The Information System Development Based on Knowledge Management in Higher Education Institution

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Abstract

The purpose of this study is to express the experiences, ideas, needs, and the use of information technology for the development of management information systems in a higher education institution. This study is a qualitative approach research using the case study method. The research data collection uses the techniques of observation, interview, and documentation study. The research procedure used in this research consists of several research steps utilizing the case study method of Robert K. Yin: research planning, research design, research preparation, research data collection, research data analysis, and doing the research report. The research analysis is done by pattern matching. The data validity testing through data source triangulation and technique triangulation. The result of the study presents: (1) the analysis of management information system based on tacit and explicit knowledge through the process of exchanging experience, idea, and initiative, (2) the management information system design based on the needs analysis, and (3) the development of management information system using information technology.

Keywords: tacit knowledge, explicit knowledge, needs assessment, information technology, qualitative case study

1. Introduction

Information and communication technologies have developed rapidly in business growth. The geographical outreach of the internet and the widespread global adoption of high technology provide educational institutions with unprecedented opportunities to increase their offerings. This technology has changed the way customers look at information and how to use it. Higher education institutions are forced to develop new systems to carry out the educational process using this technology. Information management systems have become hype today among stakeholders in higher education institutions (Babo & Azevedo, 2011). The needs of customers in higher education institutions should be undertaken to the maximum extent possible, one of which is through an efficient and effective management information system following the needs of all academic communities in higher education institutions (Mukhtar, Fransiska, & Wahyudi, 2018; Veronika, Thomas, & Norbert, 2018). The management information system usually requires ongoing design, coordination, communication, and supervision (Adebayo & Wokocha, 2011; Chulkov, 2017). Today many organizations are exploring the field of knowledge management to expand and maintain its competitive advantage in managing information systems (Adebayo & Wokocha, 2011; Chulkov, 2017).

Today, many organizations begin to realize about intellectual capital in developing information systems that should add to their market value. Because knowledge and maintenance of experience are sources of intellectual capital and knowledge management becomes very important for organizations (De Santis & Presti, 2018). In previous research results, knowledge management is a topic that is often discussed in various disciplines. Besides, knowledge management is one of the issues that is often a concern in the organizations to gain knowledge, ideas, experiences for creating an innovative process to discover new products, services, and solutions to problems faced by the organizations (Becerra-Fernandez & Sabherwal, 2010). Another previous research also concluded that knowledge management as strategy concepts are promoted as essential and fundamental aspects for educational institutions to survive and maintain their competitive keenness (Kumar & Kalva, 2011). In this research focus, the information system development based on knowledge management in higher education institutions was chosen as the unit analysis. It will ensure an utmost development in the future by empowering the knowledge of the study program

coordinator, the lecturers, the students, and the alumni, by focusing on (1) an analysis of study program information system based on the knowledge management, (2) an information system design of study program based on the needs analysis, and (3) the development of study program information system based on information technology.

1.1 Research Questions

From the background of the problem and research focus, the following research questions can be developed:

1. How is the analysis of the study program information system based on the exchange, experiences, ideas, and initiatives of students and lecturers?

2. How is the design of study program information systems based on an analysis of the needs of students and lecturers?

3. How to develop information systems information technology study programs owned by students and lecturers?

2. Theoretical Framework

2.1 Management Information Systems

Management information systems are defined as a strategy used by the organization to streamline the overall information used to achieve organizational goals (Mukhtar et al., 2018; Oz, 2014). Management information systems are a means by which the organization disseminates information to all members of the organization, either vertically or horizontally. Effective and efficient management information systems will steer the organization towards its goals following the expectations of internal customers as well as external customers. In practice, efficient and effective management information systems can use various software and hardware in achieving the predefined goals in the organization. Management information systems which defined as the management and use of information system that helps the organization make its strategies (Kroenke & Boyle, 2017). Management information systems can be described as activities to manage information by using the system as a strategy to achieve organizational goals. The information system consists of software components, hardware, processors, people who provide the information (Williams & Sawyer, 2014).

To achieve an efficient and effective management information system, information technology is required, ranging from a very simple to advanced technology. The use of information technology in the management information systems varies widely for each organization, starting with receiving data, searching data, processing data, storing data, and distributing data, using software and hardware that suits the needs of each organization (Gray et al., 2016). The information system uses information technology to collect, create, and distribute useful data. Information technology includes hardware, software, and telecommunications network (Valacich & Schneider, 2015). Concerning the use of hardware, software and communications networks in management information systems, each organization has specific strategies to achieve them, either through the initiative of employees and leaders, the provision of special budgets, innovations and creations of each member of the organization as well as donations or assistance from the government. It is in line with Rainer's et. al views that the strategy for obtaining management information systems based on information technology is through cost leadership strategy, differentiation strategy, innovation strategy, operational effectiveness strategy, and customer orientation strategy (Rainer, Prince, & Cegielski, 2015). Innovation Strategy as one of the strategies used by the organization to develop management information systems is a strategy to meet customer needs that always change from time to time. To realize these changes, new ideas are required in designing information technology that facilitates the implementation of activities within the organization.

