

# Processes and Activities for Managing Change in Information Systems Implementation in Higher Education Institution

Manzilatul Rohmah<sup>1\*</sup>; Apol Pribadi Subriadi<sup>2</sup>

<sup>1,2</sup> Information System Department, Institut Teknologi Sepuluh Nopember  
Jl. Teknik Kimia, Keputih, Kec. Sukolilo, Surabaya 60111, Indonesia  
<sup>1</sup>manzilatulrohmah@gmail.com; <sup>2</sup>apolpribadi@gmail.com

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**Abstract** - The research aimed to develop a model for managing change consisting of detailed processes and activities that include changes in technology, organizations, and individuals in the implementation of information systems. The change management model developed in the research was used as a guideline for managing changes that occur when implementing changes in information systems in higher education. This change management model was developed using the action research method to obtain a model that fits the practical conditions. The model included the process and details of activities which were obtained in two ways, namely by identifying the success factors of implementing information systems in previous studies and interviewing information system implementers in tertiary institutions to obtain practical change management activities. The proposed change management model has been verified and validated where the results show that the process in the model is in accordance with expert theory. The results of using this model indicate that the management of changes in information systems can be carried out in a clearer and more structured.

**Keywords:** change management, information systems implementation, change processes, change activities, higher education institution

## I. INTRODUCTION

Academic and non-academic systems in various higher educations are currently managed with an information-based system to make it easier, faster, and more effective in managing the data held by universities (Palilingan & Batmetan, 2018). The existence of Information Systems (IS)/Information

Technology (IT) which is widely known and provides technological benefits which are very helpful in carrying out traditional administrative processes in higher education. (Watchaton & Krairit, 2019). Administrative processes in higher education institutions (HEI) that are still carried out traditionally or manually cause slow work processes and poorly managed document and file storage. (Adam, Effah, & Boateng, 2017). According to Adam et al. (2017), HEIs generally apply innovative technology to increase competitive advantage, help reduce operating costs, and increase performance effectiveness. Despite staffs who are afraid of being replaced by the system, others agree that the information system can help staff performance in accelerating the higher education administration process. Information systems play a role in organizational development that can help universities reduce costs, increase productivity, efficiency and effectiveness, improve product and service quality, and optimize decision making (Martins et al., 2019). This has triggered an increase in the use of information systems to provide a competitive advantage in higher education.

The success of an organization in obtaining benefits from the information system cannot be separated from the success of the information system in carrying out its functions (Liulliyah & Subriadi, 2020). However, unchanging new workflow processes, unadjusted organizational structures, continuing to carry out old cultural practices in organizations, and other problems in business related to adaptation to change are not easy to fix (Chowthi-Williams, Curzio, & Lerman, 2016). The manual process that changes by implementing an electronic health record (EHR) system disrupt daily routines and cause various challenges resulting in resistance to change despite knowing its potential benefits. (Heath & Porter, 2019). This occurs

because the implementation of information systems can cause changes. Change is currently considered a normal condition when an organization implements the use of new information and communications technologies (ICTs) accompanied by changes in users, business processes, and strategic plans. In fact, when organizations implement these changes, they have become an increasing part of business in general. Much of the research conducted in HEI related to the implementation of information systems (IS) has concentrated on problems regarding staff responses to changes caused by new structures and systems. Meanwhile, improving project success related to post-implementation information systems is a challenge that needs to be considered for organizations (Adam et al., 2017). According to Watchaton and Krairit (2019), the main challenge faced by administrators from higher education is to ensure the successful implementation of IS in their higher education.

Implementation of information systems in an organization can be defined as the process of determining and installing new technology (Watchaton & Krairit, 2019). According to Al-Mamary, Shamsuddin, and Aziati (2014), there are three main issues that affect the success of IS implementation. The first one is technology issues that include system quality, information quality and service quality. System quality is the ease of use of the system and system performance. Information quality is the quality of information provided by the system for use by users. Meanwhile, service quality is the quality of service provided by the organization's department which is supported by the system. The second issue is organizational issue that include top management support and training for users of information systems. The budget that is fulfilled in accordance with the needs of the information system implementation can be a form of support from top management. The last one is individual issues that include individual computer skills as well as individual experiences using the system. Organizations must provide human resources who have information technology-related capabilities and experience in using systems to support the successful implementation of information systems. However, if the organization does not have or cannot employ adequate human resources, the organization must provide training related to information technology in general and implemented information systems to the resources it already has.

Change management aims to facilitate individual, team, or even organizational change by managing it (Almanei, Salonitis, & Tsinopoulos, 2018). Change management can take the form of the procedures, techniques, methods and tools used to control and manage people to get the desired business results after a change (Mogogole & Jokonya, 2018). The change management process begins with making individuals involved in change understand and accept that change is necessary to achieve better conditions (Abatan & Maharaj, 2018). Higher education must provide guidance for managing change for any

information technology that will be used in learning and teaching (Abatan & Maharaj, 2018). In addition, the level of management in tertiary institutions is responsible for providing clarity regarding the needs for change to all stakeholders involved in change.

