

Open Source Software Appropriation in Malaysian Public Sector

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Abstract

Many models and frameworks have been developed from IS studies in investigating the penetration, implementation and adoption of specific technologies in organizations. However, many of these models have not focused or considered in depth the later stages, after the initial introduction of the technology. This study tries to fill this gap by examining the technology appropriation theory, which is related to how organizations adopt technology and use them after the technology has been initial introduced in order to achieve organizational benefits. The focus is on the Open Source Software (OSS) in Malaysian Public Sector with relation to the establishment of Open Source Competency Centre by MAMPU in 2001. The study will look at to what extent have the organizations in the Malaysian public sector appropriated the OSS from multiple perspectives. Case study will be conducted to the chosen organizations to gather the empirical data for this study.

Keywords: Open Source Software, Technology Appropriation, Malaysian Public Sector

1. Introduction

Several researches identified that the emerging of OSS is part of the force behind increasing technology adoption in developing countries (UNCTAD 2003). Being one of the developing countries, public and private sectors in Malaysia also realized all the benefits that could be achieved by adopting OSS especially with the strong support from the Government in OSS adoption. This is shown by the establishment of Open Source Competency Center (OSCC) by the Malaysian Administrative and Management Planning Unit (MAMPU) that acts as a central unit for public sector's ICT planning and development. The OSCC will become the center of reference for OSS implementation in Malaysia especially for the government sector (MAMPU 2004). Based on this initiative, public sectors in Malaysia have started the adopting OSS to support their operation. However, it is not clear to what extent have the organizations appropriated the OSS in their operation. Therefore an in-depth study is required to answer the following question:

How have Malaysian Public Sectors appropriated the OSS?

This question will try to identify the appropriation and disappropriation criteria of the public sectors, which adopted the OSS, the extent of OSS appropriation in the organizations and the benefits that they have gained throughout appropriation process.

In order to answer this question, the authors will propose an integrated framework which is a combination and extension of several models and framework in the IS field. The rest of the paper is organized as follows:

- i. Summary of literature review which are relevant to the topic and overview of the proposed integrated framework.
- ii. Critical discussion discussing the strength and weaknesses of current approach to solve the problem and what else need to be explored.
- iii. Suggestion for further work
- iv. Conclusion

2. Summary of Literature Review

2.1 Previous Works

Rogers (2003, pp21) in his well known Diffusion of Innovation (DOI) theory defined *adoption* as

“a decision to make full use of an innovation as the best course of action available.” This DOI theory has been widely applied in studying technology in organizational contexts. There are criticisms on the relevancy of Rogers’ theory on technology use and its explanatory power in organizational settings (Carroll 2004). There is a limitation of the application of this theory on IS field as it focus on general adoption of new techniques, engineering, macro as well as micro issues, rather than strictly IS. There were only small sections of the theory that highlight technology rejection including *active rejection*, *passive rejection* and *discontinuance* (Rogers 2003, pp178) but there is no further analysis on these issues, whereas technology rejection is common in organizations (Abrahamson 1991). The scope of the theory is also narrow and does not consider the richness of human behaviours and many other factors which influence the decision-making process such as trend, peer adoption, critical mass and other complex factors (Abrahamson 1991; Larsen 2001), and in particular in a business setting.

DOI takes for granted a limited variability of innovation as it shows a smooth, linear and efficient process of making choice in technology adoption. It describes innovation in essence as not being modified but only spread to individuals who decide whether or not to adopt it (Larsen 2001). This conforms to the earlier literatures which describe diffusion of adopted innovations are fix and unchanged (Davis 1989) where in many cases users actually adapt or modify technological innovation (Orlikowski 2000; Majchrzak 2000; Carroll 2004). Especially in OSS cases where the users are free to fix bugs, develop new software or create extension from the existing coding and contribute back to the community. As such there is the possibility or a tendency for OSS of having a continuous evolution in its development and usage.

Cooper and Zmud (1990) in their model of IT implementation defined IT implementation as “an organizational effort directed towards diffusing appropriate information technology within a user community”. This model was drawn from Zmud’s earlier work with Kwon in 1987 which highlighted all the other important terms that relevant to this paper in each of its stages such as adoption, acceptance and adaptation (Copper and Zmud 1990). Cooper and Zmud (1990) defined acceptance as the technology that is employed in organizational

work and employees are encouraged to commit to applying the technology. Several model related to acceptance are the TAM model (Davis 1989) and the Theory of Planned Behaviour (TPB) model (Ajzen 1991).