The design of the information technology systems should be following the procedures and operational steps developed from the various needs of people in carrying out their work, both in using software and hardware (Ward & Peppard, 2016). To operate the management information systems, it is necessary to organize the human resources who will administer it, plan the manufacturing, plan the delivery and the return following the results and services provided to customers, as something that meets their expectations. Operation and supply chain processes can be conveniently categorized, particularly from the view of a producer of consumer products and services, as a planning, sourcing, making, delivering and returning (J. P. Laudon & Laudon, 2017). To operate the systems, it is necessary to group the system procedures based on the service systems, strategies implementation, services concepts, product services, and targets that demand the customers according to the needs of the organization members. The basic categories presented from left to right are service delivery systems, operations strategy, service concepts, and target market segments (O'Brien & Marakas, 2010) and to develop systems within an organization, it can be started from the analysis of mission, function, task, and method (Mukhtar, 2014).

First, mission analysis can be done by members of the organization through needs analysis activities by looking at the strengths, weaknesses, opportunities, and threats that occur within an organization. By looking at the strengths, it can be perceived how significant the strengths can overcome the weaknesses and threats that the organization encounters. Strengths are also applied to see the Opportunities that can be attained by the organization to achieve its goals. Secondly, the function analysis looks at how the role of each component of the system can contribute to the running or the smooth flow of activities of the organization as a whole. The functions or roles of the system components can be identified as early as possible as a basis or material in the organization's decision-making. Thirdly, the task analysis, that is the leaders of the organization can analyze and identify the duties to avoid overlapping activities carried out by employees, both groups and individuals.

Task analysis is fundamental to be carried out both by the leadership and by the employees regarding the issues of daily activities implementation in the workplace to achieve organizational goals. Lastly, methods analysis is more focused on procedures and systematic steps in doing the work. Employees work following the operational activity guidelines (SOP) and work standards that have been mutually agreed upon. SOP consists of guidelines, procedures, and rules of work implementation, which must be followed and obeyed by all members of the organization in carrying out the work in the organization. Based on the above mission analyst, the functions and the tasks, it can be observed that the systems strategy analysis is a blade analysis that can be used by every member of the organization in carrying out the day-to-day tasks of the organization.

2.2 Knowledge Management

Knowledge management is defined as a process that helps organizations develop essential knowledge that comprises part of the organization's memory, usually in an unstructured format (Nonaka & Toyama, 2003; Rainer et al., 2015). Knowledge management as the practice of selectively applying knowledge from previous decision-making experiences to current and future deci-sion-making activities with the purpose of improving the effectiveness of an institution (Raman, Kuppusamy, Dorasamy, & Nair, 2014). Knowledge management refers to the development of methods, tools, techniques and organizational values that promote the flow of knowledge between individuals and the retrieval, processing, and use of this knowledge in improving and innovating activities (Gonzalez & Martins, 2017). Knowledge management is also explicitly identified as doing what is necessary to get the most out of various knowledge resources. Knowledge management can be applied to individuals, which has recently attracted the attention of organizations. It is seen as an increasingly important discipline for promoting new creations, sharing, and enhancing organizational knowledge (Becerra-Fernandez & Sabherwal, 2010).

Knowledge management activities are all over the map in terms of technology implementations to get the right information to the right person at the right time (Malhotra, 2005). Effective knowledge management is now recognized to be the key driver of new knowledge and new ideas to the innovations process to new innovative products, services, solutions (Carrion, Landroguez, Rodríguez, & Millán, 2017; Drucker, 2011), and helps to articulate the missing segment in the causal chain connecting knowledge availability to its individual learning outcomes (Khedhaouria & Jamal, 2015). Knowledge management should combine information systems with the institutional development, regarding the institutional climate, culture, and structure, being an activity that develops, transfers and deliveries knowledge, in order to provide the essential information so that the institution members take the right decisions (Gonzalez & Martins, 2014; Ibrahim, 2017).

The concept of knowledge can be seen from how a person or group can understand what is in his mind in the form of thoughts, ideas, theories, procedures, field practices, and ways that become a habit for someone in work measured by effectiveness, efficiency, and productivity. Knowledge is connected. It exists in the collection (collective wisdom) of multiple experiences and perspectives (Burmansah, Sujanto, & Mukhtar, 2019; Frappaolo, 2006). Knowledge management leads to knowledge creation, knowledge capture, knowledge validation, knowledge storage and security, knowledge sharing or transfer, and use and reuse of knowledge. Knowledge Management has been applied at the level of individuals, groups, organizations, between organizations, cities, countries, and internationally, with a particular focus on people, processes, technology, and learning (Khedhaouria & Ribiere, 2013). The knowledge consists of two aspects, namely tacit and explicit knowledge which then developed into (1) from tacit to tacit, (2) from explicit to explicit, (3) from tacit to explicit, and (4) from et al. to tacit (Burmansah, Rugaiyah, & Mukhtar, 2019; Nonaka, Toyama, & Hirata, 2015; Rainer et al., 2015).

