innovation strategies. It is because some universities want to be more involved in producing journals or holding seminars that can enhance relationships with other research or educational institutions. IT strategy is crucial in facilitating smooth research or generating innovation in universities. Of 30 universities, 21 focus on global/external engagement strategies. This theme reflects the desire of universities to be recognized as modern campuses that use IT as a basis for their operations. IT strategy also plays a role in facilitating communication or building relationships with other research or educational institutions.
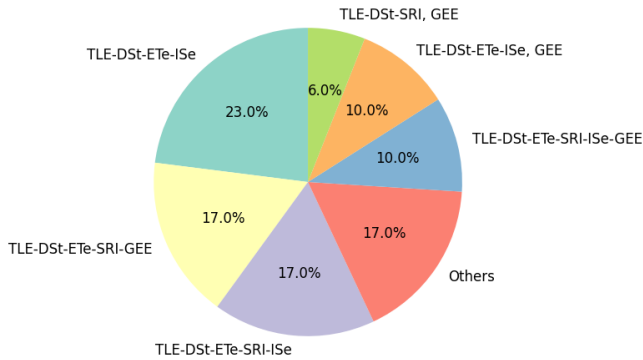

Fig. 2.   Comparison of University IT Strategy Groups.

C. What is the most common group of strategies themes?

The grouping of IT strategy themes can be seen in Fig 2. The themes are coded as follows: 1.) Teaching-Learning Excellence (TLE), 2.) Developing Staff (DSt), 3.) Emerging Technologies (ETe), 4.) Supporting Research /Innovation (SRI), 5.) Information Security (ISe), and 6.) Global/External Engagement (GEE). Based on the calculation of the grouping of themes focused on by universities, the most common group with seven universities is the group that focuses on four themes (TLE-DSt-ETe-GGE), which are teaching and learning excellence, developing staff, emerging technologies, and global/external engagement. It is followed by the group

that adds the fifth theme, supporting research, with five universities (TLE-DSt-ETe, SRI, GGE) and information security (TLE-DSt-ETe-SRI-ISe) with five universities. Three universities belong to the group (TLE-DSt-ETe-SRI-ISe-GGE) and the group (TLE-DSt-ETe-ISe-GGE). Two universities belong to the group (TLE-DSt-SRI-GGE). After that, the remaining groups (TLE-DSt-ETe), (TLE-DSt-SRI-ISe), (TLE-ETe-SRI-GGE), (TLE-DSt-ETe-SRI), and (TLE-DSt-ETe-ISe) each have one university.

The business outcomes perceived by externals, e.g., customers or business partners, resulting from the underlying related sub-business activities. In other words, there are cause-effect chains from the quality of human resources, internal business processes, and customer satisfaction to financial performance [38] [39]. We also notice a similar pattern in our data. If we apply the IT Balanced Scorecard to the most common theme groups, the model will look like the one shown in Fig. 3 Developing staff is a strategy for learning and growing human resources in higher education. Emerging technologies are at the intersection between People Potential and Application & Operations areas since they support human resources in achieving their full potential while facilitating higher education's operational excellence, e.g., teaching and learning processes. Excellency in teaching and learning will ultimately support higher education businesses, such as global/external engagement.

D. How long is the implementation of the most common strategies?
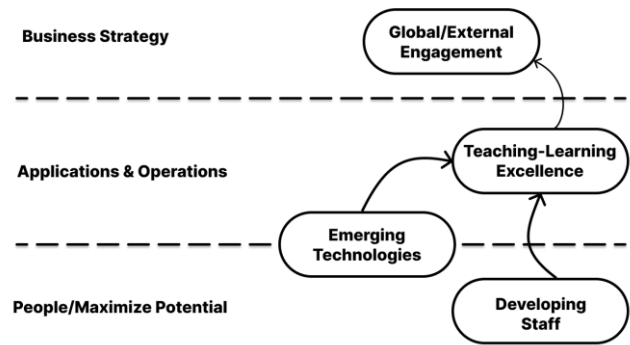

Fig. 3.   Flowchart of Literature Review

By summarizing the periods chosen by universities for implementing their IT strategies, a clear pattern emerges. Notably, the most prevalent duration for executing an IT strategy is five years, adopted by 19 universities. This indicates a common preference for a moderate timeframe that allows for comprehensive planning, execution, and evaluation of the strategy's objectives. Moreover, six universities opt for a more focused 3-year strategy, while five universities adopt a slightly extended 4-year strategy. The significance of these periods lies in their alignment with the targeted timeframe for achieving the desired goals outlined in the respective IT strategies. This insight underscores the strategic decision-making process of universities, considering the time necessary for effective IT strategy implementation and successful goal attainment.

The calculation of the period taken by universities can be seen Fig 4 Based on the summary of periods, the most

common duration for implementing an IT strategy is five years, with 19 universities using this timeframe. Additionally, six universities use a 3-year strategy, and five universities use a 4-year strategy. The period refers to the target timeframe for achieving the desired goals of the IT strategy. Key Performance Indicators (KPIs) are necessary for each strategy to measure achievement progress from year to year. The more complex or numerous the goals to be achieved, the longer it generally takes to implement the strategy.
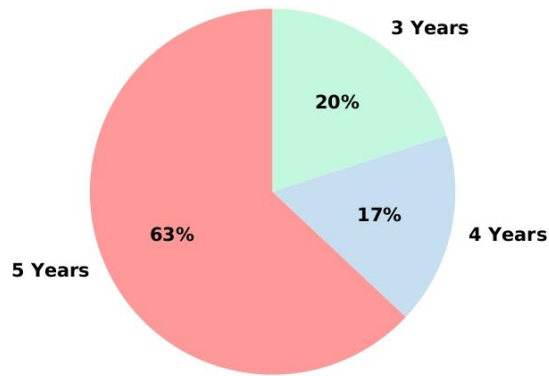

Fig. 4. Flowchart of Literature Review

VI. CONCLUSION

Based on the literature review of IT strategy in universities, the following conclusions can be drawn:

- The most frequently mentioned theme in university IT strategy is teaching and learning excellence as much as 100%.

- The least mentioned theme in university IT strategy is information security. The theme indicates that this theme should be addressed in the creation of IT strategies by universities as much as 40%.

- The most common theme groups are teaching and learning excellence, developing staff, emerging technologies, and information security as much as 23%.

- The dominant time frame for implementing IT strategy in universities is five years.

A suggestion for future literature reviews is to expand the search to include more global documents, such as IT strategies in Asian universities. The literature review can also be further developed to create a comprehensive IT strategy model. This model can be translated into an implementation plan that provides a roadmap for Indonesian universities to develop their technological and business capabilities.

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