2020 International Conference on Smart Technology and Applications (ICoSTA)

A Change Management Model for Information Systems Implementation

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2020 International Conference on Smart Technology and Applications (ICoSTA) 978-1-7281-3083-5/20/$31.00 ©2020 IEEE 10.1109/ICoSTA48221.2020.1570613999

***Abstract*—The use of information systems (IS) in education to support the learning process and administration has been widely carried out. The implementation of IS requires many interrelated processes. Failure in implementing IS can lead to negative impacts for higher education, both material, time and other resources. Change is one of the impacts of IS implementation that must be considered. The success of implementing IS depends on how far the change can be managed successfully. Therefore, guidelines are needed to manage changes in IS implementation. A change management model for IS implementation is proposed in this paper. There are 8 domains and 20 aspects of the model that are arranged based on three existing management models. Important factors from previous research related to the change management of IS implementation have been mapped in aspects of the model.**

Keywords—Change Management Model, Implementation, Information Systems, Information System Academic.

I. INTRODUCTION

The use of ICTs for the management of institutional support is an important factor and seems to be the lifestyle of a modern institution [1]. Many organizations invest money in various types of information systems to improve their performance and competitiveness [2]. Educational institutions known as providers of public knowledge and services began to prioritize the development of competitive strategies to improve their competitiveness [3]. Technological developments have greatly improved to produce several tools for educational purposes. These tools are used to facilitate learning, facilitate the teaching process, and the administration process. One of the information systems used by educational institutions is an academic information system. Based on its use, academic information systems refer to a series of systems and activities used to organize, process, and use information as a source in an organization [4].

Implementing an information system that includes the enrollment of new students, school profiles, or an assessment system in an academic environment can improve academic quality in High Schools or Universities [5]. Klein defines Information Technology (IT) implementation as the adoption of software during the transition period between its technical installation and its consistent and appropriate use of tasks by targeted employees [6]. Implementation of IT or IS causes changes in Client. Changes both in individual changes and changes in the organization related to systems, structures, and processes. The use of IT in higher education brings a change in study behavior and collaboration between stakeholders and higher education by sharing beneficial information [7].

Change needs to be managed properly. For this reason, a disciplined process is needed to ensure that the necessary changes have been planned and implemented, minimizing risks and impacts on the quality of services and processes [8]. In fact, the implementation of change management and rejection of change has been a topic of repeated discussion over the past few periods when change management was seen as bringing people into a new environment, systems, and culture [9]. In some cases, a lack of change management can fail in the implementation of information systems [10]. Change management guidelines and best practices suggest using a more comprehensive approach to change management [11]. This is because the reciprocal interactions between changes and the optimal allocation of resources for the implementation of these changes can differ depending on the desired changes. Therefore, a change management model is needed for the implementation of academic information systems in educational institutions, so that change is managed and the goals of change are achieved.

A Change management model for the implementation of academic information systems is proposed in this study. The proposed change management model was developed based on a pre-existing change management model, namely the ADKAR model from Prosci, Kotter's 8 Step model, and the McKinsey 7S model. Based on the three models, each component model is grouped based on the similarity of component descriptions. New groups are found to be the domain in the proposed model. Each domain has aspects that are derived from existing components. Besides, some previous studies discussing Critical Success Factors (CSFs) related to the implementation of information systems that are also used in the proposed model. CSF is mapped into every aspect of the proposed model. This model will make it easier for them to manage changes when implementing an academic information system by paying attention to CSF for every aspect.

In further research, the proposed change management model can be verified and validated. The proposed model can be tested by conducting a verification process through expert judgment and validation to informants who have a direct role in the process of implementing academic information systems. Verification and validation of the proposed model can be done by conducting in-depth interviews to improve the model. By refining the proposed model, the model can be implemented in practice to manage change.

II. LITERATURE REVIEW

A. Change Management

Implementing IT can cause change and change management is one of the factors that influence the success of the implementation. [12]. Change must be managed to achieve the goals of change and can increase success in

implementation. Pisla, et al [13] define change management, including a set of capabilities, methods, which are transformed into actions and results the methods, activities, and factors of change management can be combined in a change management model to help manage change effectively.