Technology Acceptance Model (TAM) is a frequently used model used by many researchers as the basis of their empirical studies. The two-core construct in TAM was *perceived usefulness* and *Perceived ease of use*. *Perceived usefulness* is defined as “the degree to which a person believes that using a particular system would enhance his or her job performance.” A system high in perceived usefulness, in turn is one for which a user believes in the existence of a positive use-performance relationship. *Perceived ease of use* is defined as “the degree to which a person believes that using a particular system would be free of effort.” All else being equal an application perceived to be easier to use than another is more likely to be accepted by users. Venkatesh and Davis (2000) later extended TAM to TAM2 with additional attributes of *Subjective Norm*, which was adapted from TPB, and later on they also produced UTAUT (Venkatesh, Morris et al. 2003) with additional social variables combined from eight previously established models.

All of these frameworks and models are applicable to organization adoption of OSS (Dedrick and West 2004). However, most of these models did not focus much on the later stages after the initial introduction of the technology. In some cases, the continuity of technologies utilization is unknown. Technology appropriation research, specifically the OSS appropriation in this case, will complement the adoption models as appropriation involve the whole cycle of process after the initial adoption (Carroll et al. 2002).

2.2 Model of Technology Appropriation

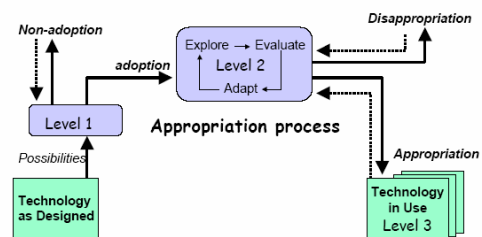


Figure 1: The Model of Technology Appropriation

The Model of Technology Appropriation (MTA) (Figure 1) (Carroll et al. 2002) was resulted from studies on technology appropriation by young people in Australia. Part of it extends the TAM model by Davis (1989). This model evaluate user on three levels:

- Level 1 – user first encounter with the technology. At this level it can be either the user will be uninterested with the technology which results to non-appropriation, or they are attracted to the *attractor* and lead to the decision to adopt (Davis, 1989; Rogers, 2003) initiates the process of appropriation
- Level 2 – deeper evaluation of the technologies through use. If users are attracted to the technology they will explore it through appropriation process. *Criteria* encourage continuing evaluation or rejection of the technology.
- Level 3 – *Reinforcers* act to maintain use.

The model had been used to study the appropriation of mobile technologies, text messaging in construction industry and Customer Relationship Management systems (Herszfeld et al. 2003; Carroll et al 2003; Carroll 2004). In this paper, we wish to investigate if the MTA could be applied to the appropriation of OSS, which seems to have a different cycle of usage and adoption to the previous MTA investigations. OSS has a different development methodology from proprietary software and support by different communities. Unlike the proprietary software, OSS users have the freedom of direct contribution of its development as well as the freedom to experiment make part of the case to analyse the application of MTA to organizations' OSS appropriation process.

2.3 Open Source Software Appropriation

In general term, Open-Source Software (OSS) is software that is built and enhanced through public collaboration. It is free and it gives the user unrestricted access to the source code (Open Source Initiatives 2005). Its rapid diffusion and great media coverage for the past few years has resulted in growth of interest in organizations to adopt OSS in running their businesses. This is also influence by the increasing availability of quality open source product and organizations desire to control their IT spending as they have alternative other than the costly proprietary systems. The organization could even commercialize and generate profit from their own OSS as long as the source codes are shared with the rest of the community. Therefore, most

of the previous studies on OSS look at its opportunities for reducing organizational costs and do not consider such software's capacity to fully meet the needs of today's organizations (Gacek and Arief 2004; Bergquist and Ljungberg 2001).

