

The Importance Of End-User Analysis In New Information System Adapters: Lessons Learned From Practice

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Abstract—The implementation of Information System (IS) in new-IS adapters can remain unused even when they developed properly. The previous research shows that the unsuccessful IS utilization problem primarily related to behavioral issues rather than technical issues. The behavioral issues should be addressed in the stakeholder analysis, an activity in the inception phase of requirement engineering. End-users of an IS are one of the focuses in stakeholder analysis. We studied the correlation of the end-user analysis in new-IS adapters with the successfulness of IS utilization. We conducted a qualitative studied on 20 IS development projects. The findings show strong correlation of the end-user behavior and the IS adoption. We suggest the end-user analysis is necessary for the IS development project in new-IS adapters. We concluded that it is recommended to formally get the end-user commitment before starting the IS development process.

Keyword : Information System, end-user analysis, new-IS adapters, end-user commitment

I. INTRODUCTION

The implementation of Information System (IS) has been closely related to developments in computer hardware and software. It is now common to talk about “computer generations” with respect to hardware development. The Information System generation has already been distinguished as well. In today’s society, the Information and Communication Technology (ICT) has been integrated in the business environment of various organizations or institutions, and hence enable the implementation of IS. The aim of implementing IS to increase business productivity and efficiency and ultimately increase profitability has attempted many new ICT users to implement IS in their business process.

However the implementation of IS can remain neglected or misused even when they are developed technically successful [7]. Markus and Keil pointed out that in 1994 the unused or underused systems cost U.S. business millions of dollars each year even though they are technically successful [8]. Yogesh and Dennis [7] findings suggest that this problem primarily related to behavioral issues rather than technical issues. They suggested that the

user motivation and commitment are essential for IS sustainability. The users’ perceptions of an IS determine the successful adoption of that IS [7].

The phenomenon of unused IS has been also found in many IS that have been developed in new adapters. It is based on our survey on the IS development projects that undertaken in new IT users (which is also new IS-adapters) in an underdeveloped country, that is Indonesia. The adoption of ICT in Indonesia has been increasing recently. The report of Minges [9] shows that the growth of Internet awareness has lead to the development of application that utilized ICT. ICT enabled IS are increasingly used in many organizations in Indonesia.

This paper will presented the facts from practices related to the IS successfulness with the user’s behavioral issue. Those facts are gathered from software development practitioners that had developed an IS for a new ICT adapters (which is also new IS-adapters). We than used those facts to find the correlation between the behavioral issue with the successfulness of IS adoption in new users. This finding will give better guidance for IS developers and managers, and hence will increase the successfulness of IS in that particular environment. Furthermore, this research can be very useful to reduce the ICT gap between developed and developing countries like Indonesia.

The rest of the paper will be organized as follow: Section 2 will address the literature review on end-user analysis. Section 3 describes the IS development projects that are used as the object of the study. In Section 4 we will present the facts finding from the studied project. Section 5 discussed the findings and concludes the result of the study.

II. END-USER ANALYSIS

The end-user analysis is one of the focuses in stakeholder analysis [1]. In Software Engineering stakeholder analysis are conducted in the inception stage of Requirement Engineering process [10]. Brooks [2] considered Requirement Engineering as one of the most important activities in software development. The completeness and correctness of requirement is essential since it becomes the foundation for all the work on software development projects [12]. Requirement engineering

becomes a key challenge for global software development due to its communication and collaborative-intensive nature [3]. However, when conducting requirement engineering, software developers are often only focuses on the software specification and hence overseeing the stakeholder analysis.

Young [13] defined a stakeholder as “anyone who has an interest in the project and anyone who will be touched by the system”. The objective of stakeholder analysis is to identify and understand: (i) who the stakeholders are, (ii) their characteristics, (iii) their interest in the project and (iv) how the project will affect them. Baar [4] presented a more detail checklist of information that should be collected and analyzed in stakeholder analysis. Some personal matters are included such as work orientation, satisfaction with the current job, desire to gain more skill, sufficient appreciation, reduction/expansion of workload and responsibility, competence, attempt to build or maintain the organization. If that information analyzed properly, it will help the developer to construct their project approach properly.