Previous research suggests that applying change management when implementing learning information systems in educational institutions can increase the success of implementation. According to Alkarney and Albraithen (2018), a conceptual model was produced for the successful implementation of the learning management system in non-scientific colleges by conducting a literature review. The research comes up with a model that has several components of critical success factors, including students, instructors, systems, university support, and change management.

Ziembra and Obłak (2015) identify critical success factors (CSFs) for change management in the IS project by conducting a literature review. CSFs obtained in the research includes top management support, recognize the change, shared vision for change, managerial activity, effective communication, organization readiness to deal change, employee training, employee involvement, employee satisfaction, information flow, and performance measurement.

Narciso and Allison (2014) combine two change management models, namely the Kotter and Prosci models to produce a framework to overcome the problem of user resistance in software process improvement initiatives. In this research, eight keys to success in overcoming resistance are generated, including active support from the executive, the intensity of open communication about change, using a structured change management approach, availability of resources, sufficient funding specifically for change management, employees willing to be involved in change, and involvement and support from middle management. Abatan and Maharaj (2018) generally show that academics are aware of the need for change management. Moreover, they believe that change management is needed to assist in integrating technology into higher education. In this research, there are success factors in implementing information systems related to change management: 1) clear needs about educational technology, 2) institutional or organizational structures that are adapted to change, 3) adequate support through training, and 4) information and explanations about the use of technology in each academic section. Based on some of these studies, it can be concluded that change management has an important role in the implementation of information systems. Therefore, universities are responsible for formulating and providing strategies to implement changes in the information technology used.

There have been many models of change management produced by researchers. Each of those models has different scope and components. From several existing models, the research uses three change management models that have a scope for individual and organizational change. Previous management models used were: 1) Awareness, Desire, Knowledge,

Ability, Reinforcement (ADKAR) from Prosci, 2) Kotter 8 Step, and 3) McKinsey 7S. In addition, a change management best practice is also used, namely Information Technology Infrastructure Library 3 (ITIL 3) change management as a basis for developing a change management model in the research. The three models and one best practice on which to base model proposal development have detailed model components and flows.

The ADKAR model is developed by Prosci which emphasizes individual change. ADKAR's Prosci Model is a framework that helps organizational leaders understand and manage individual change (Creasey, 2019). In this model there are five stages of making changes: 1) awareness, 2) desire, 3) knowledge, 4) ability, and 5) reinforcement. These stages must be carried out sequentially when managing change from an individual perspective. Prosci sees that change occurs at the individual level because when the organization changes, all the individuals in the organization must also change (Creasey, 2019). It is believed that to make changes at the organizational, business, and community levels, one must first understand how to influence individuals to support change.

The McKinsey 7S model is a change management model containing 7S components which are divided into two categories—hard and soft—where these components need to be changed to achieve complete change (Sachdeva, 2008). The components included in the hard category are strategy, structure, and systems. While the components included in the soft category are staff, style, and skill. One last component which is the center of all components is shared value. The McKinsey model pays attention to the hard and soft components of change management including organizational and individual aspects of change.

The Kotter 8 Steps model was developed by Professor John Kotter who has a scope of organizational change management, where there are eight steps in managing change, namely: 1) creating the interests of change, 2) building a change guiding team, 3) developing a vision and strategy, 4) forming a representative team as a volunteer force, 5) optimizing action by removing obstacles, 6) producing short-term achievements, 7) maintaining the acceleration of achieving change, and 8) sustaining change (Brisson-Banks, 2010). In this model, organizational change management can be done by carrying out the eight stages.

Change management at ITIL is a process that aims to ensure that all changes related to information technology systems have been recorded, evaluated, authorized, and implemented properly (Susanto, 2016). Changes to the system can be triggered by various things such as rules, policies, changes in business processes, system updates or due to system errors. In ITIL change management, there are several activities including creating, documenting, assessing and authorizing Requests for Change (RFC), coordinating and authorizing change implementation (development) & testing, coordinating change deployments, and

reviewing & closing change records.

Abatan and Maharaj (2018) suggest that managing changes that occur when the information system is implemented can affect the success of its implementation. On the other hand, according to Al-Mamary et al. (2014), there are three main issues that affect the successful implementation of information systems, namely technology issues, organizational issues, and individual issues. It is necessary to manage change on these three issues. However, according to Sulistiyani and Susanto (2018), the current scope of the change management model only focuses on each issue. Change management that covers these three issues is needed.

The need for change management when software is related to changes in business processes becomes a challenge for an organization. Changes must be managed and considered to ensure that the new software is accepted and useful to provides value to the organization (Holtel et al., 2017). In managing changes that occur when implementing information systems, a change management model that includes the three scopes is needed to be able to assist in managing changes that occur in HEI to increase the success of implementation. In the change management model, more detailed and structured processes and activities are needed, so that they can assist in managing changes in information systems. Inefficient management can lead to failed implementation of change due to lack of planning, scarce resources, and inadequate action or organization (Wadood, Gharleghi, & Samadi, 2016).