B. Prior Study

Changes can occur in individuals, organizations, and projects. In a study conducted by Ewa Ziemba and Iwona Obłąk [14], CSFs for CM in IS projects in Polish public organizations were obtained. Twelve critical factors were obtained which included aspects of the individual, the need for change, the purpose of the change, measurement of achievement, and several other factors. Changes can also occur when implementing Enterprise Resource Planning (ERP) systems. In Ridho [12] change management influences on success ERP implementation and several factors in change management have been used in its implementation. The change management factor that most influences the successful implementation is the Leadership factor. Omotayo Kayode Abatan and Manoj Maharaj [15] have conducted an examination related to Change Management Awareness (CMA) by evaluating academics' perceptions of IT integration in higher education in Africa. They identified that universities must be responsible for providing strategies to implement changes in the use of information technology.

Besides, change management can also occur in Software Process Improvement (SPI) which indirectly can cause changes in the organization. To achieve the success of the SPI initiative, Henrique Narciso and I. Allison [16] used 8 Kotter steps and the Prosci Change Management Model in overcoming resistance at SPI to accommodate the human factors of change in SPI. In this study, activities that helped the success of the SPI initiative were explained. To support the learning process, learning management systems are used in education. Incorrect implementation of LMS in universities can lead to the inability to benefit from the initiative. Weam Alkarney and Majed Albraithen [17] develop conceptual models for non-scientific colleges to successfully implement LMS. The model includes critical success factors (CSF) for LMS implementation. Ming-Hsin Lu [18] has developed a life cycle framework that includes the concept of change management that contains key factors in the transformation process of cellular IT. New change models and tools are developed together by Annette et al [19] to help change the curriculum in the future.

III. Gaps In The Current Literature

Change management has been widely studied before. There are several change management models have further developed to be applied in various organizations. Based on interviews with academic information system developers conducted in this study, many educational institutions, especially higher education institutions, utilize information technology to support the processes that exist in institutions. In fact, the adoption of information technology requires an implementation process that is not simple and causes changes in the institution.

Gap found based on current conditions and previous research. First, the change management model that has been further investigated is for change in general. These models include McKinsey 7S Steps [20], Kotter's 8 Steps [21], and ADKAR [22] Model. The change management model has been developed more on the individual approach, organizational change, or how to align parts of the organization affected by changes. Why not combine the three approaches into one model? In this study, the three approaches are combined in a proposed change management model.

Second, some research related to change management on the implementation of information systems in educational institutions [15, 19, 17], general IT project [14, 16], enterprise [12, 18], and government project [23] has been carried out. The model is specific only to the change management in government IT projects, IT projects in general, research that finds several critical success factors in IS implementation. Those critical success factors need to be considered in the implementation of information systems. The change management model proposed in this study has mapped the critical success factors into aspects of the model derived from the integration of existing models.

IV. Proposed Model

Based on previous research and general change management models that already exist, specific change management models are proposed for changes in the implementation of information systems in educational institutions.

A. Existing Model

Changes in an organization must be managed properly, both in terms of individuals and organizations. However, existing change management models focus on just one aspect, individual or organizational aspects. The McKinsey 7S change management model covers both aspects of individuals and organizations, but not very deeply. On the other hand, the ADKAR Prosci model includes managing change on the individual side in more depth while the Kotter 8 Step model includes managing change on the organizational side in depth. Based on the weaknesses and strengths of the three models, proposed change management is developed based on the three models.

1) McKinsey 7'S Steps: Dividing interrelated factors and influencing the organization's ability to change into two groups, namely hard (Strategy, Structure, and Systems) and soft (Shared Values, Style, Staff, and Skill). Significant progress in one part of the organization will be difficult without working on another *[20]*.

2) Kotter's 8 Steps: Gives organizations additional capabilities to lead change in the current special conditions of the world warp speed through 8 steps (Increasing Urgency, Building the guiding team, Getting the right vision, Communicate for Buy-in, Empower Action, Create short term wins, Don't let up, and Make it Stick) *[21]*.

3) Prosci's ADKAR: A framework for understanding and managing individual changes. It provides structure and tangible guidance for leaders who want to motivate change in others. Managing individual changes is carried out in 5 stages namely Awareness, Desire, Knowledge, Ability, and Reinforcement *[22]*.