The characteristics of the knowledge management process five organizational aspects, called organizational constructs that support the knowledge management process are identified: human resource development, teamwork, organizational culture, organizational structure, and knowledge development and absorption (Choo & de Alvarenga Neto, 2010; Gonzalez & Martins, 2014). Knowledge management success factors would possibly include the

following: enabling the conditions of the organizations; the integration and balancing of leadership; organizational culture; and infrastructure support as a composite of some of the above factors. The involvement of people in the organization to utilize the knowledge, both in the form of tacit and explicit knowledge is an activity or process in the implementation of activities that must be employed as much as possible by all members of the organization in order to achieve the efficiency and effectiveness of achieving the goals of the organization as a whole (Stylianou & Savva, 2016). The process of utilizing such knowledge in organizations can be described by Stylianou and Savva as follows:
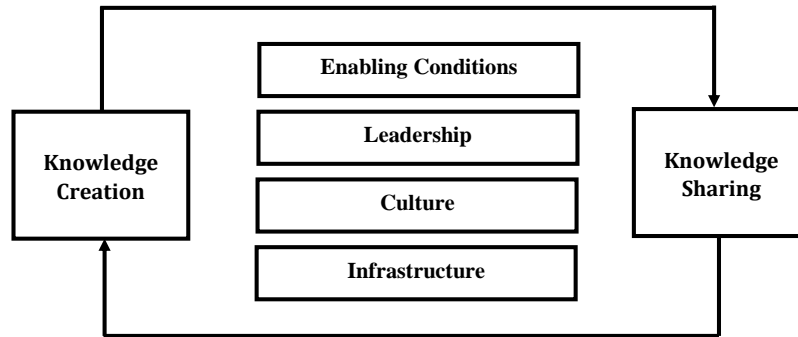

Figure 1. Knowledge Management

To improve the process of knowledge in all aspects of life, management is required to determine the strategic steps, both in the field of knowledge planning, knowledge organization, knowledge communication, and knowledge evaluation (Escrivão & Da Silva, 2019). In some views of knowledge management. Knowledge management is fundamentally about a systematic approach to managing intellectual assets and other information in a way that provides the company with a competitive advance (Bergeron, 2003). The intellectual assets management can be done through experience, ideas and concepts sharing understood by individuals and groups, which are believed to rationalize and streamline the work to achieve organizational goals. Knowledge management involves everyone in the organization, from the top, middle, and bottom managers and employees interacting with each other on the job (Castaneda, Manrique, & Cuellar, 2018).

The involvement of all elements in the knowledge management can be considered as a system, in which one interconnects and interacts with each other to achieve the goals set by the organization. The knowledge management system will be different from other systems, but they need each other for the system cohesiveness. It is described by Geisler and Wickramasinghe (Geisler & Wickramasinghe, 2009) as follows:
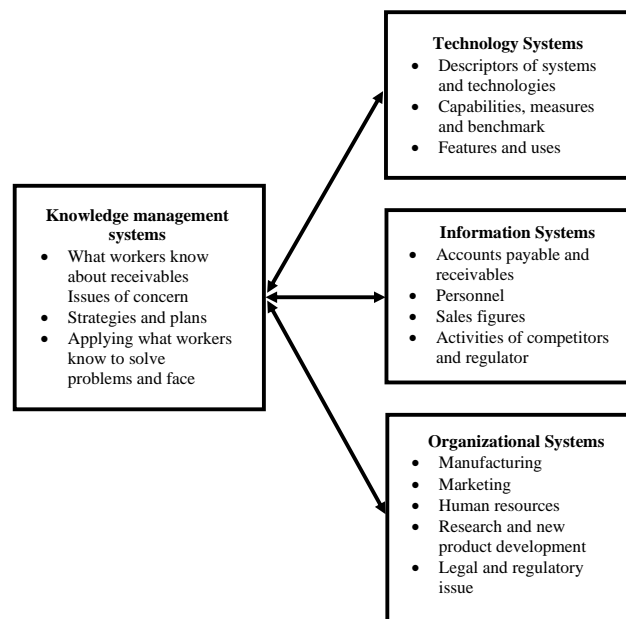

Figure 2. The Differences between Knowledge Management System

with System Technology, Information Systems and Organization System

3. Methodology

3.1 Research Setting

This research was carried out at the Post-Graduate School, Doctoral Program in Educational Management Department, Jakarta State University, Jakarta, Indonesia. The research conducted in March 2017 until November 2018.

Research Design

This study uses a qualitative approach with a research method that deals with the type of case studies to see phenomena and events (Creswell, 2007; Yin, 2009) that occur in the doctoral program in educational management, which are related to unique cases in the development of management information systems. The main objective of this research is to gain an in-depth understanding and look at phenomena and events that occur at the doctoral program in educational management that are related in the development of management information systems, therefore, semi-structured interviews are considered more appropriate (Creswell & Creswell, 2018; Miles, Huberman, & Saldana, 2019).