Therefore, the research aims to develop a model for managing change consisting of detailed processes and activities that include changes in technology, organizations, and individuals in the implementation of information systems. The change management model produced in the research is expected to help facilitate HEI in managing changes when implementing information systems by carrying out the processes and activities in the model, to increase the success of information system implementation.

## II. METHODS

The model is developed based on the action research method. Action research (AR) aims to study social practices and improve them even though the objectives and assessment criteria used to improve may vary (Smit et al., 2020). Based on the action research method, there are several processes that are repeated in several cycles, which include planning, acting, developing, and reflecting.

The planning process is carried out by collecting literature reviews on the implementation of information systems, change management, and current change management models. In this process, several studies are obtained discussing the implementation of information systems and change management. In addition, several previous change management models are obtained, which could be used as the basis for the

formulation of the model in the research.

Acting process is carried out by reviewing previous research that has been collected. At this stage, several studies are selected that discussed the critical factors for the successful implementation of information systems related to change management. In addition, the research carries out the selection of a previous change management model used as the basis for the development of the model. The three previous change management models used as the basis for model development are the ADKAR, Kotter 8 Step, and McKinsey 7S models. Apart from these three models, one best practice, namely ITIL 3, is also used as the basis for modeling the model. The selection of the previous model is based on important issues in the implementation of information systems and the clarity of the components that each model has.

The developing process carries out the preparation of a change management model in the implementation of information systems. The process is divided into two stages. The first stage is the stage of determining the process model obtained from the three previous models that have been mentioned. The second stage is determining the details of the activities for each process obtained from research that discusses critical factors of information system implementation related to change management. The first stage undertaken to develop a change management model is to review the literature related to the AKDAR, McKinsey, Kotter,

and ITIL change management models. Furthermore, the identification of model components is carried out to obtain the process in the proposed model. In the second stage, previous research that discusses change management in the application of information systems and the success factors are collected to be used as activities in each predetermined process.

The reflecting process is carried out by verifying and validating the model to obtain feedback which is then used for the next action research cycle. The model proposed in the research is verified by experts to determine the suitability of the model with its practice in change management. In addition, this model is also validated by implementing the model in real cases. Furthermore, the proposed model is developed in accordance with the results of verification and validation in the next cycle.

### III. RESULTS AND DISCUSSIONS

The preparation of processes and activities in the change management model is carried out by determining the process first. The process model is obtained from existing components in the three previous change management models and one change management best practice. Details of the components of each of the previous models are provided in Table 1.

The components of the model in Table 1 are

Table 1 Components of Previous Change Management Models

| No. | Previous Model                                 | Components   |
|-----|--|--|
| 1.  | Kotter 8 Steps Model<br>(Almanei et al., 2018) | Creating a sense of urgency<br>Building a guiding coalition<br>Developing strategic vision and initiatives<br>Obtaining voluntary troops<br>Removing obstacles<br>Producing short-term achievements<br>Maintaining acceleration<br>Institutional change                                |
| 2.  | Prosci's ADKAR<br>(Creasey, 2019)              | Awareness of the need to change<br>The desire to support and participate in change<br>Knowledge of how to change<br>Ability to implement change<br>Strengthening to sustain change   |
| 3.  | McKinsey 7S<br>(Sachdeva, 2008)                | Shared values<br>Strategy<br>Structure<br>System<br>Staff<br>Leadership style<br>Ability   |
| 4.  | ITIL 3<br>(Susanto, 2016)                      | Record Request for Change (RFC)<br>Review of RFC records<br>Assess & evaluate changes<br>Authorizing change implementation<br>Coordination of change implementation<br>Authorizing the application of changes<br>Coordinating change deployments<br>Reviewing & closing the change log |

Table 2 Mapping the Components of the Previous Research Model with the Research Model Process

| Previous Model Components   | Components Grouping                   | Research Model Process                             |
|---|---------------------------------------|--|
| Creating a sense of urgency<br>Awareness of the need to change<br>The desire to support and participate in change               | Urgency                               | Knowing and Understanding the Importance of Change |
| Developing strategic vision and initiatives<br>Strategy   | Strategy                              | Develop Change Strategy                            |
| Producing short-term achievements<br>Leadership style<br>Building a guiding coalition<br>Obtaining voluntary troops             | Team                                  | Forming a Change Team                              |
| Staff<br>System<br>Structure  | Structure                             | Providing and Ensuring Infrastructure              |
| Removing obstacles<br>Knowledge of how to change<br>Ability to implement change<br>Ability                                      | Ability                               | Identifying and Enhancing Capabilities             |
| Maintaining acceleration<br>Institutional change<br>Strengthening to sustain change<br>Shared values                            | Maintaining Change                    | Sustaining Change                                  |
| Record Request for Change (RFC)<br>Review of RFC records<br>Assessing & evaluating changes<br>Authorizing change implementation | Technology Change Request             | Analysis of Technology Change Request              |
| Coordination of change implementation<br>Authorizing the application of changes   | Coordination of Change Implementation | Coordinating the Implementation of Change          |
| Coordinating change deployments   | Change Implementation                 | Implementation of Technology Change                |
| Reviewing & closing the change log  | Implementation Review                 | Evaluation of Technology Change                    |

grouped based on the similarity of the description to get a new process in the proposed model. Determination of the process model can be seen in Table 2.

