

IT Management Flexibility Concept for Higher Education

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Abstract— The rapid development of technology influences the changing culture of various aspects of the organization. This results in a paradigm shift in many areas of the organization, including in higher education. Changes have taken place in the implementation of the core and support processes in the universities. Cultural changes occur in the teaching and learning processes as well as in the administration of higher education. Universities are required to respond and be flexible to change, which needs planning and management. Unplanned and improperly managed changes may cause a decrease in efficiency and productivity, especially in higher education. Discussion of flexibility generally relates to manufacturing companies. This paper aimed to identify factors of IT management flexibility needs in higher education by adopting supply chain flexibility concept. Supply chain flexibility is oriented at improving the quality of distributing and ordering goods while the IT management flexibility concept is oriented at improving the quality of service at universities. The research phase includes: identifying needs, envisioning, and planning solutions. The results show that communication, IT leadership, human resource, and regulation are essential factors in increasing IT management flexibility in higher education.

Keywords— *IT management flexibility, higher education, IT leadership*

I. INTRODUCTION

The world faces a paradigm shift. One of the factors driving the paradigm shift in organizations is the technological development. The rapid advance of technology influences the changing culture of various aspects at the organization. The progress of computer technology in both hardware and software and the availability of internet facilities have supported the organization to perform computerized services. The advance of computer technology and internet communication have become means to support online service process. Currently, the registration, ordering, payment, purchase, and transaction process can be done without being limited by location and time. A paradigm shift occurs in diverse fields of organization, including in higher education. Changes have occurred in the implementation of the core and

support processes in higher education. Cultural changes occur in the teaching and learning processes as well as in the administration of higher education.

The development of computer technology, hardware, software, and internet facilities has changed the culture of students, staffs, lecturers, and stakeholders in higher education. In addition to the implementation of teaching and learning process, the use of references has also experienced a shift. The use of references in the form of hard copies has shifted to e-book, Youtube, and e-journal. Similarly, in the administration of academic, financial, attendance, scheduling, lecturer and student monitoring processes, consultation of study plans, and final project consultations have been conducted online in some universities.

Higher education needs to respond and adapt to change. Adaptation to changes should be done in the teaching and learning process and in academic and administrative processes in higher education. The process of adaptation requires efforts to maintain the continuity of quality management of information technology (IT) at higher education. This condition requires appropriate handling strategies to cope with instability as a result of changes. Without proper management, changes can result in low productivity and efficiency. The organization's ability to determine the appropriate strategy has a positive impact on organizational performance [2]. This is necessary because in unstable conditions the performance of the organization's processes is in a sensitive position so that it may affect the system performance degradation [3], which could cause the university to be not able to maintain its existence [4].

Flexibility is important to maintain sustainability [5][4]. However, the paper that discusses flexibility in service-based organizations is limited. Discussion of flexibility generally relates to manufacturing companies [1][2]. Manufacturers and university have differences in the process of input and process management as well as output targets [3].

This paper aimed to analyze the IT management flexibility needs of higher education. The research phases were: identifying needs, envisioning, and planning solutions. The rest of this paper is organized as follows: Section I is the introduction that describes the background and the aim of the research. Section II reviews the related works that give supporting theories to the research. Section III describes the stages to identify factors of flexibility needs in higher education. Section IV is the results and discussion regarding flexibility needs in higher education. Finally, Section V is the conclusion.

II. RELATED WORKS

Flexibility is generally defined as flexible, easy, and fast adjustments. Meanwhile, in economic and business terms, flexibility is defined as the ability to react to changes in customer needs quickly. In another study, Backhouse and Burn [4] define flexibility as a firm's ability to respond to various customer requirements that exist within the parameters. Similarly, Palanisamy [4] defines that organizational flexibility is the extent to which an organization has numerous actual and potential procedures for improving organizational and environmental control. Meanwhile, Sherehiyet al [4] defines it as the ability to adjust and respond to change. In this study, IT management flexibility was defined as the ability of IT management at universities to adapt to change.

IT-based changes focus on the process changes, which include changes to input management, how to process, and change the resulting output management [5]. Changes in input management include changes to the format, used media, and how it is collected. Similarly, changes to output include formatting changes, the used media, and the way they are implemented. Meanwhile, changes in how to do the process are related to changes in utilized tools, which require adjustment of competence.

