EVALUATING MALAYSIA'S E-GOVERNMENT FLAGSHIP APPLICATIONS USING THE DELONE AND MCLEAN UP-STREAM MODEL OF E-COMMERCE SUCCESS

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ABSTRACT:

This study had used the DeLone and McLean (2003, 2004) up-stream model of e-commerce success to evaluate Malaysia's e-government flagship applications In this article, we present the evaluation results of Malaysia's six e-government flagship applications from internal end-users' perspective. The six flagship applications assessed were e-services, e-procurement, generic office environment, human resource management information system, project monitoring system and electronic labor exchange. This study adopted a cross-sectional survey research approach. A total of 437 questionnaires were distributed to non-clerical staff at seven lead implementing agencies namely the Road Transport Department (RTD), Treasury, the Malaysia Administration and Modernisation Planning Unit (MAMPU), Public Service Department (PSD), Ministry of Human Resources (MOHR), the Implementation Coordination Unit (ICU) and the Ministry of Health (MOH). The usable response rate was 29.7%. There was evidence to suggest that the e-government applications were generally successful in lead implementing agencies.

KEYWORDS:

E-government, e-commerce, information systems success

1. INTRODUCTION

Towards the millennium, the Malaysian government introduced seven flagship applications as part of the Multimedia Super Corridor (MSC) initiatives. These applications were e-services, e-procurement, generic office environment, human resource management information system, project monitoring system and electronic labor exchange. The government entrusted a particular agency to lead the implementation of each of these applications. Table 1 shows the agencies that were given the responsibilities as the lead implementing agencies for the respective flagship applications.

For the years 2000 until 2003, according to the Malaysian Administration and Planning Unit (MAMPU), the Malaysian government already spent in excess of RM500 million per annum on information technology (IT). This spending is neither conclusive of the total expenditure on information and communication technology (ICT) by the entire Malaysian government nor inclusive of the e-government implementation expenditure[1].

[1] Source: Dr Raja Malik Raja Mohamed Former Deputy Director General of MAMPU in his key note address at the Information Technology Colloquium 2004 (INTEC 2004) Universiti Putra Malaysia on 1 June, 2004.

Given the already massive spending amount in ICT, it may be worthwhile to pause and reflect the efforts that have been undertaken thus far. In particular, the focus of this research is to evaluate the success of the existing Malaysia's e-government flagship applications; at least as a start from internal users' perspective.

Table 1: Malaysia's E-government Projects and Lead Implementing Agencies

(Source: Abdul Karim and Mohd Khalid, 2003)

Malaysia's E-government Flagship Applications	Lead Implementing Agencies
E-services	Road Transport Department (RTD)
E-procurement	Treasury at the Ministry of Finance
Generic Office Environment	Prime Minister's Office and Malaysia Administration and Modernisation Planning Unit (MAMPU)
Human Resource Management Information System	Public Service Department (PSD)
Electronic Labour Exchange	Ministry of Human Resources (MOHR)
Project Monitoring System	Implementation Coordination Unit at the Prime Minister's Department (ICU)
E-Syariah	Islamic Justice Department at the Prime Minister's Department

Hence, this paper aims to answer the following research question:

What is the internal users' perceived success of Malaysia's e-government flagship applications in the lead implementing agencies?

This paper is organised into five sections. This section has introduced the research area. A review of literature is in section two. Section three presents the methodology. The findings are available in section four. The last section provides the conclusions.

2. REVIEW OF LITERATURE

Many past studies attempted to measure IT success by quantifying the returns for each IT investment decision. The use of economic measures like ROI, NPV etc. at the organisational level has been cited as the most common form of IT measures of success (Quinn and Baily, 1994; Sethi and King, 1994; Seddon *et al.* 2002). Standard economic and business measures of increased throughput, productivity gains, financial payback and return of capital used, are relatively easy to define in manufacturing environment but have little meaning in public administration (Irani *et al.*, 2005). Hence, measuring IT success is a difficult task.

Accordingly, researchers turned to surrogate measures of IT success. One commonly used surrogate measure is user satisfaction. User satisfaction refers to the successful interaction between the information system itself and its users (DeLone and McLean, 1992). User satisfaction provides a significant surrogate for the critical product of the information system – which cannot be measured – namely, changes in organisational effectiveness (Zviran and Erlich, 2003). The user satisfaction measure has been used since the 1980s until the present day. As the development of e-government is still in-progress, for a start, the user satisfaction measure could be used as a surrogate measure of system success. Besides user satisfaction, other measures of information systems (IS) success include system quality, information quality, use, individual impact and organisational impact (DeLone and McLean, 1992). System quality is concerned with whether or not there are bugs in the systems, the consistency of the user interface, ease of use, response rates in interactive systems, documentation and sometimes quality and maintainability of the program code. Information quality is concerned with such issues as timeliness, accuracy, relevance and format of information generated by an information system. Use examines the actual use of information systems and the extent of use of information systems in the users' jobs. Individual impact examines the effect of the information system on the users' performance. Organizational impact is concerned with the influence of the information system on overall organisational performance. Since DeLone and McLean (1992), several

researchers had added new variables (Seddon and Kiew, 1996; Seddon, 1997), combined existing variables (Glorfeld, 1994) or changed causal paths (Seddon, 1997).