As pointed by Yogesh and Dennis [7] the behavioral issue of stakeholder is essential for the successfulness of IS project. Sutcliffe and Thew [11] presented a tutorial that provides advice and guidelines on the potential impact of values, motivations and emotions on the requirement elicitation process. They suggested that “soft issues, such as politics and people’s feelings, are often cited as problems in the Requirement Engineering process and as key causes of system failures” [11]. Furthermore, the findings of le Roux and le Roux [5], suggest “besides frames of technology, the beliefs and perceptions that stakeholders have of each other influence their utilization of technological artifacts and influence the operation of information systems”. A further investigation to define the linking of technological frames, social phenomena and implementation of IS has been conducted by Lin and Silva [6]. They concluded that the IS adoption is a social and political process that framing the stakeholders; perceptions of an IS. Those findings indicate the strong correlation between stakeholders/end-users behavior and the IS adoption.

III. THE SURVEY

In this qualitative study we surveyed 20 IS development projects. We collected the facts from those IS projects by using a questionnaire that filled by the practitioners. Based on the project details from the questionnaires, those projects are conducted for new IS-adapters organizations and/or end users. Most of the clients are even in infant phase of IT utilization. The general description of those projects is presented in Tab. 1.

The types of client organizations are varied of education, government, hospital and commercial. The educational organizations consist of universities (P1 and P11) and high schools (P2 and P4). The involved government institutions consist of district governments (P9, P11 and P13), province government (P12), and national department (P16 and P18). The involved hospital (P14) is located in Toba Samosir. The commercial organizations are located in Jakarta (P3, P5, P6, P7, P10, P20) and North

Sumatera (P8, P15 and P17). Those clients are considered as new IS-adapters, especially for those located in rural area.

The educational backgrounds of end-users are recorded as well since they could influence the behavior of the end-user in adopting an IS. We used Indonesia education level to determine the end-user background of each project (SMP/SMA-high school, D3-Diploma, S1-bachelor degree, S2-master degree and S3-doctoral degree). Some of the project have high-qualified end-user such as P1, P20, P6, P10, and P17 where as many of them have low-degree users (P3, P4, P8, P9, P11, P12, P13, P14, P15, and P19).

The technical issues, including the size and complexity of those IS projects are not taken into consideration. Based on the practitioners report in the questionnaires, all the projects have been completed and released in agreed period and applied all the processes on used development methodologies, and hence we considered them as technically successful.

TABLE I. IS PROJECT DESCRIPTION

Project ID	Client Type	IS Type	Development Methodology	End-user Background
P1	Education	Academic IS	Iterative	S1,S2,S3
P2	Education	MIS	Iterative	S1
P3	Commercial	Human Resource Management	Waterfall	SMA,D3
P4	Education	Logistic Management	Prototype	SMA,D3,S1
P5	Commercial	Human Resource Management	Iterative	D3,S1
P6	Commercial	MIS	Waterfall	S1,S2
P7	Commercial	MIS	Prototype	D3,S1
P8	Commercial	MIS	Waterfall	SMA
P9	Government	MIS	Waterfall	SMA,D3,S1
P10	Commercial	MIS	Waterfall	D3,S1,S2
P11	Education	Asset Management	Iterative	SMA,D3,S1
P12	Government	MIS	Waterfall	SMA,D3,S1
P13	Government	MIS	Prototype	SMA,D3,S1
P14	Hospital	MIS	Iterative	SMA,D3,S1
P15	Commercial	Transaction Processing	Prototype	SMA,D3,S1
P16	Government	MIS	Prototype	S1
P17	Commercial	Transaction Processing	Prototype	D3,S1,S2
P18	Government	MIS	Waterfall	D3,S1
P19	Government	MIS	Prototype	SMA,S1
P20	Commercial	MIS	Waterfall	S1,S2,S3

IV. THE FACTS FROM PRACTICE

Tab. 2 presented the facts from the studied IS projects. The presented data show the behavior of main stakeholders, the management and the end-users. The commitment and motivation of management and end-user to the utilization of developed IS are measured by the correspondence developers and categorized into “high” or “low”. Two processes that closely related to end-users behavior are also recorded end-user analysis and end-user training. The last column of the Tab. 2 presents the information whether the developed IS successful into operation. All those facts are obtained from the studied practitioners (IS developers) without any further investigation to the artifact of those projects, such as documentation. We did not conduct any

certain methods to measure those parameters in Tab. 2 but using the practitioners report in the survey.