B. Change Management Model for IS implementation

The proposed change management model is developed based on the stages and aspects of Kotter, McKinsey, and Prosci models by gathering all the stages and aspects that exist in these models. Based on these models 20 stages were

obtained. All stages are grouped into 8 groups based on common definitions. This group came to be called the Domain. Domains formed include Vision, Desire, Leadership, Structure, Systems, Skills, Communication, and Sustainability Change. The model proposed in this study can be seen in Fig. 1.

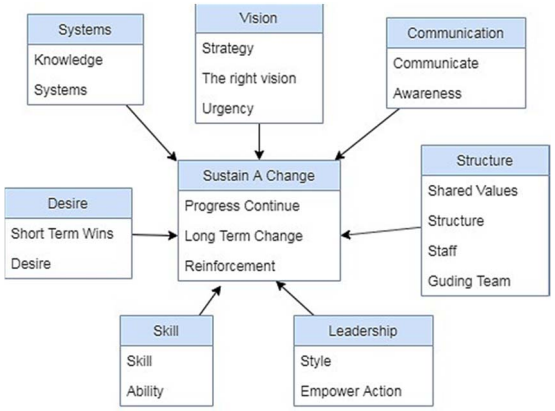

Fig. 1. Proposed Change Management Model for IS Implementation

The arrows from the 7 Domains lead to the Domain Sustain a change because, according to Prosci [22] the aim of managing change is to maintain change to prevent individuals from returning to their old ways of doing work and successful and sustainable change can increase agility for future changes. The domain represents things that need to be considered when managing changes that occur due to information system implementation. The aspects contained in this domain include all stages and aspects contained in the three change management models of McKinsey, Kotter, and Prosci.

C. Mapping Critical Factor into Aspects

Based on the proposed change management model and the success factors obtained from previous studies, mapping of factors based on the similarity of definitions was carried out. Mapping is done by matching the definition of success factors with aspects that exist in each domain.

TABLE I. MAPPING CRITICAL FACTOR OF STRUCTURE

Domain	Aspects	Critical Factors
Structure	Shared Values	Shared vision for change [14]
		Attitude [17, 24]
		Develop organizational values that reflect the importance of all parts of the organization [19]
	Structure	Organization readiness to deal changes [14]
		Deployment [12]
		System quality [17]
		creating suitable institutional/organizational structures [15, 25]
	Staff	Employees involvement [14]
		End User Involvement [12]
		Self-efficacy [17]
		Employee engagement and participation [16]
	Building the guiding team	Team Effectiveness [12, 25]
		Technical support availability [17]
		Stakeholders involvement [17]
		providing adequate support [15]

The same factor can be mapped on two or more different aspects and domains. These factors can affect two different aspects and domains due to the interrelationships between domains and aspects.

In the Structure domain, there are four aspects of it. In each aspect, several CSFs are mapped based on the similarity of their definitions. In Table I, 15 CSFs related to structure that must be considered when managing change have been determined.

TABLE II. MAPPING CRITICAL FACTOR OF LEADERSHIP

Domain	Aspects	Critical Factor
Leadership	Style	Project leadership [12, 26]
		Organization leadership [12]
	Empower Action	Top management support [17, 25]
		Managerial activity [14]
		Supervisor support [18]
		Decision Processes [18, 25]
		Active and visible executive sponsorship [16]
		Engagement with and support from middle management. [16]

As seen in Table II, Domain Leadership has two aspects related to leadership that include the leadership style of change and its activities that need to be carried out.

TABLE III. MAPPING CRITICAL FACTOR OF SYSTEM

Domain	Aspects	Critical Factor
System	System	Service quality [17]
		System quality [17]
	Knowledge	Information quality [17]
		Information flow [14]
		Knowledge of Technology [17, 26]
		promoting technology use for different academic purposes [15]
		Service quality [17]
		System quality [17]

The systems domain is shown in Table III. is related to the information system that will be implemented. In this case, the academic information system. In addition to managing other aspects of change, the quality of the system to be implemented must also be considered.

The quality of information produced by the system and the flow of information must be known. Skills can be developed and improved from time to time by combining abilities and knowledge, but the underlying abilities are needed so that these skills can be developed.

TABLE IV. MAPPING CRITICAL FACTOR OF SKILL

Domain	Aspects	Critical Factor
Skill	Skill	Technology experience [17]
		Provide training and education [17, 25]
		Self-efficacy [17]
	Ability	Employees training [14]
		End-User Training [12]
		Provide training and education [17, 25]
		Training [15]
		Develop leadership skills across the organization [19]
		Develop leadership and management skills of Guiding Teams. [19]

Ability is the qualities of being able to do something. Therefore, both skills and abilities are needed to support the

success of change management in the implementation of information systems. CSFs from both aspects can be seen in Table 4.