With the increasingly pervasive use of the Internet as well as theoretical and empirical contributions made by other researchers since the published article in 1992, DeLone and McLean (2003, 2004) consequently updated their earlier model. The updated model is an improvement to the original model so that it can be applied to evaluate e-commerce success. There are six measures in the updated model: system quality, information quality, service quality, use, user satisfaction and net benefits. System quality in the Internet environment is concerned with usability, availability, reliability, adaptability and response time. Information quality is concerned with content issue such as personalization, complete, relevant, easy to understand and secure. Service quality refers to the overall support delivered by the IS department or Internet service provider if services are outsourced. The service orientation approach was borrowed from the service operation SERVQUAL instrument (Zeithaml et al., 1990). There are five elements: (i) *Tangibles* - appearance of physical facilities, equipment, personnel and communication materials (ii) *Reliability* - ability to perform the promised service dependably and accurately (iii) *Responsiveness* - willingness to help customers and provide prompt service (iv) *Assurance* - knowledge and courtesy of employees and their ability to convey trust and confidence (v) *Empathy* - caring, individualized attention which the organisation provides to its customers. Usage measures everything from a visit to a Web site and navigation within the site to information retrieval and execution of a transaction. User satisfaction measures customers' opinions of an e-commerce system. Net benefits capture the balance of the positive and negative impacts of e-commerce, suppliers, employees, organisations, markets, industries, economies and even society as a whole.

As the objective is to understand an individual's perception, this study in particular adopted the DeLone and McLean (2003, 2004) up-stream model of e-commerce success to evaluate the effectiveness of Malaysia's e-government flagship applications. The DeLone and McLean (1992) model had been used in other setting like education and business but not in e-government environment. However, two measures from the DeLone and McLean (2003, 2004) up-stream model are excluded: use and net benefits. Firstly, the usage variable is omitted on account that the measurement of usage in the past has raised various complexities. Although perceived usefulness has been used in previous studies to replace use where this variable has shown to influence user satisfaction (Seddon and Kiew, 1996; Hussein *et al.*, 2003; Hussein, 2005), this study has dropped the perceived usefulness variable. Information quality and system quality variables have been shown to refer to object-based beliefs while usefulness and ease of use were referred to as behavioral beliefs (Wixom and Todd, 2005). Behavioral beliefs form the foundations for the Technology Acceptance Model (TAM). On the other hand, system satisfaction was referred to as object-based attitude (Wixom and Todd, 2005). Thus, based on Wixom and Todd (2005), mixing object-based beliefs and behavioral beliefs appears to potentially lead to a conceptual flaw in the information systems success model; and hence the decision to drop the perceived usefulness construct. Secondly, the net benefits are dropped as the study was confined to only internal end-users' perspective.

3. RESEARCH METHODOLOGY

The study adopted a cross-sectional survey and self-administered procedure. All e-government flagship applications as listed in Table 1 were the target for evaluation except *e-syariah*. E-syariah was in the process of roll-out at the point of data collection (refer to http://www.jksm.gov.my/web/template/esyariah.php). The population refers to all internal staff who use the electronic government flagship applications at lead implementing agencies in Klang Valley and Putrajaya Malaysia. The estimated number of population is within the range of 600 and 700. Targeted respondents were internal end-users (who were at non-clerical level) of those e-government flagship applications. A sampling frame was formulated based on available telephone directories and web sites. Where job designations were indicated in telephone directories, clerical level staffs were omitted from the sampling frame. Thus, the sampling units were actually made up of only non-clerical staffs. In compliance with Malaysia's government agencies' procedure for participation of their staff in survey research and also in maximizing response rate, the researcher only sent the survey questionnaire to offices of directors and/or deputy directors of users' and technical divisions.