The changes experienced by universities requires innovative and competitive strategies. Some of the technological changes in the universities include virtual reality, cloud computing, and digital technology. Changes in IT implementation in higher education include e-learning [6], integration of technology in education [7][8], e-library[9], and implementation of cloud computing [10]. Flexibility is essential when organizations implement business processes that use the internet or other electronic as a medium to meet business transactions (e-business). The need for flexibility has been recognized by various organizations. In addition, several studies have further shown that stiffness and inability to handle new situations can lead to a failure of information systems, as explained by Palanisamy [4]. Dreyer and Gronhaug [4] also convey that flexibility gets is essential for gaining competitive advantage.

Different organizational domains have distinct goals. Manufacturing and service domains have some differences regarding input, outputs, and the operating processes [11]. Higher education also has different characteristics with the company, not only in terms of mission, environment, policies, and processes but also on applications, need, and

infrastructure. There are differences in the type of output produced, the resulting added value, and the type of data processing. Types of data processing, transaction volume, and the need for speed of transactions in higher education is also different than in the company [3]. Therefore, the difference between the manufacturing and the service domains is focused on reviewing the unique flexibility. John [12] states that there is a direct link between the type of supply (product or service) and the required degree of flexibility.

Higher education consists of several types and varieties. The types of higher education are private and public while the variety includes university, institute, high school, and polytechnic. Each type and variety of higher education has a different management system.

III. RESEARCH METHOD

The study of IT management flexibility need was done in three stages, namely identifying needs, envisioning, and planning solutions. The study was conducted based on supply chain flexibility concept [1][2].

A. Identifying needs

Starting with the first understanding, the background requires flexibility. This stage was performed by identifying the trigger and inhibiting factors in adopting technological changes in higher education. Trigger factors observed include service quality, the rapid development of technology, needs of stakeholders, increased competition and government regulation [1][2]. Whereas the IT change inhibitors are cost, human resource, and support of management [1][4][12].

B. Envisioning the solution

Determining the targets and the analysis of alternative solutions focus on how important IT management is to the business processes in the university. This stage was performed by observing the perception of the university to the level of importance of technological change in running its business processes. This is related to one of the functions of IT management in higher education that is managing process [3]. The processes observed were: the teaching and learning process, the academic services process, the student registration, the e-learning, and e-library.

C. Planning the solution

In this stage, we determined the proposed solution that integrates with business objectives. This stage was performed by identifying supporting factors in increasing IT management flexibility in higher education, which was based on related literature studies, interviews, and giving questionnaires to IT specialists at universities.

Data was collected using analysis in areas related to IT management and flexibility concept, questionnaires, and an interview. The interview was done to validate the answers to the questionnaires. Validation of the content of the questionnaires referred to the level of expert agreement shown by the score of inter-rater reliability (IRR). Three experts were involved in the content validity process, who were selected based on their work [14][13] that related to understanding the

business processes and IT support needed for IT management in higher education. The experts in this research were the IT managers or vice chancellors of finance and resources. After the content was validated, the questionnaires were distributed to 10 public and private universities as pilot data [14].

IV. RESULTS AND DISCUSSION

With the exponential use of mobile technology and Internet connectivity, it is essential to identify the major changes that will occur in the next decade in the university process [15].

A. Identifying Needs

In addition to technological developments, there are several other factors that trigger changes in IT implementation in higher education, including the needs of stakeholders, increased competition, and government regulations.

Stakeholder need for graduate competencies changes rapidly. Thus, higher education must equip their graduates with competencies that are consistent with technological development trends. This relates to higher education responsibilities. Higher educations are responsible for improving awareness, knowledge, skills, and values that serve the needs of the future [16]. In relation to the role of higher education, the need for industries as graduate users should also be considered.

In addition, increased competition influences higher education to make changes. Higher education has an obligation to improve its quality continuously. Diverse approaches are made by higher education to improve their quality, including improvement in the quality of teaching, research, community service, and service quality improvement. Similarly, government regulations may influence the adaptation of the higher education. These regulations include changes in the curriculum, student competency standards, lecturer competency standards, and online-based online reporting system development.

Related to factors that trigger changes in IT implementation in higher education, we conducted a survey on 10 universities, with the results are shown in Fig. 1.