3.2 Research Informants

Interviews with the informants are an essential source of case study evidence because most case studies are related to human events or behavior (Yin, 2009). Researchers used purposive sampling and snowball sampling. To obtain data information, researchers set informants as targets for research conducted following the quality and characteristics of the informants. In the process of collecting data, this research involved researchers and interviewed. Each interview session lasts 20-30 minutes for each participant. The primary purpose of this interview is to obtain information about the information management system developed in the doctoral study program in educational management. Therefore, the researcher collected data through semi-structured interviews from key informants, namely, (1) students, (2) lecturers, (3) coordinators, and (4) alumni. Those who were involved in this research are listed in the following table:

Table 1. Research Informants

Code of Informant	Status
C-MM *(Key Informant)*	*Program Study Coordinator*
PKA-ST-01	Student
TTD-ST-02	Student
GFT-AL12-03	Alumni
TTG-LC-04	Lecturer
CCR-LC-05	Lecturer
HHR-AL14-06	Alumni
TTF-ST-07	Student
DDR-ST-08	Student
LLP-AL15-09	Alumni
FGT-LC-10	Lecturer
HTG-LC-11 *(Informants)*	Lecturer

3.3 Procedure Data Analysis

The research procedures used in this study consisted of six research steps, namely: plan, design, prepare-share, collect-design, analyze-collect or collect, analyze, and share. Data collection techniques were done by participant observation, in-depth interviews, and documentation. Data collection activities were obtained from extensive forms, documentation and archival records, and interviews, observations, and physical artifacts (Bogdan & Biklen, 1992; Cho, Lee, Ji Young, & Eun-Hee, 2014; Yin, 2009). Data analysis techniques include testing or testing the validity of data, grouping data according to sub-focus, combining data in the form of a matrix or table, or recombining the evidence that has been obtained, and drawing conclusions. Data analysis consists of testing, categorizing, tabulating,

or reassembling evidence to show an initial research proposition. Three data analysis techniques are used through pattern matching, making explanations, and analyzing time-series data (Miles et al., 2019; Yin, 2009).

4. Results

The results of each research focus can be described in three aspects, as follows:

4.1 Exchange of Experiences, Ideas, and Initiatives

The exchange of experiences takes place between lecturers, lecturers, and students, lecturers with alumni. It started from the discussions conducted by the program coordinator with several lecturers, students, and alumni. The topic discussed was related to the problems encountered by the department coordinator in serving the students, as starting from the beginning of 2017, the study program secretary was no longer available to assist in tending to the students. The informant of C-MM said:

Since 2017, I have strived to develop a needs service system program because the policy of the university states that the absence of a study program secretary for effectiveness and efficiency in HR and financial management. So, I think to address this using the knowledge management approach in an information system.

Furthermore, the informant of GFT-AL12-03 said that "*to build an information system that can help solve service problems for students, the study program should provide an updated management information system that can help the academic process of students as we have gone through before.*" It did not stop there, an informant TTG-LC-04 stated that "*the academic process of general student academic services and the process of writing a dissertation from start to finish relating to requirements and administration.*" The results of the discussion illustrated that the alumni proposed to build information systems that can help in solving the service problems experienced by students. The other lecturers, as well as the students, proposed the same thing. The informant of   C-MM added that "*to build a service information system for students requires a significant financial budget. For this, the study program is constrained. But I commit to build and make it happen.*" The study program coordinator then explained to the students, lecturers, and alumni that building the system required to fund or the budget should be big enough, while the department had no budget at all to build the system as commitment.

One of the lecturers gave input, asking not to think about the budget. Instead, the lecturers, students, and alumni were to be empowered to build the system. It was going to be started by designing a straightforward system that later can be gradually developed. The informant of CCR-LC-05 said that:

I think the problems and constraints that arose because the financial budget did not stop this effort, but the study program coordinator, lecturers, students, and alumni could make this effort in such a way that they could build this information system slowly but surely. Starting from designing information systems based on service needs that exist in integrated study programs.

The informant of FGT-LC-10 stated that "*I think today many students also can build an information management system. It should be our effort to realize the proposals that we want to make and empower students and study program citizens who have the skills that support this project. We should begin in the year of academic 2016/2017.*" According to the statement of the informant of FGT-LC-10, we can conclude that besides, the lecture proposes to build a system that would involve the students of the academic year 2016/2017, especially those in the management system course. Many education management students have expertise in management information systems and information technology. The same statement was added by the informant of LLP-AL15-09 that:

The development must start from developing the needs of writing the dissertation from the beginning, starting from the submission of the dissertation title, registration of purposing the dissertation proposal to the public defense of the dissertation. It can even be done up to the filing of graduations conducted at the level of study programs and integrated by postgraduate.

The statement was abovementioned state that one of the alumni has started to create a very simple system for students to interact with the study program, such as creating an online program for title verification, proposal seminar registration, feasibility seminar, closed and open examination as well as consultation appointment through the WEB grafted on one of the Hotspots owned by alumni. According to the statements by the informants above, the researcher could conclude that both students and lecturers developed the web-based management information systems, and each student gave his/her opinion during the class that involved four classes: namely, regular A-class, regular B, non-regular A, and non-regular B. Each student and lecturer designed the information system according to the ability of the class members.

