A case study of IT implementation in public university: its barriers and challenges

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Abstract

This paper attempts to study the IT implementation in public sector organizations particularly higher education institution in developing countries. The goal is to understand the aspects that could hamper the successful IT implementation process in educational institution. An interpretive case study with 2 weeks empirical data collection has been performed in public university in Indonesia. This study found several factors that hamper the implementation process in the university, either from internal or external organization, including limited human resources, lack of management commitment, lack of clear job description among staffs, lack of appropriate planning and strategy for systems development and implementation, ineffective communication & coordination, lack of funds, lack of rewards, and government policies. These findings are tie in well with the barriers and challenges found in the literature.

Keywords: *IT Implementation, IT adoption, Higher Education Institution, Developing Countries.*

1. INTRODUCTION

In the last decade, implementation and adoption of Information and Communica-tion Technology (ICT) into organization becomes more prominent in developing countries, particularly in public sector organizations. ICT adoption provide the hope of being able to enhance policy formulation, promote participation, im- prove service quality, make planning more effective, resources efficiency, and become a means of empowering citizens through access to information and knowledge (Traunmiiller & Linz 1996, Bhatnagar 2000, Imran & Gregor 2005). Moreover, as global information techno-logy emerges, developing countries must ensure them self not isolated from the technology and link to global information society (Davison et al. 2000). However, implementation of IT is not a simple construct, many issues need to be con- sidered (Furuholt & Ø rvik 2005). In fact, as reported by Heeks(2002), many information systems in developing countries are failed, either total or partial, and only minor are fall into success.

Various studies have been carried out in order to ensure better understanding about IT implementation and adoption. For examples how organizational culture influence the adoption of IT in govern- ment agency (Dasgupta & Gupta 2011), identification of barriers and challenges to ICT adoption in public sector in developing countries (Imran 2006, Al- busaidy & El-haddadeh 2011, Weera-kkody et al. 2009), health information systems implementation in district level in Mozambique by Braa et al. (2001), and information systems and organizational change management in health sector in Ecuador by Javier & Alvarez (2004).

Although considerable attention has been devoted to this topic, rather less research has been paid to examine IT implementation and adoption in higher education institution such as universities. Universities differ from other organiza-tions because they have different environ-ment and circumstances, and they use IT for educational purposes as well as administrative support (Curry & Katz 2002). It is also believed that IT can boost development of the institution, strengthen and increase the competitiveness of the institution among others. A few studies in this context including: a study that carried out by Furuholt & Ø rvik (2005) which attempted to assess the implementation process in Tanzanian college using interpretive case study approach. A critical review about challenges in establishing and managing information resource manage-

ment (IRM) at Kenyan Public University presented by Bii & Gichoya (2006). Meanwhile, Huda & Hussin (2010) conducted a study to understand ICT implementation in Islamic-based University in Indonesia. It is necessary also to look at from different context to enrich the knowledge and experience in this field.

The purpose of this study is therefore to explain the implementation of information technology in public sector organizations, particularly in higher education institution in developing countries. The study is performed by examining the current status of IT implementation in public university in Indonesia. With the suitable approach, the study attempt to identify the contributing factors that hamper the implementation process and later on, try to discover suitable strategies that could improve the implementation process in the institution.

This paper is organized as follows; After Introduction, the theoretical basis for this work will be presented, mainly recent study in the field of IT implementation in developing countries, and then followed by description of employed data collection and methodology. in Section 3, context of the case will be described include anything that found from the institution during data gathering. Discussion and analysis of the current situation at the institution in contrast with the recent study are conducted in Section 4. This paper is finished with conclusion; study limitations and prospects for further research work in Section 5.

2. LITERATURE REVIEW

This section aims to describe the established theories regarding IT implementation and followed by recent study of IT implementation in developing countries.

2.1 Implementation Theory

Implementation process of IT in an organization plays an important role in the success of incorporating IT in to the organization life. At first, implementation was seen as the last stage of the system development life cycle, consisting of analysis, design, programming, and implementation, and was regarded as a stage to delivery the product to a client. Apparently, implementation process is not as that simple, rather multi-dimensional and complex process concerns both technical and social aspects within an organization (Kankaanpaa 2002).