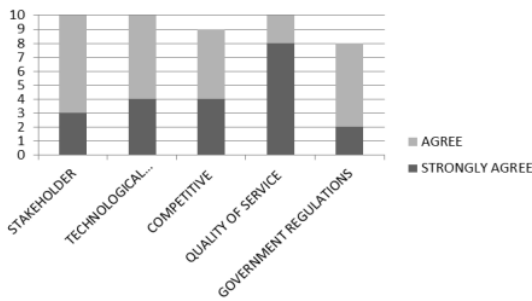


Fig 1. Trigger factors of IT change

Fig.1 shows the trigger factors of technological change in higher education. The results show that the improvement of

service quality, the rapid development of technology and the needs of stakeholders were considered as the principal drivers. Meanwhile, government regulation was the trigger with the lowest score in this survey, which indicates that the lack of government regulation may trigger a change in IT management in university. However, government policies that regulate the implementation of IT in higher education are essential. One of the obstacles to implementing e-learning in higher educations.

Other than the trigger factors, inhibitors of IT change also surveyed on ten universities [17], with the results are displayed in Fig. 2.

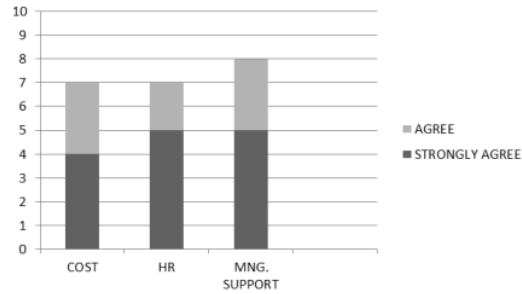


Fig 2. IT change inhibitors

Fig. 2 shows that the support from the management was the highest barriers. Other obstacles were human resources and financing.

B. Envisioning Solution

Higher educations need to respond and adapt to change, including the changes in the teaching and learning process and academic services process in the university. One method that is commonly used is by adopting technological changes to support the implementation of services and Three pillars of Higher Education, which include teaching, research, and community service. Adoption of changes includes the application of online academic information system, e-Learning, and e-Library. The survey results related to the importance of adopting technological changes are shown in Fig. 3.

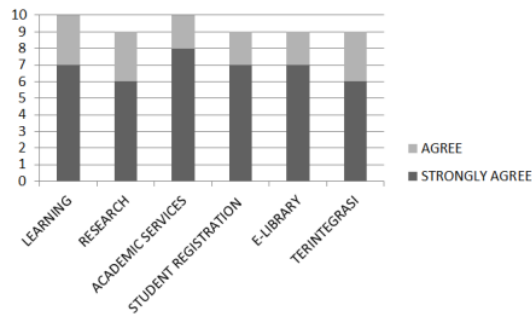


Fig 3. Adoption of IT change in higher education

As can be seen in Fig. 3, the technology adoption was considered very important in supporting academic services and e-learning. Similarly, technological support for other processes also considered essential by the respondents.

C. Planning Solution

The need to adopt technological changes in higher educations causes flexibility to technological changes. The adaptation process requires efforts to maintain the continuity of information technology (IT) management quality in higher educations.

The validity assessment was conducted by three experts, which obtained 94% inter-rater reliability score. This score shows a high level of approval of the questionnaires [18]. Based on survey results in Fig. 1 and Fig. 2, the factors that trigger and inhibit the adoption of technological changes in the manufacture industries were approved as factors triggering the technological change in universities. Five trigger factors of change were further classified as external and internal factors. Three inhibiting factors, which comprised of cost, human resources, and support management, were the factors required to improve the flexibility of IT management in universities.

The survey results are supported by Marlon's theory [11] which states that flexibility is related to resource management. Meanwhile, the resource base (TRB) theory [19] explains that resources consist of the organization, human, and infrastructure. Therefore, the ability of information technology (IT) management in universities to respond to changes can be defined by functions of technology, organizational management, and human resource (HR) management. The link between these elements is illustrated in Fig. 4.

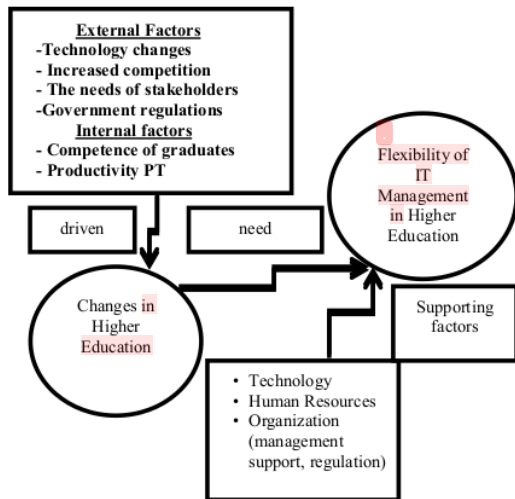


Fig 4. The connection of trigger elements and flexibility support in higher educations

IT management flexibility is related to the adjustment of infrastructure technology, human resource competency, and management policy support. The sustainability of the IT

change process is supported by infrastructure technology in the form of hardware, software applications, operating systems, and computer networks or internet devices. It also needs the support from human resources as actors and the management as policymakers. Competent human resources should adapt to changing needs. In addition to technological infrastructure and human resources, some previous studies also analyze the management support.