TABLE II. SURVEY RESULT

Project ID	Management Commitment	End-user Analysis	End-user Commitment	End-user Training	Operational
P1	High	N	High	Y	Y
P2	High	N	High	Y	Y
P3	Low	N	Low	Y	N
P4	High	Y	High	Y	Y
P5	High	Y	High	Y	Y
P6	High	Y	High	Y	Y
P7	High	Y	High	Y	Y
P8	Low	N	Low	Y	N
P9	Low	N	Low	Y	N
P10	High	N	High	Y	Y
P11	High	N	Low	Y	N
P12	Low	N	Low	N	N
P13	Low	N	Low	N	N
P14	High	N	Low	Y	N
P15	High	N	Low	Y	N
P16	Low	N	High	N	N
P17	High	N	High	Y	Y
P18	Low	N	Low	N	N
P19	Low	N	Low	Y	N
P20	High	Y	High	Y	Y

The facts in Tab. 2 show that mostly projects do not conduct the end-user analysis. The survey said that those developers were focusing on IS specification. During requirements gathering they collected the users' requirement without gave enough attention on their behavior. They met the management in that process and found that the management interested toward the IS adoption but there is no further study on the management behavior as well. On the other hand, some of the projects are not required by the client but proposed by the developer. It may also influence the client behavior. However, the end-user analysis has strong connection with the end-user commitment. The facts show that all IS projects with end-user analysis have high-motivated end-users. In contrast, mostly the IS without end-user analysis have low-committed end-users.

The end-user training is not a key success factors for IS. The facts show that even though end-user training has been conducted properly and sufficiently in some projects, the IS are still fail into operation. However, it is an important activity, since the facts also show that all IS without end-user training fail. On contrary, the end-user commitment becomes the key success factor for the utilization of IS. It has strong correlation with the successfulness of IS. All the projects without end-user commitment will fail into operation. Except for P16, all the IS projects with high end-user commitment will be operated.

It also found that the educational background of end-user influence their commitment. All the projects with well-

educated end users (P1, P6, P10, P17 and P20) have high-motivated end-user, even for the projects without end-user analysis. An interesting phenomenon found on those IS projects, most of the end-users that still new on IT utilization are resistance for the IS utilization. Some of them have no confidence to try that new technology and prefer to use the previous manual system. Another reason is that they do not want the automatic process provided by the new IS. They refused the standardized procedure and unlike the transparency and accountability of the IS. The bad system has formed the values of the organization that the management and end-user do not want to change.

The managements have influenced the successfulness of IS. The committed-management will be useful when it can increase the end user motivation to use an IS. However, in some cases the high-commitment is not enough, like in P10, P11 and P15, the management cannot force the end-user to utilize the developed IS and left the motivation of end-user low, and hence cause the IS failure. Different facts for P1 and P2, they have low-motivated end-user at the beginning, the high-motivated and strong leadership forced the end-user to use the developed IS. After using the IS, the end-users practice the benefit of the utilization of the IS, and hence increase their commitment. In case of P16, the main problem that causes the IS failure is on the management, they have low commitment when the end-users have a high motivation. *The developer of P16 reported that the management changed the business process just after the IS released. This finding suggests that the management commitment has also influence the successfulness of IS adoption in their organization. The projects with uncommitted management are fail into operation.* Another interesting facts is that all the IS projects with government organization have low motivation to utilize the developed IS in their organization.