4.2 Design and Needs Analysis

Related to the findings, the informant of HTG-LC-11said:

In my opinion, to design, we have to do a study and mapping needs. Starting from the nature of individual needs to the collective needs in the study program. It does not stop there, and we must embrace the human resources that can support this. We can ask those who understand and are experts and vice versa.

Students in each class did the design of the system. They conducted intensive discussions both inside and outside the classroom involving those who did not understand the information system and those who were familiar with information systems and technology. Furthermore, the informant of DDR-ST-08 added that "*the students had started this project by analyzing the necessities of life individually. These individual needs also lead to experience in the workplace, organizations, and institutions in which they work.*" To design the system, the students started by analyzing their individual needs, then collected them in class groups. Their needs also varied according to the experience in their respective workplaces, their organizations, and the institutions where they worked. The informant of LLP-AL15-09 added that "*in building this information system management, a knowledge management approach is needed because by identifying the things needed through the needs of each individual student, alumni, and university, the needs will be found in properly designing and building the information system.*" The statement from the informant of LLP-AL15-09 could conclude that from the set of individual needs, they began to design the system with the appropriate components to meet those needs. Each class varied in its design, according to their needs and their ability to create the system.

According to the informants abovementioned, the researcher could conclude that the design of the systems generated from the four classes varied. Each class began to identify the needs of the students, lecturers, and alumni. The designs made were dissimilar. The techniques and procedures were in line with their ideas, aspirations, and skills to build the information systems design.

4.3 The Information System Development based on Information Technology

The informant of CCR-LC-05 said that the management information systems development was based on the implementation of systems that have been previously used. System development was more focused on adding the designed system components. The system components consist of: title verification, proposal seminar registration, result seminar registration, closed and open exam registration, consultation appointment, and scientific journal (JERAM). Furthermore, the informant of HHR-AL14-06 explained that "

From the statement of informant HHR-AL14-06, the conclusion was taken that the developed system components were for the administrators, students, lecturers, and alumni. Each component was designed into sub-systems that suit the needs in the field. As for the *siakad* feature facilities for the Educational Management - Doctoral Program was improved into twenty features for students, eighteen features for lecturers, and twenty-six features for administrators.

Furthermore, it is no different from an informant of FGT-LC-10, who said:

Academic Information System that was built to provide convenience to users (students, lecturers, operators, and others) in online campus administration activities. In the UNJ of education management doctoral study program, there are twenty feature components used by students, eighteen feature components used for lecturers, and twenty-six features used by administrators. Each featured design that is used is based on the needs in the field through grouping, according to sub-systems.

The informant of GFT-AL12-03 also stated that

SIAKAD covers overall data management and is intended for the entire academic community, both lecturers, students, affairs, and other elements that are in this educational institution. Campus academic administration activities such as; New Student Admission process, making class schedules, filling in Study Plan Cards (KRS), filling in grades, guardianship, lecturer & student data management that can be used online. This system can also function as a support for data analysis in determining Campus decisions.

From the informations from the informant of GFT-AL12-03, the researcher could conclude that the main page of *Siakad* for Educational Management Doctoral Program - Universitas Negeri Jakarta starts from the news information, which consists of the main menu and gallery, *siakad* statistical data, testimonials, and research terms and conditions, followed by the student room main menu, personal data, KRS data, scoring data, payment data, course schedule, teaching schedule of lecturers, letter submission, dissertation title verification, proposal seminar registration, and so on. Furthermore, the informant of GFT-AL12-03 added:

The purpose of this SIAKAD is to organize data in academic management and to accelerate and facilitate the delivery of information. SIAKAD is intended for management and aims to facilitate and accelerate the management of information ranging from registration of new students, important information, filling KRS, class schedules to the graduation of students can be managed with an academic information system. Not only students who can use SIAKAD, lecturers and the entire academic community can also use it.