There are various definitions about the concept of IT implementation, depending on the selected approach (Kankaanpaa 2002). Lucas (1992) uses the term implementation when referring to installation of IT application. Based on extensive literature study on published management information systems research during 1976-1995, Lai & Mahapatra (1997) found that in most studies, implementation is seen as one phase of a total of technology transfer process. Curley & Cremillion (1983) seen an implementation as the process of getting a system into use. Another definition from Kwon & Zmud (1987) view IT implementation from a technology diffusion perspective, as "an organizational effort directed to diffusing an appropriate information technology within user community". By including target organization in their definition, it shows that it is importance because according to Cooper (1994), introduction of new technology is likely to cause changes in the existing environment of an organization. In this study, the definition of IT implementation from Kwon & Zmud (1987) is used, accordance with the focus of this study in public sector organization.

Concerning about technology diffusion, Quaddus (1995) categorizes IT diffusion models in two groups: stage models and dynamic models. Stage models are implicitly time dependent and consist of stages, while Dynamic models are explicitly time dependent models and deal with diffusion processes over time.

One of stage models is the IT implementation model that developed by Kwon & Zmud (1987), which is from the basis of innovation, technology diffusion, and organizational change theories. The organizational changes model such as Lewin's (1952) change model consists of three stages: unfreezing, change, and re-freezing. Unfreezing period, an organization is prepared to change in order to adapt a new order. Change occurs and moves a group towards the desired level. When the desired level has been reached, re- freezing takes place and anchors the group life on the new level.

Kwon & Zmud (1987) proposed six-stages model for IT implementation activities including Initiation, Adoption, Adaptation, Acceptance and Incorporation. A variation of the Kwon & Zmud's (1987) six-stage model, which incorporates some of the post-adoption behaviors, developed by Cooper & Zmud (1990) in which consists of: initiation, adoption, adaptation, acceptance, routinisation, and infusion. The difference with previous model is the last two phases, while the other four stages remain the same.

However, different type of organizations could have difference environment and circumstances. Education organizations i.e. university is one of the examples (Curry & Katz 2002). From the perspective of leaders or managers in the context of higher education institutions, to gain successful in IT implementation, they need to pay attention concerning organizational behavior aspect, in addition to technology issues. Curry & Katz (2002) suggest three lessons:

1. Adopt the way people change and learn, incrementally, into the organization life, internalized.
2. Knowing the people and organizational culture for transformative change.
3. Universities are deeply decentralized, loosely coupled in nature. Familiarize with it is mostly a better way rather than against. The challenge would be finding ways to get benefit from it.

Above description shows that the implementation of IT is not only a matter of develop and deploy the system, but also considering about organizational/contextual issues, social culture as well as political and economic aspect, in addition to technological itself.

2.2 Challenges in Developing Countries

Information and Communication Technologies (ICTs) are now widely accepted by developing countries as a critical tool for national building. Significant benefits would be achieved if adopted properly. In fact, however, many information systems in developing countries are reported as failed, either total or partial, and only minor are fall into success (Heeks 2002). For ex- ample, investigation conducted by Braa et al. (2001) in health information systems found that the system was not functioning satisfactorily in "margina-lized" parts of Mozambique (e.g. provinces and districts). Another study by Krisana Kitiyadisai (2000) in Thailand public sector reported that failure cases seem to be the norm in Thailand at all governmental levels.

Numerous studies have been conducted to investigate problems and challenges of ICT adoption and implementation in developing countries, particularly in public sector. Al-busaidy & El-haddadeh (2011) performed an empirical study on Ministry of Man-Power, Oman to investigate the factors influencing public sector administrators toward the e-government services implementation. Employed institutional theory perspective, a theoretical framework was made to study the organizational change by considering the key pressures from economic, political, social, and technological sides. The study concluded that the economic, political, social and technological pressures have a significant impact on the implementation of e-government projects.