By adopting OSS, user have the freedom of direct contribution to its development which mainly different from the typical proprietary software and other technology. This makes it interesting to analyze the application of MTA to organizations' OSS appropriation process. Based on previous literatures, technology maturity, cost, government and organization support are some of the criteria that may influence the adoption and continuous use of the OSS. While dependency on proprietary technology, lack of commitment and poor usability may become some of the attributes, which influence the dissappropriation of the technology (Golden 2004; Dedrick and West 2004; Carroll 2004; Goode 2005; Payne 2002). However, these appropriation and dissappropriation criteria have not been tested empirically and may differ in Malaysian context.

2.4 Technology in Organization

Technology-organization-environment (TOE) model by DePietro et al. (1990) are frequently used to look at technology adoption at organizational level. The TOE is an influential framework for understanding IT adoption in an organizational context, which consists of three elements *technology* that relates to the competency of the technology to the organization, *organization* which measures firm size and scope, the centralization, formalization, quality of human resources and organizational slack (Xu et al 2004; Dedrick and West 2004) and *environment* that described the external relationships of the organization, which include its industry, competition, relations with buyers and suppliers, external skills such as auditors and consultants as well as deals with government (DePietro et al. 1990; Dedrick and West 2004). The model has been used in an exploratory study of open source platform adoption (Dedrick and West 2004), e-commerce use (Gibbs and Kraemer 2004) Internet adoption and many other empirical studies (Xu et al. 2004).

Multiple Perspective Framework (MPF) for exploring IS Quality (Alias and Wood Harper 1997) (Figure 2) was adapted from the MPF by

Vidgen et al. (1993) which incorporates the Soft Systems Methodology (SSM) (Checkland 1981; Checkland and Scholes 1990), Multiple Perspectives and Multiview (Linstone; Avison and Wood-Harper cited in Alias 1997). It looks at stakeholders' analysis in multiple perspectives. Despite its initial use and frequent adoption to study Information Systems Quality (ISQ) (Vidgen et al. 1993; Alias and Wood-Harper 1997) the different perspectives analysis in this framework is useful to address complex context such as the technology appropriation. It involved two streams of analysis: stream of cultural analysis to understand the IS context of the situation, and logic-based stream of analysis which identify the multiple perspectives classification of the stakeholders. The Multiple Perspectives (MP) described by Linstone (1989) highlight different perspectives namely *Technical (T)*, *Organizational or Societal (O)* and *Personal (P)* perspectives. These perspectives represent a system through different lens and each offer insights not encompassed within others.

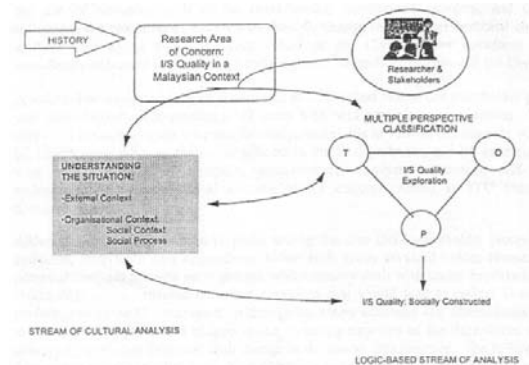


Figure 2: Multiple Perspectives Framework for exploring IS Quality

2.5 Integrated Framework

Our study proposes the combination and extension of the MPF for exploring IS Quality (Alias and Wood Harper 1997) and the MTA (Carroll et al. 2002) (Figure 3) as the theoretical framework to be used to conduct the empirical research for the study. By applying this framework, the authors intend to seek the answer to the research questions in a holistic form.

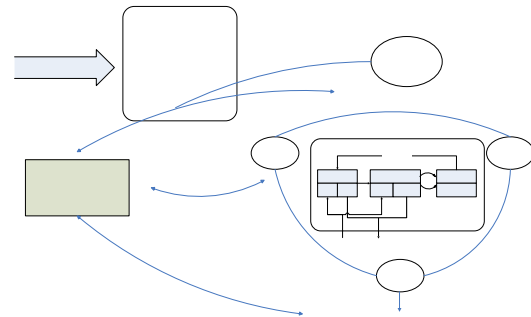


Figure 3: Multiple Perspective Framework in Exploring OSS Appropriation

3. Critical Discussion

As our intention is to conduct an in-depth investigation to the problem situation, a qualitative research approach is considered as a suitable approach as it allows the researcher to be part of the instrument while doing the investigation (Neuman 2003; Liamputtong and Ezzy 2005). This approach will allow us to study the problem in its own context, apply multiple methods, see the problem holistically, employ complex reasoning and systematically reflect the relevant stakeholders (Liamputtong and Ezzy 2005). All of these suit our chosen integrated model and framework.