Recognising the complexity to measure IT success by quantifying the returns for each IT investment decision, this study thus used measures of user satisfaction, system quality and information quality that were borrowed and adapted from Seddon and Kiew (1996). Respondents were required to evaluate agreement to statements that used a seven-point Likert scale. A seven-point represents "strongly agree" while a one-point represents "strongly disagree". Measures of service quality were borrowed and adapted accordingly from Sherman (1997). Respondents were required to evaluate agreement to statements that used a seven-point

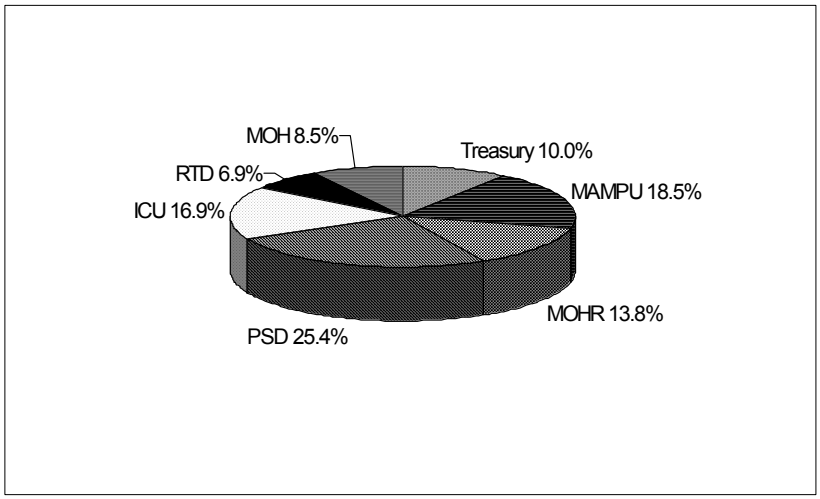
Likert scale. A seven-point represents "strongly agree" while a one-point represents "strongly disagree". Fifteen questionnaires were distributed to senior members of academic staff and doctoral students of the Kulliyyah of Information and Communication Technology at the International Islamic University Malaysia for pretest. 30% responded and the feedback was incorporated accordingly. A pilot test was conducted using the improved version of the survey instrument based on the pretest. A total of seventy survey questionnaires were then distributed in a pilot test to three government agencies namely Ministry of Human Resources (MOHR), MAMPU and Public Service Department (PSD). There were no items required for revision on those questions.

4. FINDINGS

A total of 437 questionnaires were distributed between December 2004 and March 2005 to non-clerical staff at seven lead implementing agencies namely the Road Transport Department (RTD), Treasury, the Malaysia Administration and Modernisation Planning Unit (MAMPU), Public Service Department (PSD), Ministry of Human Resources (MOHR), the Implementation Coordination Unit (ICU) and the Ministry of Health (MOH). The Ministry of Health was included as a lead implementing agency as listed in PSD's news bulletin. The number of usable response was 130; yielding a usable response rate of 29.7%.

The usable response by agencies is in Figure 1.

Figure 1: Pie chart of usable responses by agencies



Out of the total of 130 usable questionnaires from seven lead implementing agencies, Public Service Department emerged the highest in contribution of usable questionnaires, that is, at 25.4%. The Road Transport Department became the lowest contributor in usable questionnaires among the agencies at 6.9%. The contribution by non-usable responses were for the following reasons: (i) the nature of respondent's job did not entail them to use the systems to support daily operation in interacting with either citizens or other government agencies (ii) officers did not yet use the systems as their operational unit is just being established and no access to systems are yet given during the data collection process (iii) during the period of data collection, officers were not at the office as they were posted outstation (iv) officers were recently transferred to other agencies (v) more than 25% of the total expected responses in a questionnaire were omitted.

The breakdown of usable responses for each application system is in Table 2.