Based on the process obtained from the previous change management model, the change management model proposed is provided in Figure 1.

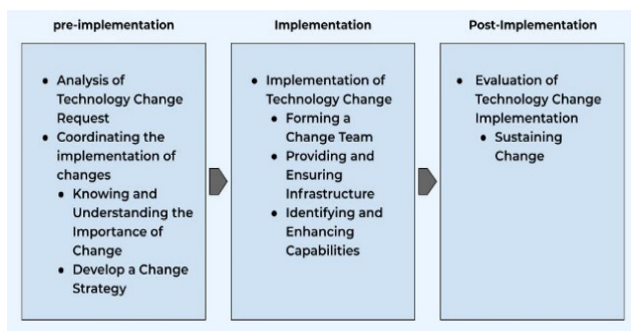


Figure 1 Proposed Model

The stages of the change management process at ITIL can be grouped into three stages, namely

pre-implementation, implementation, and post-implementation. The term implementation in this case is the implementation of change.

In the proposed change management model, there are seven processes carried out to manage changes in the implementation of information systems. Processes are carried out sequentially from process 1 to process 7.

The detailed determination of activities is obtained from previous research related to the success factors of information system implementation and change management that can be seen in Table 3.

In the analysis of technology change request process, the activities carried out include recording change requests that refer to activities in ITIL change management. In the knowing and understanding process of importance of change, the activities undertaken include setting goals and clarifying objectives and communicating them (Abatan & Maharaj, 2018), as well as discussing the purpose of change to each part involved (Chowthi-Williams et al., 2016; Ziemba & Obłąk, 2015). In the developing a change strategy process, the activities carried

out include registering stakeholders (Alkarney & Albraithen, 2018), planning process changes/flow/data related between divisions (Wijaya et al., 2019), determining resources and progress communication strategies (Reitsma & Hilletoft, 2018), and communicating strategies to each division involved change (Ziemba & Obłak, 2015). In the process of forming a change team, the activities carried out include the formation of a functional change team (Wijaya et al., 2019), forming a representative team for each section (Yusif et al., 2019), and developing skills and directing change in team leaders (Chowthi-Williams et al., 2016). The providing and ensuring infrastructure process, includes division of tasks (Wijaya et al., 2019), providing centralized data (Yusif et al., 2019), ensuring IT infrastructure and providing

technical support (Alkarney & Albraithen, 2018). The process of identifying and enhancing capabilities, includes listing IT capabilities, analyzing current individual IT capabilities (Alkarney & Albraithen, 2018), conducting training for all involved users (Abatan & Maharaj, 2018; Alkarney & Albraithen, 2018; Reitsma & Hilletoft, 2018; Wijaya et al., 2019; Ziemba & Obłak, 2015), and communicating the use of information systems (Alkarney & Albraithen, 2018). The final process of the sustain change process includes evaluating the understanding of change and developing team skills (Chowthi-Williams et al., 2016), monitoring the behavior of information system users (Alkarney & Albraithen, 2018), and assessing employee satisfaction and measuring achievement (Ziemba & Obłak, 2015).

Table 3 Critical Success Factors from Previous Research

| No. | Source                        | Critical Success Factors   |
|-----|-------------------------------|--|
| 1.  | (Ziemba & Obłak, 2015)        | Support from top management<br>Recognizing changes<br>Having shared vision for change<br>Planning projects as change<br>Activities from the managerial level<br>Effective communication<br>Organizational readiness to deal with change<br>Employee training<br>Employee involvement in change<br>Employee satisfaction with the system<br>Clarity of information flow<br>Change performance measurement |
| 2.  | (Wijaya et al., 2019)         | Project leadership<br>Application of the system<br>End-user training<br>End-user communication<br>End-user engagement<br>Team effectiveness<br>Organizational leadership<br>Culture  |
| 3.  | (Alkarney & Albraithen, 2018) | Experience with technology<br>Self-efficacy<br>Top management support<br>Availability of technical support<br>IT infrastructure<br>System quality<br>Quality of information<br>Quality of service<br>User attitude<br>Knowledge about technology<br>Awareness and communication<br>Providing training and education<br>Stakeholder involvement   |
| 4.  | (Narciso & Allison, 2014)     | Frequent and open communication about change<br>A structured change management approach<br>Dedicated change management resources and funding<br>Employee engagement and participation<br>Middle management involvement and support   |
| 5.  | (Abatan & Maharaj, 2017)      | Clarifying the need for educational technology<br>Creating an appropriate institutional / organizational structure   |