The increased infrastructure of technology requirements is related to increasing data volume and frequency of access. Similarly, the use of reference books also shifts from the hard copies into the e-books, Youtube, and e-journal in the library. This condition results in increase in the need for communication facilities. Quality communication technology allows processing information in parallel so that it may generate information in real time.

Other than meeting the need for improving communications infrastructure, increasing the need for data security is also an essential factor. It is related to the data of higher education that are sensitive, such as academic, finance, and administration data. The availability of infrastructure technology with high data security will facilitate a quick, safe, and comfortable data exchange, text, and multimedia process.

Another significant factor is the competence of human resources (HR). IT-based changes relate to changes in the way human resources performs their tasks. The changes require a high competency of the human resources. Thus, training needs to be done periodically to adjust and improve the competence of human resources to meet the changing demands. Esther [5] states that knowledge and skills relating to the changing needs will support the successful implementation of the IT system changes. Successful implementation of IT changes requires appropriate HR competencies. This is supported by [20][12] that explain one of the causes of failure of implementing change is the HR factor.

Changes need to be communicated, which is commonly done in the preparation stage. Communication or socialization is done to all users involved in the business process to provide an understanding of the purpose and benefits of the IT change. With proper communication, the process of change is expected to be accepted and supported by all parties. This is in line with Kottler's [5] study, which states that one factor that influences the successes of change is the support of all elements of the organization. The decision-making system, control system, and coordination of IT procedures change in higher education are crucial to the success of adopting IT changes. Management support is needed in making IT change decisions. It needs a clear division of roles for internal factors of business processes in higher education, which will facilitate coordination between business process actors, technology providers, and top management in higher education. The coordination will facilitate IT decision-making.

Management with a vision of IT leadership significantly affects the speed of IT-based changes. Management with high IT leadership will prioritize IT-based changes that require the allocation of funds for the procurement of IT infrastructure and human resource development. Universities that have adequate funds can freely respond to the needs of its IT

infrastructure. Management who has high IT leadership will direct and provide support for the use of IT for the smooth implementation of business processes in higher education. In contrast, management with low IT leadership will prioritize the procurement of other non-essential infrastructures, such as building and official travel.

Another factor that may increase flexibility is the strict regulation of the government. The results in Fig. 1 show that the low score of regulation as the trigger factor. The IT change process may be implemented optimally if supported by positive regulation. For example, in the application of e-learning in the university that is not optimal due to the lack of a formal policy that regulates the application of e-learning. This causes minimal incentive for universities, especially those with limited funding. Meanwhile, other universities with adequate funds and a high motivation also limited by the lack of conformity of applicable implementation and appraisal system. The prevailing rules still prioritize the number of physical meetings, not the e-learning system. Therefore, it needs regulation regarding the credit, the lecture process, and the appraisal system.

V. CONCLUSION

The questionnaire validity of the research instrument was tested to assess the accuracy of the content and the redaction of questions. Content validity and redaction was assessed by the score of inter-rater reliability (IRR). The obtained IRR was 94%, which shows that the expert considered the questionnaires as suitable for this study.

The results show that the five trigger factors and three inhibiting factors of the adoption of technological changes in the manufacturing industries were also approved as factors that trigger the technological change in universities.

The results are similar to the resource base theory (RBT); therefore, it can be defined that the ability of information technology (IT) management in the universities to respond to the changes is a function of technology, organizational management, and human resource management (HR). Increased IT management flexibility in higher education may be done through the support of infrastructure technology, human resource, management support, and government regulation. Lack of government regulation is one obstacle in adopting IT changes in higher education

However, the factors could still be analyzed in more detail. Future studies could get more specific factors that influence optimal flexibility support. Universities with well-established financial capabilities and management guarantees who have high IT leadership can adopt IT-based changes quickly. On the contrary, universities with limited funds are slow to adopt IT-based changes. These conditions will make the university to have a different level of IT flexibility.

Future studies also could analyze the differences in flexibility factor based on type and variety of higher education, which was not covered in this study.

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