The information abovementioned by the informant GFT-AL12-03 could conclude that the lecturer room is next displayed, consisting of personal data, educational data, functional position, passing data, certification data, teaching schedule, presentation materials, course syllabus, lecture contract, and teaching schedule. Lastly is the administrator's data consisting of personal data, a list of doctoral advisors, activities schedule of the study program coordinator, curriculum data, teaching materials, announcement, research data of lecturers, dissertation guidance, and so forth. According to the information from all informants above, the summary of the research findings described as follows:
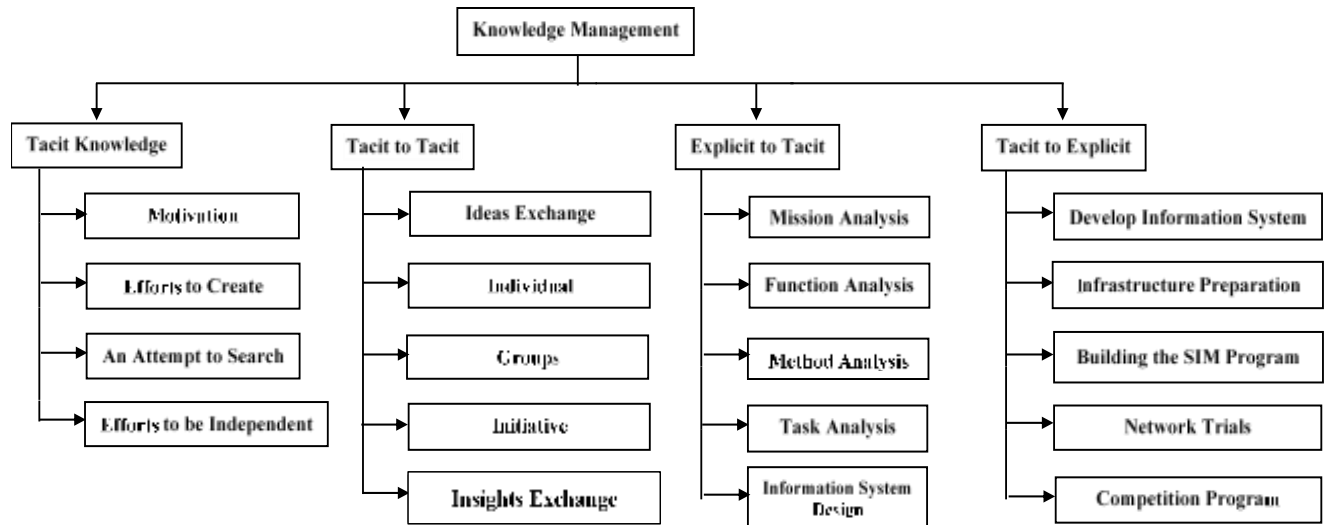

Figure 3. Summary of Research Findings

5. Discussion

In this research shows that the management information system of Doctoral Program in Educational Management – Jakarta State University provides the information about the study program profile, the lecturers, the students, the alumni, title verification, the proposal seminar registration system, the consultation registration system, the feasibility seminar registration system, the closed exam registration system, and the open exam registration system through the online system. To build an effective and efficient information system, a substantial budget and financing are required (Adekeye, 1997). However, in this research, field study has indicated that the faculty did not have the necessary budget. Within the budget constraint, the study program coordinators, together with the lecturers, the students, and the alumni, have designed a management information system gradually through the initiative, experiences, and innovation based on knowledge management through the process of utilizing ideas, feelings, strategies, and experiences (Stylianou & Savva, 2016).

From the results of the previous research, it can be seen that: *first*, the development of management information systems in the Educational Management Doctoral Program of Jakarta State University is based on the exchange of experiences, ideas, and the initiative of lecturers, students, and administrators. It is evident in the sharing done by the administrators with the students and the lecturers to help to solve the problems faced by the department coordinators in serving the students. The process of experiences, ideas and initiatives sharing is part of knowledge management, which is in line with what the previous researches have put forward from tacit to tacit. Sometimes, an individual shares tacit knowledge directly with another (Gonzalez & Martins, 2014; Malhotra, 2005; Nonaka et al., 2015).

For the purpose of realizing the sharing of experiences, ideas, and initiatives in the organization, leadership strategy is needed to provide chances for students, lecturers, and alumni for space and opportunities, by utilizing the organization as a forum for learning, in order to share ideas, knowledge, and initiatives to other members of the organization. *Second*, the management information systems design is based on the needs analysis, i.e., each student provides input and discusses these needs as the study program needs that must be realized in the form of information systems. According to the previous researches stated that the process of knowledge can be initiated from the creation

of each individual that is in accordance with their respective conditions, directed through good leadership, adapted to culture or organizational habits and equipped with adequate infrastructure (Hakimpoor & Khairabadi, 2018; K. C. Laudon & Laudon, 2019; Stylianou & Savva, 2016).

The system design that has been built by the students should be tailored to the conditions of the study program, and it requires personnel who direct and control the system, and the operational systems are adjusted to the custom or rules and policies that exist in the Graduate School of the Jakarta State University, and are adapted to the existing infrastructure. *Third*, the management information systems development is based on the knowledge management system, which is knowledge management as the basis for lecturers, students, alumni, and managers to develop a technology system, information system, and organizational system. Furthermore, the previous research stated that technology systems, information systems, and organizational systems can be built from knowledge management systems (Adekeye, 1997; Geisler & Wickramasinghe, 2009).

6. Conclusion and Recommendation

6.1 Conclusion

The conclusions of this research are: (1) the management information systems analysis of the study program is based on tacit and explicit knowledge through the process of exchanging experience, ideas, and initiative among the administrators, students, lecturers, and alumni. (2) The management information systems design of the study program is based on the analysis of the needs of managers, students, lecturers, and alumni. And (3) the management information systems development of the study program is based on the information system and the technology system owned by the managers, the lecturers, the students, and the alumni.

6.2 Recommendation

From the results of the research, the discussion, and the conclusions, it can be recommended that: *Firstly*, managers, students, lecturers, and alumni are encouraged, as much as possible, to share ideas, experiences and initiatives to develop innovative activities and contribute to each other, especially in learning information systems. *Secondly*, the design of information systems should be prepared based on needs analysis, as well as the needs of internal customers and external customers. It is expected that Postgraduate and University leaders to contribute to the accomplishment of information systems involving top, middle and lower-level leadership. And *thirdly*, to create an efficient and effective management information system, university leaders should generate the necessary policies, budgets, regulations on an ongoing, consistent, and systematic basis in the procurement of infrastructure required to operate the system.