TABLE V. MAPPING CRITICAL FACTOR OF DESIRE

Domain	Aspects	Critical Factor
Desire	Create short term wins	Employees satisfaction [14]
		Performance measurement [14]
		Culture [12, 25]
	Desire	Employees involvement [14, 25]
		End-User Involvement [12]

TABLE VI. MAPPING CRITICAL FACTOR OF VISION

Domain	Aspects	Critical Factor
Vision	Strategy	Planning a project as a change [14, 25]
		Structured change management approach [16]
		Dedicated change management resources and funding [16, 15]
		Use a model of change management that best fits the organization's business. [19]
	Getting the right vision	Goals for change [18]
		clarifying the need for educational technology [15]
		Build the right vision with inter-organizational wide engagement and involvement [19, 25]
	Increasing Urgency	Create an empowering environment [19, 26]
		Affirm and embed the direction of change on the front line [19]

In managing change, the desire to change must be increased for each individual involved with change. Every individual involved must know the reasons for making changes and negative impacts if not. Employee involvement is a primary factor in making changes. In Table 5, Desire and Create short term wins are interrelated aspects that can support each other.

Vision must be determined before changes are made any further. In Vision, the purpose of the change is determined to include the objectives of the implementation of academic information systems. Table VI. shows the factors that need to be considered in determining vision.

TABLE VII. MAPPING CRITICAL FACTOR OF COMMUNICATION

Domain	Aspects	Critical Factor
Communication	Communicate for Buy-in	Effective communication [14, 25]
		End-User Communication [12]
		Awareness and communication [17]
		Frequent and open communication about the change [16]
		Create inter-organizational communication forums in the front lines. [19]
	Awareness	Recognize the change [14]
		Awareness and communication [17]

The key to the success of a process, including the process of managing change is communication. Table VII. shows that Awareness can be increased by effective communication, on the other hand, awareness can increase individual desire to change.

TABLE VIII. MAPPING CRITICAL FACTOR OF SUSTAIN A CHANGE

Domain	Aspects	Critical Factor
Sustain Change	Don't let up	Frequent and open communication about the change [16]
	Make it Stick	Create inter-organizational communication forums in the front lines. [19]
	Reinforcement	Create an academic culture of readiness for continuous change [19]

After all the domains that must be considered in change management, the sustainability of the changes also needs to be considered. Change can be said to be successful when able to achieve the goals of change. However, maintaining changes by the concern to aspects as well as CSFs that are in Table VIII. can provide satisfaction for staff who have supported the achievement of change goals.

V. DISCUSSION

We found several factors that influence the successful implementation of the information system that we put in place with the aspects contained in the existing change management model to be able to help in sustaining change.

A. Build A Vision for Change

A change that has a clear vision of change and its strategy can help sustain change. In implementing information systems, institutional management must be responsible for clarifying the need for change to users or stakeholders [15]. Strong reasons for the importance of embracing change can be developed into a vision of change. Clear documentation about the change management process can help in laying out tasks and determining the resources needed [14]. Thus, it can help in determining a strategy that is following the vision. Structured approaches to change management help describe activities for better change management outcomes. In addition to determining the processes and resources needed, activities in managing change must also be determined. Structured approaches to change management help describe activities for better change management outcomes [14]. Determine specific change management resources and funding [16, 15] also need to be done to plan activities, processes, and also related to funding needs. The use of a change management model that is most appropriate for the organization's business [19] as a reference in managing change can also help to direct the desired change. In determining the vision, goals for change [18] must also be determined at the beginning. This is useful to determine the direction of change to be achieved.

B. Increase Desire to Change

Success in managing change management can not only be achieved by setting clear vision, goals and change strategies. The desire of individuals involved in the change to make changes must also be increased. Employee satisfaction is a requirement for successful implementation of changes that are linked to IS implementation where satisfaction is not fully felt until employees are familiar with the new IS [14]. In this case, it is necessary to increase the desire of employees in making changes. Creating the desire to change is not under the direct control of a leader. Change leaders can influence the desires of their members, but each individual finally makes his or her own choices to support change [22]. Progress in the implementation must be measured regularly for more efficient and effective control [14]. By knowing the progress of the implementation of information systems, staff involved in

change can be increasingly motivated to continue to make changes with small significant achievements.