Table 3 Critical Success Factors from Previous Research (Continued)

| No. | Source                             | Critical Success Factors   |
|-----|------------------------------------|--|
| 6.  | (Chowthi-Williams et al., 2016)    | Providing adequate support<br>Training for users<br>Promoting the use of technology for different academic purposes<br>Developing leadership skills<br>Building the right vision<br>Developing organizational values<br>Affirming and instilling direction of change at the forefront<br>Creating an academic culture ready for sustainable change<br>Developing guidance team leadership and management skills.<br>Creating a communication forum between organizations on the front lines. |
| 7.  | (Reitsma & Hilletoft, 2018)        | Providing education and training<br>Conducting effective communication   |
| 8.  | (Yusif, Hafeez-Baig, & Soar, 2019) | Providing change agents who are committed at all levels<br>Developing a strategy for implementing change that is clearly articulated   |

Table 4 Detail of the Process and Activities of the Proposed Change Management Model

| No. | Process  | Description  | Activities   |
|-----|--|--|--|
| 1.  | Analysis of technology change request              | Record related information system change requests and evaluate changes requests that have been recorded to get details of change requests.   | 1. Involving managers in the formulation of changes to be made<br>2. Noting the change request<br>3. Creating a Request for Change (RFC) document<br>4. Assessing and evaluating change<br>5. Authorizing the implementation of the changes  |
| 2.  | Knowing and understanding the importance of change | Knowing and understanding the causes of changes in information systems and the purpose of changes which are communicated to all parts related to change.   | 1. Determining the change goals to be achieved<br>2. Determining the gap between the current condition and the conditions to be achieved<br>3. Clarifying the purpose and function of information system changes<br>4. Creating a forum / meeting to communicate changes between the parties involved<br>5. Informing the purpose of the changes made to all parts affected by the change<br>6. Ensuring stakeholders related to change understand the context of change   |
| 3.  | Developing a change strategy                       | Developing a change strategy includes a system change planning strategy as well as the required human resources.   | 1. Registering the stakeholders associated with change to be involved in the development of a change strategy<br>2. Planning changes related to changes in process/flow/data and linkages between parts of the organization<br>3. Determining the resources needed to implement the change<br>4. Developing a communication strategy for the progress of change at every level of the organization<br>5. Planning conflict management<br>6. Holding a meeting to discuss the plan to change the information system that involves relevant stakeholders |
| 4.  | Forming a change team                              | Building the team needed to manage change. Teams can be created according to the needs that have been planned in the strategy formulation process. The purpose of forming a team is to facilitate the management of change in accordance with the function of each team. | 1. Forming a change management team based on team functions<br>2. Developing a change management team consisting of representatives from each division<br>3. Determining the leader of each team along with the required specifications<br>4. Directing the changes that have been planned   |

Table 4 Detail of the Process and Activities of the Proposed Change Management Model (Continued)

| No. | Process                                | Description   | Activities  |
|-----|--|---|---|
| 5.  | Providing and ensuring infrastructure  | The process of providing and ensuring infrastructure is a process that includes determining roles and tasks for everyone involved in change, providing IT infrastructure, ensuring system quality is in accordance with needs, and providing a help center (Help desk). | <ol style="list-style-type: none"> <li>1. Creating a division of tasks for implementing changes in information systems</li> <li>2. Communicating the division of roles and responsibilities of each person associated with change</li> <li>3. Providing centralized data and information related to change</li> <li>4. Providing the IT infrastructure required in the implementation of information system changes</li> <li>5. The executive manager provides the attention, resources, and authority needed for implementation</li> <li>6. Make a check list of information system requirements that have been implemented</li> <li>7. Carrying out a User Acceptance Test</li> <li>8. Communicating the progress of changes with the developer (internal/external)</li> <li>9. Providing staff or sections to solve technical problems related to information systems</li> </ol> |
| 6.  | Identifying and enhancing capabilities | Identifying the capabilities needed to implement changes in information systems and their use and efforts to improve these capabilities.  | <ol style="list-style-type: none"> <li>1. List the IT capabilities required for each role in the information system</li> <li>2. Registering and analyzing the current IT and non-IT capabilities of information system users</li> <li>3. Conducting training for all users of information systems related to change</li> <li>4. Sharing the knowledge that is owned centrally</li> <li>5. Communicating the use of information systems to users who are involved in the change</li> </ol>   |
| 7.  | Sustain change                         | Maintaining change can be done by ensuring the changes that occur are in accordance with the direction of the goals to be achieved in the change. Evaluation is one way to ensure that the changes made are still in accordance with the direction of change.           | <ol style="list-style-type: none"> <li>1. Evaluating the understanding of change to every employee / staff involved in change</li> <li>2. Evaluating the results of training in the use of the system</li> <li>3. Monitoring system usage</li> <li>4. Assessing employee satisfaction with the use of information systems</li> <li>5. Reporting the progress of each employee in accordance with their respective duties</li> <li>6. Evaluating the performance of employees / staff who are involved in the change</li> <li>7. Measuring the achievement of changes that have been made based on the plans made</li> <li>8. Holding regular meetings to discuss the progress of implementing changes in information systems</li> <li>9. Creating a change progress document to all related sections of the change</li> </ol>   |

Furthermore, these activities are grouped based on the similarity of the description and then placed in each process that has been previously determined. Table 4 provides the process and details of the activities of each process in the proposed change management model that has been developed.