Table 2: Breakdown of usable responses by each application system

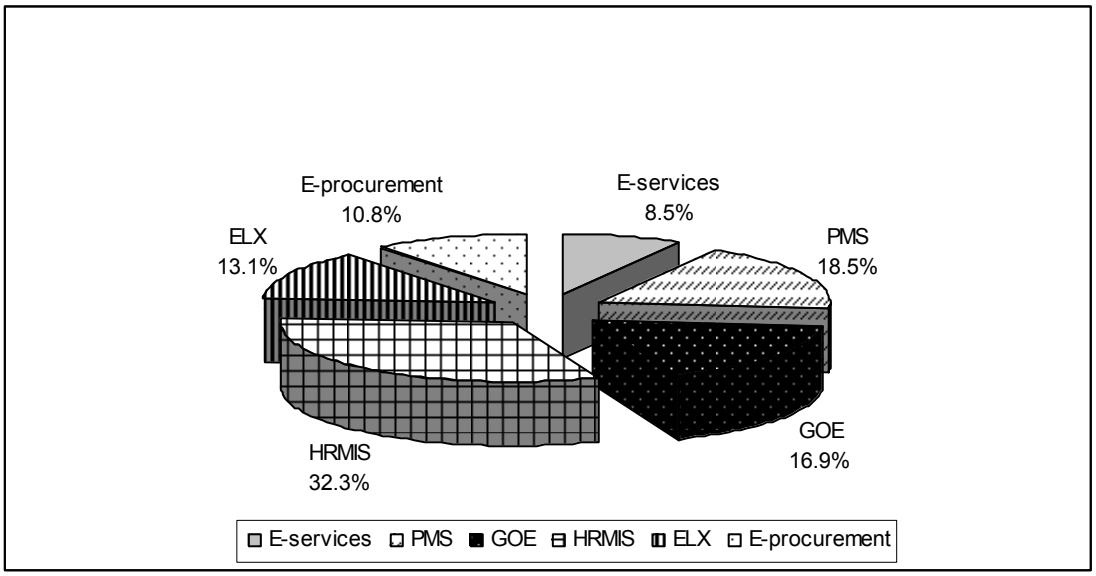
Application	Number of usable responses
E-services	11
PMS	24

GOE	22
HRMIS	42
ELX	17
E-procurement	14
Total	130

It is observed from Table 2 that the majority of the usable responses were on HRMIS while the fewest number of usable responses were on e-services.

The data in Table 2 are shown graphically in a pie chart (Figure 2) in percentage.

Figure 2: Pie chart of usable responses by each application system



A *t*-test was conducted to check for non-response bias. It was found that there were no significant differences. *t*-tests were also conducted to check for differences among end users' gender and two groups of education level. It was found that there were no significant differences in gender and education level. A one-way ANOVA was performed for end users' age. Three groups were identified namely (i) below 29 years old (ii) between 30 and 39 years old and (iii) more than 40 years old. The analysis of variance revealed non-significant differences among these age groups.

4.1 Profile of respondents

The profile of respondents is in Table 3.

Table 3: Profile of Respondents

Characteristics	Item	Frequency	Percentage
Gender	Male	64	49.2
	Female	64	49.2
Age Group	20-29	51	39.2
	30-39	35	26.9
	40-49	28	21.5
	Over 49	15	11.5
Education Level	Upper secondary education (MCE/SPM/GCE O level)	7	5.4
	Diploma/certificate/HSC/STPM	23	17.7
	Bachelor's degree	77	59.2
	Master's degree	21	16.2
	Others	2	1.5
Job Level	Executive/top management	6	4.6
	Middle management	74	56.9
	Technical and professional	35	26.9
	Supervisory	1	.8
	Administrative & Support	14	10.8

In terms of gender, the proportion of male and female respondents was equal. In terms of age group, 39% of the total respondents were between the age of 20 and 29 with the remaining (60.4%) 30 years and over.

The majority of respondents (76.9%) had at least a Bachelor's degree. A high proportion of them (89.2%) occupied management and technical positions.

Based on the predominant age group that is above 30 years of age, educational background and job level, it could be implied from these figures that the respondents would be generally familiar with management evaluation process.

4.2 Reliability analysis of measures

Reliability analysis was performed for all the measures. This is in Table 4.

Table 4: Reliability Analysis

Measures	Cronbach's alpha
User satisfaction (number of items: 4)	.929
System quality (number of items: 5)	.931
Information quality (number of items: 10)	.950
Service quality (number of items: 9)	.954

Tests of internal consistency (Cronbach's alpha) were conducted to assess the reliability of each of the scales used. All of the measures included in the questionnaire show adequate levels of internal consistency and reliability. The internal reliability for the measures ranges from .929 for the measure of user satisfaction to .954 for the measure of service quality. The findings of this study support those of previous studies (Seddon and Kiew, 1996; Sherman, 1997).

In order to understand the strength of the relationship between the variables, correlation analysis was conducted. This is in Table 5.

Table 5: Correlation Analysis

	User satisfaction	System quality	Information quality	Service quality
User satisfaction	1	.721**	.757**	.475**
System quality	.721**	1	.589**	.380**
Information quality	.757**	.589**	1	.485**
Service quality	.475**	.380**	.485**	1

**Correlation is significant at the 0.01 level (2-tailed)

Table 5 shows that all the variables are correlated to each other. There is a strong correlation between (i) user satisfaction and system quality (ii) user satisfaction and information quality. The remaining relationships show modest strength. This finding supports those of previous studies (Seddon and Kiew, 1996; Sherman, 1997).

4.3 Profile of measures

The profile of the user satisfaction measure is in Table 6a and 6b.