An alternative study to identify issues pertaining to implementing e-government initiatives was performed by comparing issues occurred in a developed countries (UK) and an economically developing countries (Sri Lanka) (Weerakkody et al. 2009). They argued, "E-government initiatives in developing countries can be effectively implemented if experiences acquired by developed countries are shared proficiently". By doing semi-structure interview with observation and a re- view of documentation on both side, the study found that there are common challenges faced to the UK and SriLanka in political, organizational and technical contexts. However, more specific adoption challenges were found for Sri Lanka such as lack of ICT literacy, inadequate ICT infrastructure and inability to access e-government services using local languages.

Imran (2006) performed examination of barriers to ICT adoption in public sector in Bangladesh. The study found that lack of knowledge and aware- ness were the most influential barriers in ICT adoption in the public sector. Another barriers including (1) attitude and mindset: Motivation, Resistance to change, Fear of loosing job, Lack of initiative, (2) political will and leadership, (3) lack of planning and strategy, (4) infrastructure, (5) bureaucracy business process: Lack of

Accountability and Corruption, (6) Lack of Expertise and Professionals and (7) Lack of Championship and Models. In addition, the study also mentioned about lack of reward and punishments, lack of commitment, absence of a dedicated organization to oversee the eGovernment/ ICT adoption.

Several studies focus in education organization has been addressed. Furuholt & Ørvik (2005) investigated 10 years implementation process of college in Tanzania using interpretive case study. They found that common barriers that occurred in other developing countries were similarly happen in the organization under investigation. Moreover, Huda & Hussin (2010) investigated IT implementation in Indonesia's Islamic-based HEIs and found several barriers that inhibit the adoption process. Meanwhile, a critical review by Bii & Gichoya (2006) in Kenya University listed challenges faced by the organization. All the related challenges mention above can be seen in Table 1.

Table 1. IT Adoption Challenges in Education Organization in Developing Countries

Literature	Country	Challenges
Furuholt & Ørvik (2005)	Tanzania	1. Lack of Top Management Engagement, 2. Knowledge Barriers and Staff Resistance, 3. Lack of Utilitarian Value and Other Personal Incentives, 4. The Symbolic Value of Information Technology, 5. Poor Organization, 6. Poor Infrastructure
Bii & Gichoya (2006)	Kenya	1. Conflicting Management Styles, 2. Lack of ICT Policy, 3. Training, 4. Conflicting Functions between units/departments, 5. Lack of Funds, 6. Ineffective Communication, 7. Resistance to Change, 8. Sustainability of ICT Resources, 9. Electric Power Supply, 10. Lack of Clear Job Description for IRM Staff, 11. Old Technology, 12. Lack of Feedback on IRMPerformance
Huda & Hussin (2010)	Indonesia	1. *Technological factors* (ICT product selection problems, expensive cost of ICT infrastructure, software / hardware incompatibility problems) 2. *Organizational factors* (low ICT awareness, low ICT development budget, communication among management level, hierarchical structure of the institution, inadequate use of strategic planning,lack of training, lack incentive, lack IT vision among management); 3. *Individual/Social factors* (resistance to change,Language barriers, Lack of user involvement, lack of ICT literacy, 'lack of trust' towards ICT usage) 4. *External Factor* such as Government policies

Introducing information and communication technology into public sector organization especially in developing countries deal with various challenges. Difference organization and context share common challenges in general. However specific and unique challenges exist for certain organization.

3. METHODOLOGY

It is important to choose appropriate research method in order to answer the research questions. Oates (2005) defines research method as a strategy, overall approach or technique to answering research questions. Difference strategy influences the way in collecting data.

An interpretive case study was chosen to provide deeper insight into a situation of the selected organization for which validated theory is not available. This approach help in understanding the social context un- der the study, the social processes by which it is developed and interpreted by people and through which it influences, and is influenced by, its social setting (Walsham 1995). It also enable to identify, explore and explain how all the factors in a particular social setting are related and often interdependent each oth- ers, or contrasting what was found in the case against the theories from the literature in order to see whether one theory matches the case better than the others.

This study was carried out in public university located in Indonesia. The university just started IT establishment since 2006. Therefore, the selected institution is expected to provide an insight about IT implementation process in public sector organization especially in educational institution in developing countries. This case study focuses on organization as the level of study.