C. Form the Organizational Structure for Change

The university must create an appropriate institutional structure to provide adequate support in implementing the information system so that it can support the achievement of change goals [15]. Organizational readiness in making changes reflects the employee's perception of the extent to which an organization is ready to make changes to improve performance [14]. The organization needs to prepare a structure that supports changes in the implementation of information systems. Structure Domain includes the organizational structure, staff involved, change management teams, and the sharing of organizational values. Involve employees directly in change [14, 16], Involve end-users of information systems [12], as well as employee involvement and participation, can support the process of change management. Involving them can increase the success of system implementation and the changes that occur.

D. Define the System for Change

The system becomes one of the important parts that must be considered in change management. Determination of Service, System, and information quality [17] needs to be done to determine the system to be implemented as well as information that can be generated by the system. This is related to support in achieving business goals. Information flow [14] must also be determined at the beginning to find out what processes are needed in the implementation of information systems. Besides, Knowledge of Technology [17] needs to be owned by each individual involved in changes to the implementation of SI. Promoting technology used for different academic purposes [15] also influences the determination of the supporting technology needed.

E. Define a Leadership Style for Change

Leadership is very influential in managing change. Change management requires a special team and the team must have a leader. The role of the leader, besides directing, also divides the tasks to its members. The responsibilities of all tasks must be left to the group or individually [12]. Besides, support from the top management can greatly assist the team in managing change. Support from top management can be in the form of helping to formulate and determine policies and goals for change, provide resources and training, oversee the implementation of SI at all levels of the organization [14].

F. Build Skill for Change

Improving the ability of students, teachers, and staff in terms of technology needs to be done when implementing a new information system. The aim is not only to improve the quality of education, but also to improve educational skills, and improve teaching and learning outcomes [15]. In addition, meeting the needs of the ability to technology can increase the successful implementation of information systems and the changes that occur in it.

G. Build The Right Communication for Change

Communication information is very important during change, and openness to change can be linked to information reception [19]. Effective communication is very important for effective CM. Without proper communication, employees involved in the change process will not know what changes must be made and will not be aware of their duties related to the changes implemented [14]. Change needs to be clearly defined. The Identification of appropriate changes determines changes in organizational processes and duties and responsibilities of employees [14]. The definition of change also needs to be communicated to all individuals involved in the change. That makes communication very important in managing change. Whatever the company's structure, the organization must facilitate communication channels, including norms that define ways of interacting [16].

H. Sustain Change

The purpose of managing change is to maintain change to prevent individuals from returning to their old ways of doing work and successful and sustainable change can increase the agility for future changes. With Frequent and Open Communication about Change [16], create a communication forum between organizations at the front lines [19], Creating a culture of academic readiness for continuous change [19] can help in sustaining change so that it does not return to its initial state before changing.

VI. Conclusion

Many educational institutions have used IT / IS in supporting the learning process and administration process. One of them is higher education which utilizes academic information systems as supporting administrative processes related to student academics. The use of the information system is not only about making the system but also about the process of implementing the information system. In the implementation process, many parts of the organization involved both individually and in groups, teachers and students are also involved. The implementation of the information system will certainly cause changes, even if the changes are large or small. Changes can occur in individuals, processes, and other resources in higher education. To achieve successful implementation, changes that occur when implementation must be managed because changes that are not managed can lead to failure in the implementation of IS.

Based on the objectives of this study, a change management model is proposed to manage the changes that occur when implementing an academic information system in higher education. The proposed model is developed based on the existing change management model, the model developed by McKinsey, Kotter, and Prosci. The proposed model consists of domains and aspects taken from the stages and processes that exist in all three models. Furthermore, the factors obtained from previous studies are mapped into every aspect of the model. These CFSs are put into aspects to provide guidance on what needs to be considered so that changes can be managed well.

The model proposed in this study can be used as a guide to higher education in managing the changes that occur when implementing IS. By knowing what things need to be considered in managing change (domain) as well as aspects and factors that influence the success of change management, higher education can be helped in achieving the goals of change to increase the successful implementation of academic information systems.

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