Table 6a: Profile of User Satisfaction Measure

	Strongly Disagree	Disagree	Slightly Disagree	Neutral	Slightly Agree	Agree	Strongly Agree
USAT01 The e-government systems adequately meets the information processing needs of my area of responsibility.	3 (2.3%)	3 (2.3%)	10 (7.7%)	34 (26.2%)	33 (25.4%)	30 (23.1%)	17 (13.1%)
USAT02 The e-government systems is efficient.	4 (3.1%)	6 (4.6%)	9 (6.9%)	35 (26.9%)	39 (30.0%)	27 (20.8%)	10 (7.7%)
USAT03 The e-government systems is effective.	2 (1.5%)	5 (3.8%)	11 (8.5%)	32 (24.6%)	42 (32.3%)	29 (22.3%)	9 (6.9%)
USAT04 Overall, I am satisfied with the e-government systems.	3 (2.3%)	6 (4.6%)	13 (10.0%)	32 (24.6%)	37 (28.5%)	30 (23.1%)	9 (6.9%)
N=130							

Table 6a above shows that the majority of users were satisfied with the e-government flagship applications. Table 6b below shows the central tendency for each of the items that measured user satisfaction

Table 6b: Profile of User Satisfaction Measure

(Measure of Central Tendency)

	Item	Mean	S.E. Mean	Std. Deviation	Variance
USAT01	The e-government systems adequately meets the information processing needs of my area of responsibility.	4.92	.121	1.381	1.908
USAT02	The e-government systems is efficient.	4.69	.121	1.374	1.889
USAT03	The e-government systems is effective.	4.77	.112	1.279	1.636
USAT04	Overall, I am satisfied with the e-government systems.	4.69	.120	1.363	1.858
	Average user satisfaction score	4.77	.107	1.226	1.502
N=130					

Based on Table 6b, all variables that measure user satisfaction show that the mean is above 4.0. The average score for user satisfaction is also above 4.0 (mean=4.77, SD= 1.226).

The profile of the system quality measure is in Table 7a and 7b.

Table 7a: Profile of System Quality Measure

	Strongly Disagree	Disagree	Slightly Disagree	Neutral	Slightly Agree	Agree	Strongly Agree
SYSQUAL01 The e-government systems is easy to use.	2 (1.5%)	0 (0%)	8 (6.2%)	29 (22.3%)	45 (34.6%)	35 (26.9%)	11 (8.5%)
SYSQUAL02 The e-government systems is user friendly.	3 (2.3%)	5 (3.8%)	14 (10.8%)	26 (20.0%)	43 (33.1%)	31 (23.8%)	8 (6.2%)
SYSQUAL03 Compared to other computer software, the e-government systems is easy to learn.	1 (0.8%)	3 (2.3%)	8 (6.2%)	36 (27.7%)	42 (32.3%)	30 (23.1%)	10 (7.7%)
SYSQUAL04 I find it easy to get the e-government systems to do what I want it to do.	1 (0.8%)	8 (6.2%)	15 (11.5%)	35 (26.9%)	41 (31.5%)	22 (16.9%)	8 (6.2%)
SYSQUAL05 It is easy for me to become skilful at using the e-government systems.	0 (0.0%)	6 (4.6%)	14 (10.8%)	30 (23.1%)	45 (34.6%)	24 (18.5%)	11 (8.5%)
N=130							

Table 7a above shows that the majority of users perceived that the e-government flagship applications had system quality value. Table 7b below shows the central tendency for each of the items that measured system quality.

Table 7b: Profile of System Quality Measure

(Measure of Central Tendency)

	Item	Mean	S.E. Mean	Std. Deviation	Variance
SYSQUAL01	The e-government systems is easy to use.	5.03	.101	1.154	1.332
SYSQUAL02	The e-government systems is user friendly.	4.74	.117	1.333	1.776
SYSQUAL03	Compared to other computer software, the e-government systems is easy to learn.	4.88	.103	1.179	1.390
SYSQUAL04	I find it easy to get the e-government systems to do what I want it to do.	4.58	.113	1.287	1.657
SYSQUAL05	It is easy for me to become skilful at using the e-government systems.	4.77	.110	1.248	1.559
	Average system quality score	4.80	.096	1.100	1.210
N=130					

Based on Table 7b, all variables that measure system quality show that the mean is above 4.0. The average score for system quality is also above 4.0 (mean=4.80, SD= 1.210).

The profile of the information quality measure is in Table 8a and 8b.