The MTA will be able to study the whole cycle of the OSS appropriation while the overall MPF will be able to cover the organization wide context and different stakeholders' perspectives. This multiple perspective approach will be able to provide a richer base to investigate complex problem situations (Avison et al. 1998). This suits the situation that we intend to study, the OSS appropriation in organizations as it involves multiple actors, various technical disciplines, organizations and diverse individuals (Mitroff and Linstone 1993).

This differs from the typical hard systems or positivist approach taken in various other IS studies, which normally adopt a quantitative approach. The advantage of this approach is that it can be generalized, repeated, simplified and proved (Checkland 1981). Most of the time, these kind of studies are able to highlight the dependent and independent variables, the cause and effect and the direct relation or influence between these variables. It tends to produce objective answers, whereas in a real world view

the relations and solutions are actually more abstract and complex.

However, we need to take note that despite of the objectivity, many criteria obtained with a quantitative approach in some the models discussed earlier are still useful in these integrated models. The specified variables or criteria will be able to be bases of assumptions before getting into the field. It will also able to assist us to get the initial rich picture in trying to understand the possible problems or concern of the stakeholders and the overall situation, which can be very complex and chaotic. Anyway, we need to be very careful not to be influenced with the objectivity of the criteria, as it may mask the initial interpretations, understanding and interaction with the stakeholders (Liamputtong and Ezzy 2005).

4. Suggestion for further work

This study is going to be an exploratory research as it intention is to understand and become familiar with a phenomenon by conducting an in-depth review; in this case, the level of OSS appropriation in Malaysian public Sectors. From the review, the feasibility of this study and a pattern might be able to be identified. As this research intend to understand human thought and action in social and organizational contexts in dealing with a particular technology, it has the potential to produce deep insights into information systems phenomena which makes this study as an interpretive research (Neuman 2003)

4.1 Case Study Research

This study will investigate a contemporary phenomenon within its real-life context. Clearly, the case study research method is particularly well suited to this research, since the object of the study here is of information systems in organizations, and the interest is more on the organizational aspect rather than the technical issues (Yin 1994).

Since organizations' OSS appropriation has rarely been analyzed previously in the literature, multiple case studies with triangulations of methods and views (Yin 1994) are useful to understand the process, context, and specific phenomena in this issue. The research intent to build upon a multiple case study based on a snapshot view to find out how OSS have been

appropriated in several public Sectors in Malaysia.

The organizations will be chosen based on their similarities and differences (Orlikowski 1993), which may affect the study in various ways and be the base of the comparison between the organizations. Organizations variables will be identified based on the type of operation, location, size structure and culture. One of the main criteria in choosing the organizations for the case study should already be adopting any kind of OSS. In order to justify this, information will be obtained from Open Source Initiatives of MAMPU in identifying the relevant organizations. Initial set of exploratory questionnaires will then be sent to the identified organizations to get the overview of their OSS implementation status and the feedback on their cooperation for the later case studies. The case studies will only then be conducted to organizations, which are considered relevant and willing to provide access. This is important as the gatekeeper or someone who provides access to the organizations may influence or shape the direction of the research (Neuman 2003). Variety of quantitative and qualitative research methods suitable for case study research (questionnaires, observation, interviews and document analysis) will then be used in order to gather data. This triangulation method will enable a more comprehensive data to be gathered (Neuman 2003; Yin 2004)

5. Conclusion

This study will use the combined and extended models of MTA and MPF to study OSS appropriation in Malaysian public Sector. The result from this study can be used to support future research on OSS especially in terms of its appropriation. It allows researchers and practitioners to understand the multiple perspectives view and criteria that influence appropriation of OSS in each level of the process. The model could also be used by organizations to know at what extent their technology appropriations are. In practice, understanding the appropriation of OSS is fairly important in order to help the organizations to identify how the applications can be utilized to fulfill their business operation and strategy. It will also assist organization in their future OSS development, adoption and investment decision-making.

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