References

Adebayo, E. I. & Wokocha, M. C. (2011). A guide to establishing management information system in tertiary institutions in nigeria. *Proceedings of the 2011 International Conference on Teaching, Learning and Change International Association for Teaching and Learning (IATEL)*, 54–62. Retrieved from http://hrmars.com/admin/pics/111.pdf

Adekeye, W. B. A. (1997). The importance of management information systems. *Library Review, 46*(5), 318–327. Retrieved from http://www.vra.com/kmportal/online_resources/mis/The importance of MIS.pdf

Babo, R. & Azevedo, A. (2011). *Critical factors influencing instructors' acceptance and use of learning management systems*. Hershey PA, USA: Information Science Reference - IGI Global.

Becerra-Fernandez, I. & Sabherwal, R. (2010). *Knowledge management: systems and processes* (2nd ed.). New York, USA: Taylor & Francis Ltd.

Bergeron, B. (2003). *Essentials of knowledge management*. New York, USA: John Wiley & Sons Inc.

Bogdan, B. & Biklen, S. K. (1992). *Quality research for education: An introduction to theory and methods*.

Burmansah, B., Rugaiyah, R. & Mukhtar, M. (2019). A case study of mindful leadership in an ability to develop focus, clarity, and creativity of the buddhist higher education institute leader. *International Journal of Higher Education, 8*(6), 57–69. https://doi.org/10.5430/ijhe.v8n6p57

Burmansah, B., Sujanto, B. & Mukhtar, M. (2019). Work-life quality, job involvement, and affective commitment of school teachers. *International Journal of Recent Technology and Engineering, 8*(2 Special Issue 9), 159–164. https://doi.org/10.35940/ijrte.B1034.0982S919

Carrion, I. C., Landroguez, S. M., Rodríguez, A. L. L. & Millán, A. L. (2017). Critical processes of knowledge management: An approach toward the creation of customer value. *European Research on Management and*

Business Economics, 23(1), 1–7. https://doi.org/10.1016/j.iedeen.2016.03.001

Castaneda, D. I., Manrique, L. F. & Cuellar, S. (2018). Is organizational learning being absorbed by knowledge management? A systematic review. *Journal of Knowledge Management, 22*(2), 299–325. https://doi.org/10.1108/JKM-01-2017-0041

Cho, J. Y., Lee, E.-H., Ji Young, C. & Eun-Hee, L. (2014). The qualitative report reducing confusion about grounded theory and qualitative content analysis: Similarities and differences. *Qualitative Report, 19*(32), 1–20. Retrieved from http://www.nova.edu/ssss/QR/QR19/cho64.pdf

Choo, C. W. & de Alvarenga Neto, R. C. D. (2010). The concept of ba in nonaka's knowledge-based theory of the firm: research findings and future advancements towards the design and managing of enabling contexts in knowledge organizations. *EnANPAD XXXIV - 2010*, 1–17. Retrieved from http://www.anpad.org.br/admin/pdf/adi1255.pdf

Chulkov, D. V. (2017). On the role of switching costs and decision reversibility in information technology adoption and investment. *Journal of Information Systems and Technology Management – JISTEM USP, 14*(3), 309–321. https://doi.org/10.4301/S1807-17752017000300001

Creswell, J. W. (2007). *Qualitative inquiry & research design: choosing among five approaches* (2nd ed.). California, USA: SAGE Publications, Inc.

Creswell, J. W. & Creswell, J. D. (2018). *Research design: qualitative, quantitative, and mixed methods approaches* (5th ed.). Thousand Oaks, United States: SAGE Publications Inc.

De Santis, F. & Presti, C. (2018). The relationship between intellectual capital and big data: A review. *Meditari Accountancy Research, 26*(3), 361–380. https://doi.org/10.1108/MEDAR-10-2017-0222

Drucker, P. F. (2011). *The practice of management*. New York, USA: HarperCollins Publishers Inc.

Escriv ão, G. & Da Silva, S. L. (2019). Knowledge management maturity models: Identification of gaps and improvement proposal. *Gestao e Producao, 26*(3), 1–16. https://doi.org/10.1590/0104-530X3890-19

Frappaolo, C. (2006). *Knowledge management* (2nd ed.). Oxford, United Kingdom: John Wiley and Sons Ltd.

Geisler, E. & Wickramasinghe, N. (2009). *Principles of knowledge management: theory, practice, and cases: theory, practice, and cases*. London, United Kingdom: Taylor & Francis Ltd.

Gonzalez, R. V. D. & Martins, M. F. (2014). Knowledge management: an analysis from the organizational development. *Journal of Technology Management and Innovation, 9*(1), 131–147. https://doi.org/10.4067/s0718-27242014000100011

Gonzalez, R. V. D. & Martins, M. F. (2017). Knowledge management process: A theoretical-conceptual research. *Gestao e Producao, 24*(2), 248–265. https://doi.org/10.1590/0104-530X0893-15

Gray, H., Issa, T., Pye, G., Troshani, I., Rainer, R. K., Prince, B. & Watson, H. J. (2016). *Management information systems*. New York, United States: John Wiley & Sons Inc.