Table 8a: Profile of Information Quality Measure

	Strongly Disagree	Disagree	Slightly Disagree	Neutral	Slightly Agree	Agree	Strongly Agree
INFOQUAL01 The output is presented in a useful format.	1 (0.8%)	3 (2.3%)	7 (5.4%)	35 (26.9%)	55 (42.3%)	22 (16.9%)	7 (5.4%)
INFOQUAL02 I am satisfied with the accuracy of the system.	3 (2.3%)	8 (6.2%)	17 (13.1%)	30 (23.1%)	43 (33.1%)	24 (18.5%)	5 (3.8%)
INFOQUAL03 The information is clear.	0 (0%)	5 (3.8%)	11 (8.5%)	28 (21.5%)	44 (33.8%)	33 (25.4%)	9 (6.9%)
INFOQUAL04 The e-government systems is accurate.	3 (2.3%)	4 (3.1%)	10 (7.7%)	37 (28.5%)	47 (36.2%)	21 (16.2%)	8 (6.2%)
INFOQUAL05 The e-government systems provides sufficient information.	0 (0%)	7 (5.4%)	8 (6.2%)	35 (26.9%)	37 (28.5%)	33 (25.4%)	10 (7.7%)
INFOQUAL06 The e-government systems provides up-to-date information.	2 (1.5%)	5 (3.8%)	15 (11.5%)	42 (32.3%)	34 (26.2%)	26 (20.0%)	6 (4.6%)
INFOQUAL07 I get the information I need in time.	4 (3.1%)	5 (3.8%)	17 (13.1%)	34 (26.2%)	33 (25.4%)	29 (22.3%)	8 (6.2%)
INFOQUAL08 The e-government systems provides reports that seem to be just about exactly what I need.	2 (1.5%)	12 (9.2%)	18 (13.8%)	35 (26.9%)	45 (34.6%)	12 (9.2%)	6 (4.6%)
INFOQUAL09 The system provides the precise information I need.	0 (0%)	9 (6.9%)	17 (13.1%)	38 (29.2%)	42 (32.3%)	18 (13.8%)	6 (4.6%)
INFOQUAL10 The information content meets my needs.	0 (0%)	7 (5.4%)	12 (9.2%)	40 (30.8%)	45 (34.6%)	21 (16.2%)	5 (3.8%)
N=130							

Table 8a above shows that the majority of users perceived that the e-government flagship applications had information quality value. Table 8b below shows the central tendency for each of the items that measured information quality.

Table 8b: Profile of Information Quality Measure

(Measure of Central Tendency)

	Item	Mean	S.E. Mean	Std. Deviation	Variance
INFOQUAL01	The output is presented in a useful format.	4.800	.095	1.081	1.169
INFOQUAL02	I am satisfied with the accuracy of the system.	4.490	.117	1.331	1.771
INFOQUAL03	The information is clear.	4.890	.105	1.196	1.430
INFOQUAL04	The e-government systems is accurate.	4.660	.109	1.242	1.543
INFOQUAL05	The e-government systems provides sufficient information.	4.850	.109	1.246	1.552
INFOQUAL06	The e-government systems provides up-to-date information.	4.560	.110	1.258	1.581
INFOQUAL07	I get the information I need in time.	4.580	.122	1.391	1.935
INFOQUAL08	The e-government systems provides reports that seem to be just about exactly what I need.	4.300	.114	1.304	1.700
INFOQUAL09	The system provides the precise information I need.	4.470	.107	1.221	1.491
INFOQUAL10	The information content meets my needs.	4.580	.101	1.147	1.314
	Average information quality score	4.62	.091	1.033	1.069
N=130					

Based on Table 8b, all variables that measure information quality show that the mean is above 4.0. The average score for information quality is also above 4.0 (mean=4.62, SD= 1.033).

The profile of the service quality measure is in Table 9a and 9b.