Empirical Data collection was done during summer 2011, for 2 weeks duration in total, with 3 - 4 hours for each day. Data gathering was based on several sources. Semi-structured interviews and informal discussion were used to obtain information from stakeholders. Interviews were performed in Bahasa Indonesia as language, and later translated into English. All the interviews were performed by note taking, but not for tape recording, due to the uncomfortable feeling of the interviewees.

Table 2. Data Collection Summary

Event	Count
First phase (understanding the context)	
Semi-structured interviews	20
- Administrative staffs	8
- IT People	7
- University & Faculty Management	5
Informal discussion	5 - 8 times
Document collection	5 docs
Experiences in past involvement	3 years
Total time spent at the institution	30 - 40 hours

However, limited interviews were performed only staffs and management of the institutions excluding the students align with the project scope to get clear picture of the situation from the internal stakeholders. 20 people from the institution were interviewed, of whom 8 people were administrative staffs, 7 from IT related person including Head of IT Unit and Head of Computer Centre of the institution as well as Internal System Developer, 5 people from Management and Faculty such as Dean, Finance Manager, deputy of academic and human resource department. Table 2 shows the summary of data collection during the fieldwork.

The interview focus on how the system was going so far, what problems was encountered during the implementation and future need to succeed with IT in the institution. In addition to this, valuable information was collected from available documents in the institution, direct observation and previous involvement in the development and implementation process in the selected institution.

4. DISCUSSION AND ANALYSIS

The purpose of this study was to explain the implementation process of IT in universities in developing countries. The study was performed by examining the current status of IT implementation in public university in Indonesia. As an educational organization, the university has vision to be able to compete with other higher education institutions, nationally and internationally, and deliver an eminent, independent and cultured human resources. To achieve the organization's vision, the development of the university will be carried out gradually and sustained based on the institutional development roadmap. The themes are managing the institution capacity building, educational reform and best practices. One step of the development is becoming a world-class university based on culture in South-East Asia (ASEAN) level in 2021 as part of ASEAN University Network criteria.

To do so, in 2005 the university determined the strategic planning of the development into Institutional Development Master-plan and in 2009, the university published a white-book contain general policy and roadmap of the university development and act as a guidance for institutional development. In the con- text of ICT, several strategic plans were outlined including Information System, Network Infrastructure, application and information integration, organization structure and management, human resource capability and supporting facilities and maintenance. They also represent the policy into three stages to make an easy accomplishment and measurement: short-term, medium-term and long-term plan.

Since then, many things have been achieved so far, including organization structure, network infrastructure, and information systems. Since 2006, The University has established a special unit that responsible for ICT development and implementation. Almost all the units have been connected each other's either using fiber optic, cable or wireless backbone connection, de- pend on their condition. Numbers of information systems have been made to support administrative tasks. Official website were available for publishing information related to the institution. However, many problems also arose and inevitable affecting IT development and implementation process, especially in information systems.

4.1 Factors that hamper the implementation

Based on the interview result, observation, and interpretation of the situation and condition, following are some factors that hampers the successful of IT implementation process of which has been identified.

1. **Limited Human Resources**

   Despite the fact that there exists a dedicated unit for organizing IT, however, less support were obtained in term of human resources. The number of people in IT Unit is relatively few if compare with the amount of works should be done, especially technical support and system developers. IT Unit has difficulty to recruit or request new personnel to the human resource department due to either regulation or limited quota.

   At the time this study was performed, it was impossible to hire professional staff to handle internal tasks, in daily manner. Financing regulation is one of the reasons why it is so difficult to do. Consequently, head of IT Unit have to appointing

academic staff for IT positions. Currently, Key person in IT Unit is a mostly academic staff belonging to department/faculty. As consequence, they are responsible for both full academic work- load as well as ICT related work. Obviously, their focus will fall apart and disrupt the work performance.

This circumstance obviously affects the implementation process. The selected strategic plan for developing systems as "in-house" cannot run properly and it could also affect the quality of the developed systems.