Hakimpoor, H. & Khairabadi, M. (2018). Management information systems, conceptual dimensions of information quality and quality of managerial decisions: modelling artificial neural networks. *Universal Journal of Management, 6*(4), 127–133. https://doi.org/10.13189/ujm.2018.060403

Ibrahim, F. (2017). Knowledge Management Methodology: Developing a Phenomenalogical Middle-range Thinking Approach for Knowledge Management Research. *Journal of Management Research, 9*(4), 110. https://doi.org/10.5296/jmr.v9i4.10790

Khedhaouria, A. & Jamal, A. (2015). Sourcing knowledge for innovation: knowledge reuse and creation in project teams. *Journal of Knowledge Management, 19*(5), 1–24. https://doi.org/10.1108/JKM-01-2015-0039

Khedhaouria, A. & Ribiere, V. (2013). The influence of team knowledge sourcing on team creativity: evidences from information system development. *Learning Organization, 20*(4–5), 308–321. https://doi.org/10.1108/TLO-10-2012-0063

Kroenke, D. M. & Boyle, R. J. (2017). *Using MIS* (10th ed.). Harlow, United Kingdom: Pearson Education Limited.

Kumar, A. A. & Kalva, U. K. (2011). Knowledge management: a review. *International Journal of Academic Research in Social Sciences & Humanities (IJARSH), 1*(1), 9–17.

Laudon, J. P. & Laudon, K. C. (2017). *Management information systems: managing the digital firm* (15th ed.).

Harlow, United Kingdom: Pearson Education Limited.

Laudon, K. C. & Laudon, J. P. (2019). *Management information systems: managing the digital firm* (16th ed.). Harlow, United Kingdom: Pearson Education Limited.

Malhotra, Y. (2005). Integrating knowledge management technologies in organizational business processes: getting real time enterprises to deliver real business performance. *Journal of Knowledge Management, 9*(1), 7–28. https://doi.org/10.1108/13673270510582938

Miles, M. B., Huberman, A. M. & Saldana, J. (2019). *Qualitative data analysis: a methods sourcebook* (4th ed.). Thousand Oaks, United States: SAGE Publications Inc.

Mukhtar, M. (2014). *Systems management*. Jakarta, Indonesia: BPJM UNJ.

Mukhtar, M., Fransiska, A. B. & Wahyudi, M. (2018). Management information systems doctorate program of educational management (DOCPEM). *2018 6th International Conference on Cyber and IT Service Management (CITSM)*, 1–5. https://doi.org/10.1109/CITSM.2018.8674314

Nonaka, I. & Toyama, R. (2003). The knowledge-creating theory revisited: knowledge creation as a synthesizing process. *Knowledge Management Research & Practice, 1*(1), 2–10. https://doi.org/10.1057/palgrave.kmrp.8500001

Nonaka, I., Toyama, R. & Hirata, T. (2015). *Managing flow: a process theory of the knowledge-based firm* (2nd ed.). Palgrave Macmillan.

O'Brien, J. A. & Marakas, G. M. (2010). *Management information systems* (10th ed.). New York, USA: McGraw-Hill Education.

Oz, E. (2014). *Management information systems* (7th ed.). MA, United States: Cengage Learning, Inc.

Rainer, R. K., Prince, B. & Cegielski, C. G. (2015). *Introduction to information systems* (5th ed.). Singapore, Singapore: John Wiley & Sons Singapore Pte. Ltd.

Raman, M., Kuppusamy, M. V., Dorasamy, M. & Nair, S. (2014). Knowledge management systems and disaster management in malaysia: an action research approach. *Journal of Information & Knowledge Management, 13*(1), 1–15. https://doi.org/10.1142/S0219649214500038

Stylianou, V. & Savva, A. (2016). Investigating the knowledge management culture. *Universal Journal of Educational Research, 4*(7), 1515–1521. https://doi.org/10.13189/ujer.2016.040703

Valacich, J. & Schneider, C. (2015). *Information systems today: managing in a digital world* (7th ed.). Harlow, United Kingdom: Pearson Education Limited.

Veronika, K., Thomas, E. & Norbert, S. (2018). Efficiency of universities: drivers, enablers and limitations. In C. Adrian, D. Ligia & P. Remus (Eds.), *European Higher Education Area: The Impact of Past and Future Policies* (pp. 603–618). https://doi.org/10.1007/978-3-319-77407-7

Ward, J. L. & Peppard, J. (2016). *The strategic management of information systems : building a digital strategy* (4th ed.). New York, United States: John Wiley & Sons Inc.

Williams, B. K. & Sawyer, S. C. (2014). *Using information technology* (11th ed.). New York, USA: McGraw-Hill Education.

Yin, R. K. (2009). *Case study research: design and methods* (4th ed.). Thousand Oaks, California: Sage Publications, Inc.