Table 9a: Profile of Service Quality Measure

	Strongly Disagree	Disagree	Slightly Disagree	Neutral	Slightly Agree	Agree	Strongly Agree
SERVQUAL01 Give prompt service.	1 (0.8%)	2 (1.5%)	13 (10.0%)	29 (22.3%)	39 (30.0%)	41 (31.5%)	5 (3.8%)
SERVQUAL02 Are always willing to help.	0 (0%)	1 (0.8%)	4 (3.1%)	20 (15.4%)	52 (40.0%)	44 (33.8%)	9 (6.9%)
SERVQUAL03 Are consistently courteous to me.	0 (0%)	1 (0.8%)	4 (3.1%)	34 (26.2%)	52 (40.0%)	32 (24.6%)	7 (5.4%)
SERVQUAL04 Have the knowledge to answer my questions.	0 (0%)	2 (1.5%)	11 (8.5%)	23 (17.7%)	44 (33.8%)	43 (33.1%)	7 (5.4%)
SERVQUAL05 Give me personal attention.	0 (0%)	3 (2.3%)	11 (8.5%)	39 (30.0%)	37 (28.5%)	35 (26.9%)	5 (3.8%)
SERVQUAL06 Understand my needs and those of my work group.	0 (0%)	1 (0.8%)	8 (6.2%)	39 (30.0%)	41 (31.5%	33 (25.4%)	8 (6.2%)
SERVQUAL07 Deliver when they promise to do something.	1 (0.8%)	4 (3.1%)	11 (8.5%)	32 (24.6%)	41 (31.5%)	36 (27.7%)	5 (3.8%)
SERVQUAL08 Show sincere interest in solving problems encountered by myself or others in my work group.	0 (0%)	3 (2.3%)	5 (3.8%)	39 (30.0%)	40 (30.8%)	33 (25.4%)	10 (7.7%)
SERVQUAL09 Perform services right the first time.	0 (0%)	1 (0.8%)	12 (9.2%)	32 (24.6%)	49 (37.7%)	29 (22.3%)	7 (5.4%)
N=130							

It is observed from Table 9a that the majority of users perceived that generally they were receiving quality services from IT units in lead implementing agencies. Table 9b below shows the central tendency for each of the items that measured service quality.

Table 9b: Profile of Service Quality Measure

(Measure of Central Tendency)

	Item	Mean	S.E. Mean	Std. Deviation	Variance
SERVQUAL01	Give prompt service. *(responsiveness)*	4.890	.102	1.163	1.353
SERVQUAL02	Are always willing to help. *(responsiveness)*	5.240	.084	.955	.912
SERVQUAL03	Are consistently courteous to me. *(assurance)*	5.010	.084	.960	.922
SERVQUAL04	Have the knowledge to answer my questions. *(assurance)*	5.050	.096	1.099	1.207
SERVQUAL05	Give me personal attention. *(empathy)*	4.810	.098	1.114	1.242
SERVQUAL06	Understand my needs and those of my work group.*(empathy)*	4.930	.093	1.058	1.119
SERVQUAL07	Deliver when they promise to do something. *(reliability)*	4.820	.103	1.180	1.392
SERVQUAL08	Show sincere interest in solving problems encountered by myself or others in my work group.*(reliability)*	4.960	.097	1.110	1.231
SERVQUAL09	Perform services right the first time.*(reliability)*	4.880	.093	1.057	1.117
N=130					

All the variables that measure service quality show that the mean is above 4.0. The average score for service quality is also above 4.0 (mean=4.953, SD= .922). The IT divisions in lead implementing agencies were perceived as having higher intensity in responsiveness and assurance than in other service characteristics (e.g. reliability and empathy). This is as evident in three variables that demonstrate scores above 5.0.

4.3 A comparative study of the six application systems

In order to assess the relative success of the six application systems within the study, an analysis of how each application system performed on each of the four dimensions was undertaken. The mean score for application system was computed and the results are shown in Table 10. The data in Table 10 are shown graphically in a radar diagram (Figure 3) as departures from the overall mean of each of the four dimensions.

Table 10: E-government flagship application system on four dimensions

Application System	Success Dimensions			
	User Satisfaction	System Quality	Information Quality	Service Quality
E-services	4.07	4.36	4.33	5.12
PMS	5.57	5.33	5.03	5.38
GOE	4.83	4.44	5.12	5.07
HRMIS	4.54	4.67	4.41	4.72
ELX	4.97	5.06	4.18	5.07

E-procurement	4.27	4.87	4.54	4.47
Total mean	4.77	4.80	4.62	4.88

Figure 3: Radar diagram depicting relative application system performance on the four dimensions