2. Lack of management commitment

Management commitment is one of the key issues that emerged during empirical research in the organization. There is a situation in which the management of university looks to support the imple-mentation process, however the reality says otherwise. There is neither clear policy nor instruction as the foundation/guideline for fastening the implementation process.

Lack of commitment could decrease level of "trust" to the management, in which it supposes to be maintained continuously (Curry & Katz 2002). It might affect the motivation of staffs in carrying out tasks/projects assigned to them. Consequently, they might be resisted, or at least try to stay away from, when asked to get involved in a new project.

According to (Curry & Katz 2002), higher education institution such universities are deeply de- centralized and loosely coupled by nature. It is mean that the implementa-tion process depends on the sub organization management. This situation is true, indeed, as one of the developer com-plained, "*Lack of management support in some of the faculties*". It shows that, even though the university management, rector, encourage all the stakeholders to support the implementation process, it always depend on the "small empire" in faculties.

3. Lack of clear job description among staffs

The establishment of IT Unit with its subunit aim to divide the workload and focus of the as- signed tasks. It is clearly separated that which unit is responsible

with network infrastructure, information systems, communication and socialization, and publication. However, unclear situation emerge in the unit level, i.e. in Computer Center unit.

It can be realized that due to limited number of staffs, all of them engage almost on all tasks, mutually assist one another. The consequence is when something goes wrong, it is difficult to track back and find who's in charge on that task. With clear job description and proper standard procedure, will give clear understanding about responsibility. An *explicit* job description, *standard procedure* on executing a routine task, "when to do what" on a sequence of sub-task, and alternative way in response with unintended event should be available and should be clearly understood by the staff, especially in this kind of situation. This condition was admitted by the head of Computer Center unit and he is aware about these problems, as he put "*yes, there is no explicit job description and SOP yet in my unit. We should improve this to avoid any mistakes in the future*"

Providing explicit job description and standard procedure will help, not only current staffs, but also for new staffs, new head of unit and all related personnel, to understand the working behaviour.

4. Ineffective communication & coordina-tion

The existing systems were developed by group of developers and many of those systems were experiencing problems. Every system has no technical guidance on how to develop the system, no common framework were used among the developers, only general boundaries provided in master plan, such as must be web-based application and using open source software solution (i.e. mysql, php etc).

It is realized that with above situation will give a huge chance for developers to use their thought and creativity to make a better system. Unfortunately, there were limited sessions for brain- storming and knowledge sharing among them regarding development and strategy for system implementation. It can be seen from difference implementation's experience

between systems. There is a system that employed step-by-step, incremental strategy from the beginning of implementation, experiencing less problems compare with other system in which was implemented at once to all levels. If they communicate and share their knowledge among the developers, it would decrease occurrence of problems.

5. **Lack of Funds**

Most of the projects were initiated and supported by either donor or competitive grant, and the institution funded only small parts of it. It would become problematic once the donors or grants pull out, especially for operational and maintenance activities, either for infrastructure or information systems. This situation was admit- ted by IT Director, "*We have limited budget for IT operational and maintenance*". The Head of Computer Center also comment on this situation, "*One of the main constraint in developing and implementing IT is the limitation of allocated budget for application development and infrastructure such as computer server*". The sustainability of funding was outlined in master plan, however, in fact, it was not happen. Hence, it needs more effort to encourage awareness of top management regarding this issue.

6. **Lack of Rewards**

It is well known among the staffs in the university that there are no differences between staffs with good or bad performance in term of reward they get. This situation affects the motivation of the staffs to enhance their work's performance. It is already known from the theory of participation (Miller 1993, Ehn 1993), that reward, could be promotion or incentive/bonus, can increase the intention of user to participate during IT implementation, either by emergence of creative thinking or more active in the organization, in which will increase their performance.

Consequently, as pointed out in factor no. 2, they might be resisted, or at least try to stay away from, when asked to get involved in a project. If they have to, they might perform their work in standard fashion.

One of the examples, the educational staffs prefers to give lectures, doing researches instead of selected to occupy position in IT unit.

2.3 Implication

The findings in this research that related to IT implementation are tie in well with the barriers and challenges found in the literature. Even though they have little bit differences in type and context with others, public sector organizations in developing countries share common challenges in general.