The proposed model is verified using expert judgement. Expert judgement is a method for identifying the quality of the proposed instrument with the aim of gathering expert knowledge on certain topics which can then be used to refine the instrument (Nurrohmah, Sensuse, & Santoso, 2018). The model is verified by an expert who serves as the Head of the Customer Relations and Business Planning Section at

the Directorate of Technology and Information System Development at higher education Institution A in Indonesia. Validation is carried out through a two-way discussion related to the proposed model and practical change management in these state universities.

Based on the seven processes in the information system implementation change management model proposed in Table 5, the entire process in this model is also carried out in practice in higher education when there are changes to the information systems in higher education.

Furthermore, model verification is carried out by asking for opinions regarding the processes and activities in the model. The research provides expert's



opinion regarding the proposed information system implementation change management model.

*“The proposed Information System Implementation Change Management Model is quite complete and structured. With this model, it is hoped that it can help every change in the Information System in Higher Education and facilitate documentation.”* – Expert

Table 5 Process Model Verification Results

| No. | Processes  | Done Practically |
|-----|--|------------------|
| 1.  | Analysis of Technology Change Request              | Yes              |
| 2.  | Knowing and Understanding the Importance of Change | Yes              |
| 3.  | Developing a Change Strategy                       | Yes              |
| 4.  | Forming a Change Team                              | Yes              |
| 5.  | Providing and Ensuring Infrastructure              | Yes              |
| 6.  | Identifying and Enhancing Capabilities             | Yes              |
| 7.  | Sustaining Change                                  | Yes              |

The expert also comes up with opinions regarding the suitability of the information system that proposes implementation change management model with the practice of change management in your university.

*“It is appropriate and indeed an Information System change management model is needed when there is*

*a change in the Information System to fit the needs, according to a schedule based on determined and well documented Human Resources”* – Expert

In addition, the expert points out suggestions regarding the proposed information systems implementation change management model.

*“In this model, it is necessary to add the process of "Analysis of existing information system conditions" to know more in depth the needs and management of Information Systems change. In addition, the existence of a flow chart will make it easier to follow the flow based on this model and the changes that occur are not only changes in technology, but also changes in business processes as well as additional features.”* – Expert

The results of expert verification will be analyzed to develop a further model combined with the validation results. In addition to model verification, model validation is also carried out. The proposed model is validated by using this model in three management information systems in higher education Institution B according to the action research scenario in Appendix A.

Table 6 provides the results of using the proposed model in managing change management for each change in information system management according to the scenario.

In implementing the process in accordance with the scenario determination, process 7 which is

Table 6 Results of Using the Proposed Model According to Scenario

| Process  | Information Systems                                  | Condition of Implementation   | Analysis of Implementation Results  |
|--|--|---|---|
| Analysis of technology change request              | New Student Admissions Management Information System | Every activity in the process is carried out                                | Positive: <ul style="list-style-type: none"> <li>• Make it easier to analyze and document change requests through all its activities</li> <li>• There is an RFC document template</li> <li>• Produce an RFC document for a more detailed description of the request</li> </ul> Negative: <ul style="list-style-type: none"> <li>• Filling in detail RFC documents cannot be as complete as those in ITIL</li> </ul>   |
| Knowing and understanding the importance of change | New Student Admissions Management Information System | Every activity in the process is carried out                                | Positive: <ul style="list-style-type: none"> <li>• Users are more concerned, active, and understand changes by carrying out all activities in it</li> <li>• Users know what to do in preparation for change</li> </ul> Negative: <ul style="list-style-type: none"> <li>• No specific document has been produced in implementing this process.</li> </ul>   |
| Develop a change strategy                          | New Student Admissions Management Information System | There is one activity that cannot be done: Planning for Conflict Management | Positive: <ul style="list-style-type: none"> <li>• Clearly know the units / sections involved and their relationship in the New Student Admissions Management Information System</li> <li>• Assisted in making change planning</li> <li>• It is easier to define the required infrastructure</li> </ul> Negative: <ul style="list-style-type: none"> <li>• No specific document for change planning has been produced</li> <li>• There is no sample change planning document or template</li> </ul> |

Table 6 Results of Using the Proposed Model According to Scenario (Continued)