V. DISCUSSION AND CONCLUSION

We have conducted a qualitative study on 20 IS projects with new-IT adapters to investigate the correlation of end-user analysis with the successfulness of IS utilization. The first finding suggests that many IS developers are still not take the stakeholder analysis particularly the end-user analysis as an important process and hence they fail to identify the low-motivated end-users. It is found that the end-user commitment is the key success factor of the IS utilization. End-user analysis is essential to identify the end-user background, beliefs and values and used it to increase the end-user motivation and get the commitment of them to use the developed IS. This finding agrees to the hypothesis regarding the importance of end-user analysis. It shows a strong correlation of the end-user behavior and the IS adoption. *It also suggests that the management behavior is important for the IS adoption as well. They have to support and commit to the implementation of the developed IS in their organization.*

We suggest that the end-user analysis is a necessity for an IS project in new-IS adapters and it is better to formally obtain the end-user commitment before starting an

IS development project. The management should support it. Therefore, management is also should be analyzed in the scope of stakeholder analysis. The resistance of the management is a challenge in the new IT-adapters, especially in government organization. The end-users educational background and training are factors that influence the adoption of IS as well. *The lower educational background of end-user, the lower their commitment, therefore developers need more attentions on this kind of environment.*

There are some threats to the validity of this study, such as the small number of IS projects and the limited area of study. Besides, it is also important to validate the related technical issues. This paper only uses the information provided by the practitioners in the survey. Providing sufficient study on the technical issues and behavioral issue will give result that is more reliable. The further study should involve more objects of study with various type of IS development projects to give more statistical analysis. The psychological issues related to the IS adoption are also need to be investigated.

REFERENCES

- [1] Alexander, I., "Stakeholders: who is your system for?," Computing & Control Engineering Journal, vol 14, pp. 22 – 26, 2003
- [2] Brooks, F., No Silver Bullet, Essence and Accidents of Software Engineering, IEEE Computer, vol. 20, no. 14, pp. 10 – 19, 1987.
- [3] Damien, D., "Stakeholders in Global Requirements Engineering: Lessons Learned from Practice," IEEE Software, pp. 21 – 27, 2007.
- [4] de Baar, B., "Using Stakeholder Analysis in Software Project Management," 2006, <http://www.SoftwareProjects.org>.
- [5] le Roux, D. B. and le Roux, G. P., "People frames: the social construction of information systems," in Proceedings of the 4th Symposium on Computer Human Interaction for the Management of Information Technology, ser. CHiMiT '10, 2010.
- [6] Lin, A. and Silva, L., The social and political construction of technological frames, European Journal of Information Systems, vol. 14, pp. 49 – 59, 2005.
- [7] Alexander, I., "Stakeholders: who is your system for?," Computing & Control Engineering Journal, vol 14, pp. 22 – 26, 2003
- [8] Brooks, F., No Silver Bullet, Essence and Accidents of Software Engineering, IEEE Computer, vol. 20, no. 14, pp. 10 – 19, 1987.
- [9] Damien, D., "Stakeholders in Global Requirements Engineering: Lessons Learned from Practice," IEEE Software, pp. 21 – 27, 2007.
- [10] de Baar, B., "Using Stakeholder Analysis in Software Project Management," 2006, <http://www.SoftwareProjects.org>.
- [11] le Roux, D. B. and le Roux, G. P., "People frames: the social construction of information systems," in Proceedings of the 4th Symposium on Computer Human Interaction for the Management of Information Technology, ser. CHiMiT '10, 2010.
- [12] Lin, A. and Silva, L., The social and political construction of technological frames, European Journal of Information Systems, vol. 14, pp. 49 – 59, 2005.
- [13] Malhotra, Y. and Galletta, D. F., Building Systems That Users Want to Use, Communication of the ACM, vol 47, no. 12, pp. 89 – 94, 2004.
- [14] Markus, L. and Keil, M., If we build it, they will come: designing information system that users want to use, Sloan Manage. Rev, pp. 25 – 26, 1994.
- [15] Minges, M., Kretek Internet: Indonesia Case Study, International Telecommunication Union, Geneva, Switzerland, March 2002, Available: <http://www.itu.int/ITU-D/ict/dai/upper.html>
- [16] Pressman, R. S., Software Engineering: A Practitioner's Approach, 6th edition, McGraw-Hill, 2005
- [17] Sutcliffe, A. and Thew, S., Analysing "People" Problems in Requirement Engineering, in Proceedings of the 32nd ACM/IEEE International Conference on Software Engineering-volume 2, ser. ICSE'10, 2010, pp. 469 – 470.
- [18] Wiegers, K. E., More About Software Requirements: Thorny Issues and Practical Advice, Microsoft Press, 2006.
- [19] Young, R. R., The Requirements Engineering Handbook, Artech House, Boston, 2004.