Some of the literature introduced in Section 2 deals with organizational issues that hamper the IT implementation. Weerakkody et al. (2009) found that the project management in SriLanka is lack of coordination, and lack of government support in term of funding, which is in line with findings in this project in factor no. 4 and 5. Imran (2006) found that lack of planning and strategy is in top 4 most influential barriers in ICT adoption and he found less influential barriers in ICT adoption such as lack of commitment and lack of reward and punishment. Somewhat parallel with description in factor no. 2 and 6.

Although they took place in different continent, what Bii & Gichoya (2006) found in their critical review for IRM report in Kenya university somehow similar with findings described in factor no. 3, 4, and 5. Huda & Hussin (2010) found that several barriers that inhibit the adoption process including low ICT development budget, lack of incentive in a way similar with findings described in factor no. 5 and 6.

Worth to notice regarding the barrier that pointed out by Imran (2006), that is the absence of dedicated organization to oversee the ICT adoption. Indeed, in this research, the dedicated unit helps the university in organizing the development and implementa- tion of ICT. However, if the unit also acts as the executor of the development and implementation, i.e. "in-house" approach, as what the IT Unit did, an additional consideration need to take into account, concerning the resources availability.

2.4 Recommendation

To cope with factors that hamper the implementation process as described in subsection 4.1, several strategies could be

considered toward the successful of the implementation process, such as:

1. **Involve students in system development and implementation.**

   To cope with the limited human resources and limited funding it would be a good idea to involve students in system development and implementation, where students are educated human resources in the university. However, it needs a proper management so that the chosen strategy could support the acceleration of development and implementation process.

2. **Introduce new system development and implementation management.**

   Organize the development of many systems with many group of developers is not a simple task, especially if the developers work independently, as what have been happen in the university. In fact, this situation cast off the opportunities to obtain knowledge sharing and experiences among developers, if they can work in collaborative manner. Introducing a project management software and versioning system would be one of the examples. With a good, effective communication, it could construct common understanding among IT people particularly in the IT Unit in the hope that can lead to standardization and further for system integration.

3. **Development and implementation strategy**.

   It is very helpful if we can learn about development and implementation strategy from existing theories or experiences from other study that have been carried out in similar context, such as in developing countries. With the existing limitation faced by organization in developing countries, Heeks (2002) argues that if there is design divisibility, modular approach and step-by-step incremental implementation, it increases the opportunities for successful local improvisation, learning, and allows improvisations that reduce design-actuality gaps. It means that staff could learn from early relatively small failures, and could address subsequent improvisation of both design and actuality to manage the project. In addition, Local social-culture-behavior of the users is worth to put into consideration during arrangement of the implementation strategy, as studied by the researchers (Ndou 2004, Furuholt & Ø rvik 2005, Imran 2006, Bii & Gichoya 2006, Weerakkody et al. 2009, Huda & Hussin 2010).

4. **Standard Operating Procedure (SOP).**

   Start to produce explicit standard procedure to give a clear understanding about activities and responsibilities as well as job description among parties. This is not limited only SOP between units, but also SOP for staffs in a unit. This approach obviously will introduce new behavior into the organization. Hence, need to put into consideration about awareness of the staffs to reduce their resistance and management policies that support the SOP implementation.

5. **Socialization and Training.**

   IT Division needs to increase the socialization activities in order to improve the awareness of stakeholders regarding benefits of IT. Regular training can be conducted to upgrade the ICT capability of the staffs. In addition, commitment of university/faculty management could be increased by stimulate their awareness in IT.

5. CONCLUSION

This study has attempted to explain the IT implementation in public sector organizations in developing countries, particularly in higher education institution, and found that they share common challenges in general, among others. However, this study has several limitations that need to be considered. Not all stakeholders of the institution are covered, in which excluding the students as the "main clients" of the institution. In addition, the work has a somehow narrow perspective, with only one specific public sector organization in focus, higher education institution. Further research should be broaden this perspective by following the implementation process of the subsequent period (the long-term plan) and conducted real experiment to con- firm the effectiveness of the recommended strategies.

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