| Process                                | Information Systems                                  | Condition of Implementation   | Analysis of Implementation Results   |
|--|--|---|--|
| Forming a change team                  | New Student Admissions Management Information System | Every activity in the process is carried out  | Positive: <ul style="list-style-type: none"> <li>Know the team needed</li> <li>A clearer division of roles and tasks</li> <li>There is a Decree for Team Formation</li> </ul> Negative: <ul style="list-style-type: none"> <li>Only one team was formed by dividing the roles according to the team needed, due to limited human resources and the large number of Management Information Systems that had to be developed</li> </ul>  |
| Providing and ensuring infrastructure  | Financial Management Information Systems             | There is one activity that cannot be done: Provide centralized data and information related to change | Positive <ul style="list-style-type: none"> <li>Pay more attention to the infrastructure needed</li> <li>Ensure that the Financial Management Information System has met the needs and quality as determined previously</li> </ul> Negative: <ul style="list-style-type: none"> <li>The results are not optimal because it follows the status of the Financial Management Information System so that it only applies this process to the Financial Management Information System without applying the previous process.</li> <li>The focus of activities is only on the provision of infrastructure and UAT.</li> <li>The detailed division of roles and responsibilities has not been documented</li> </ul> |
| Identifying and enhancing capabilities | Financial Management Information Systems             | There is one activity that cannot be done: Share knowledge on centralized data and information        | Positive <ul style="list-style-type: none"> <li>Can provide more detailed training according to the needs based on the current capabilities of the user and the abilities needed.</li> </ul> Negative: <ul style="list-style-type: none"> <li>Data and information related to Management Information Systems and related changes cannot be accessed centrally because documentation is still very minimal.</li> </ul>  |

maintaining changes cannot be carried out due to time constraints and application conditions.

Furthermore, the proposed model is developed according to the results of verification and validation. This development is done by analyzing the results of expert judgment verification and validation results and adjusting the model. The following is an analysis of the results of the verification and model validation.

Based on the results of the expert judgment verification, the entire process in the proposed change management model is practically carried out in higher education when there is a change in the information system. The seven existing processes will still be used in the model. However, in Part II the expert's response regarding statement three, it is necessary to add the process of analysis of existing information system conditions to know more in depth the needs and management of information systems change.

In the results of verification of the proposed model in the third statement, the expert provides suggestions regarding the flow of this model that the flow chart will make it easier to follow the process based on this proposed model. The model proposed for managing changes to information systems implementation has an unclear model for the flow of

each process. Therefore, the form of this management model needs to be adjusted so that it has a clearer flow of each process.

The expert states that the proposed information systems implementation change management model is quite complete and structured. Thus, the description, input, and output of the activities in each process is quite clear. However, with the addition of a new process at the beginning of the model, namely the analysis process for the existing conditions of the information system, it is necessary to detail the activities along with the inputs and outputs of the process.

In the process of analysis of technology change request, there is the first activity, namely involving managers in the formulation of changes to be made. This activity is an activity to formulate changes to the information system that will be carried out. The formulation of this information system change should be done before submitting a technology change request. The technology change demand analysis process is more on recording requests for technological changes that have clear details of the changes which will be given to the information system developer section. Therefore, activities involving managers in the formulation of changes to be carried out will

be transferred to a new process, namely the analysis process, of the existing information system conditions to determine what changes in the information system will be carried out. Figure 2 shows details of activities in the process of analyzing the existing conditions of information systems.

Based on the results of the verification and validation that have been analyzed, the results of the development of the Information System Implementation Change Management Model are obtained according to Figure 2.

The final form of the Change Management Model proposal becomes clearer in the flow of each process according to the results of verification with the Experts. A clear flow will make it easier for implementers to use this model when managing

changes in information system implementation. In addition to adjusting the shape of the model, a process was also added at the beginning, namely Analysis of Current Information System Conditions. Details of the process can be seen in Table 7.

The formulation of information system changes must involve managers and related stakeholders. The results of the analysis of the current condition of the information system, the causes of change, and the desired condition of the information system are documented to be used as the basis for making change request documents in the next process. Table 8 provides explanation regarding the proposed model compared to the previous model and the model from previous studies.

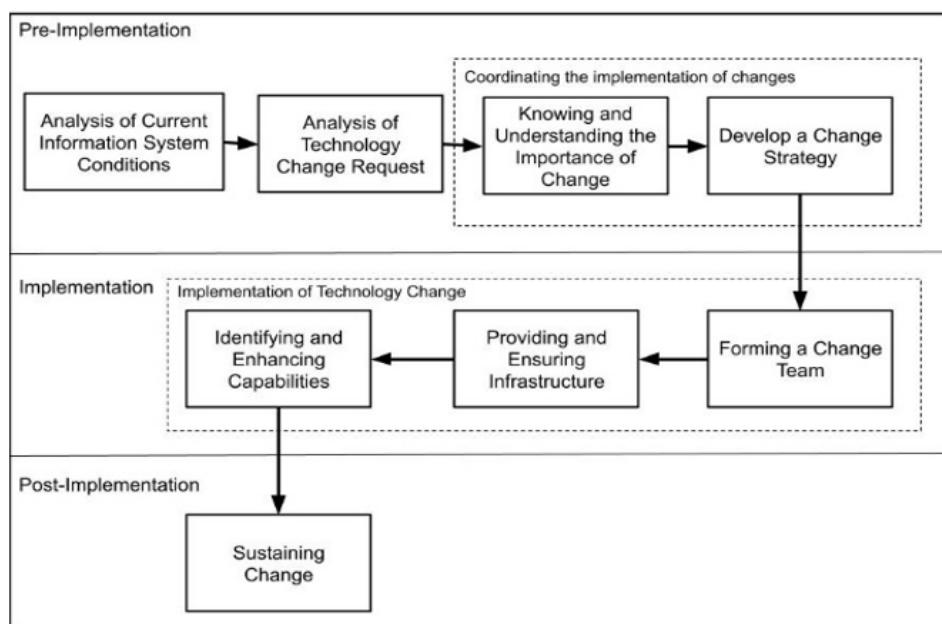


Figure 2 Final Proposed Change Management Model

Table 7 Analysis of Current Information System Conditions Process

| No. | Process   | Description   | Activities  |
|-----|---|---|---|
| 1.  | Analysis of current information system conditions | Perform analysis related to the current condition of the information systems which causes the need for changes to be made, and the conditions of change to be achieved. | <ol style="list-style-type: none"> <li>1. Involving managers in the formulation of changes to be made</li> <li>2. Analyzing the current state of the information system</li> <li>3. Analyzing the causes of the need for changes to the information system (based on policies, regulations, or other conditions)</li> <li>4. Analyzing the desired condition of the information system</li> <li>5. Documenting the results of the analysis of the three things that were done previously</li> </ol> |

Table 8 Comparison of Research Models and Previous Models

| Model                        | Change Management Scope                  | Processes                            | Activities                                |
|------------------------------|--|--------------------------------------|---|
| <b>Research Model</b>        | Individual, Organization, and Technology | There is a process with a clear flow | There is a clear activity in each process |
| <b>ADKAR (Creasey, 2019)</b> | Individual                               | There is a process with a clear flow | No activity defined                       |

Table 8 Comparison of Research Models and Previous Models (Continued)

| Model  | Change Management Scope     | Processes                               | Activities                                |
|--|-----------------------------|---|---|
| <b>Kotter 8 Step</b> (Almanei et al., 2018)      | Organization                | There is a process with a clear flow    | No activity defined                       |
| <b>McKinsey 7S</b> (Sachdeva, 2008)              | Individual and Organization | No process flow only changes components | No activity defined                       |
| <b>Change Management ITIL v3</b> (Susanto, 2016) | Technology                  | There is a clear flow                   | There is a clear activity in each process |

#### IV. CONCLUSIONS

The research produces a model for managing changes in the implementation of information systems in HEI. The model has eight processes to manage changes in information systems. Each process in the proposed model has detailed activities.

Each activity in the model is obtained from previous research that discusses the success factors in implementing information systems, most of which are the implementation of information systems in HEI by paying attention to change management as one of the aspects that affect the success of implementation.

The purposed management model of information system implementation change in higher education compiled in the research is verified with experts. The results state that every process in this model is significantly necessary to be carried out in managing changes in higher education information systems. In addition, the expert adds a process that must be carried out at the beginning, namely the analysis of the current information system conditions and what kind of change criteria can be managed with this model.

Model validation is done by using action research methods to find out how the results of using this model on changes in information systems owned by higher education institutions. The model is applied to two management information systems (MIS) in higher education B, namely the New Student Admissions MIS and the Financial MIS with the distribution of model application scenarios. Based on the results of the proposed model validation, analysis of demand for technology change; and knowing and understanding change interests processes can make it easier to manage change maximally if the whole activity is implemented.

On the other hand, the process of developing a change strategy allows managing change to be easier but not maximally since some activities cannot be done due to time constraints. Forming a change team can simplify the management of change but not optimally since the conditions of the research object are not supportive. The process of providing and ensuring infrastructure can facilitate change management. However, it might not be optimal as the process is not carried out from the initial stage which is related to this process. The process of identifying and improving skills can simplify change management

but not significantly since some activities cannot be carried out due to limited data and research time. The last process, the sustain change process cannot be implemented due to the limited time and control. Therefore, it is suggested used as further research by applying the entire process model to one case of information system change in higher education.

Based on the results of implementing the processes and activities to manage changes that occur when the implementation of the information system can help higher education institutions (HEI) in managing change and increasing the success of implementing information systems. The clarity of each activity in each process facilitates implementers to plan and determines the next steps in dealing with changes that occur.

However, testing in the application of these processes and activities is limited to only one HEI. It is believed to be better applying to only one case of information system implementation, so that these processes and activities can be carried out in detail without being missed. In addition, the scenarios used to improve the processes and activities in the model are still very limited.

Therefore, this can be used as a continuation of future research. By applying these processes and activities to many HEIs with one information system case each with a defined scope, it can make processes and activities clearer and more measurable.

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## Appendix A

The existing process in the model is divided into three information system objects to be applied according to the current condition of the information system object.

| Stage                      | Process  | Object                                    |
|----------------------------|--|---|
| <b>Pre-implementation</b>  | Analysis of Technology Change Demand               | New Student Admissions Information System |
|                            | Knowing and Understanding the Importance of Change | New Student Admissions Information System |
|                            | Develop a Change Strategy                          | New Student Admissions Information System |
| <b>Implementation</b>      | Forming a Change Team                              | New Student Admissions Information System |
|                            | Providing and Ensuring Infrastructure              | Financial Information System              |
|                            | Identify and Improve Skills                        | Financial Information System              |
| <b>Post-implementation</b> | Sustaining Change                                  | -   |