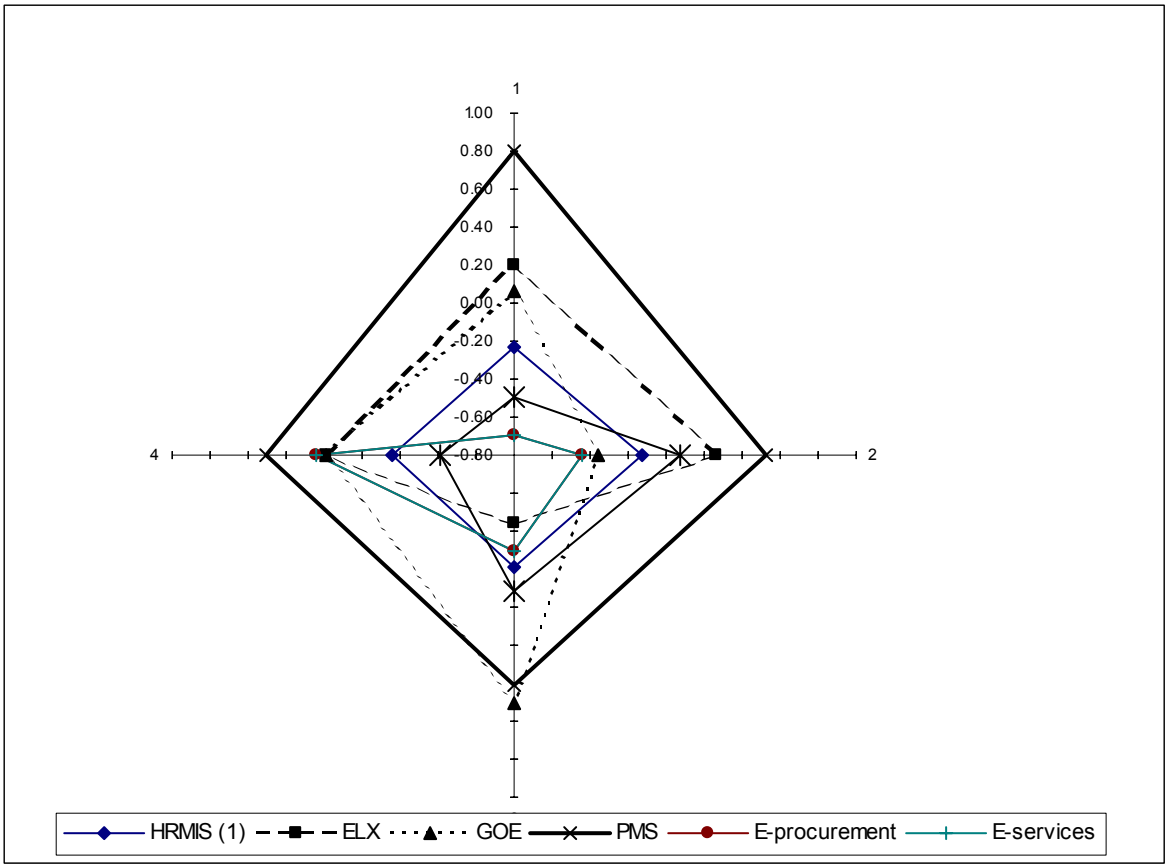


Figure 3 shows that the Project Management System (PMS) outperformed the mean score in all four dimensions. On the other hand, the mean scores for all dimensions Human Resource Management Information System (HRMIS) were below the total mean scores. Furthermore, the mean scores for three dimensions in E-services and E-procurement were below the total mean scores.

A further analysis was run to identify the differences that existed among the two groups i.e. group 1 consisting of HRMIS, E-services and E-procurement; group 2 comprising PMS, ELX and GOE. The results are in Table 11.

Table 11: Identifying Differences between Groups (using *t*-test)

Key Variables	Degrees of Freedom	2-tailed Significance	Are they significant at the 95% level?
The e-government systems adequately meets the information processing needs of my area of responsibility.	128	.019	Significant
The e-government systems is efficient.	128	.001	Significant
The e-government systems is effective.	128	.000	Significant
Overall, I am satisfied with the e-government systems.	128	.001	Significant
The information is clear.	128	.002	Significant
The e-government systems is accurate.	128	.043	Significant

The e-government systems provides sufficient information.	128	.005	Significant
The information content meets my needs.	128	.013	Significant

Table 11: Identifying Differences between Groups (using *t*-test) .. cont.'

Key Variables	Degrees of Freedom	2-tailed Significance	Are they significant at the 95% level?
Give prompt service. *(responsiveness)*	128	.037	Significant
Are always willing to help. *(responsiveness)*	128	.005	Significant
Are consistently courteous to me. *(assurance)*	128	.035	Significant
Have the knowledge to answer my questions. *(assurance)*	128	.015	Significant
Give me personal attention. *(empathy)*	128	.011	Significant
Deliver when they promise to do something. *(reliability)*	128	.001	Significant
Show sincere interest in solving problems encountered by myself or others in my work group.*(reliability)*	128	.005	Significant

The *t*-test analysis revealed that there were significant differences between the two groups in terms of user satisfaction, some aspects of information quality in particular accuracy, sufficiency and clarity of information as well as all dimensions of service quality of the IT function.

5. CONCLUSIONS

This paper began with the research question:

What is the internal users' perceived success of Malaysia's e-government flagship applications in the lead implementing agencies?

In order to answer the above research question, the study had used the DeLone and McLean (2003, 2004) up-stream model of e-commerce success to evaluate Malaysia's flagship applications. The research findings demonstrate that end-users in lead implementing agencies generally perceived that Malaysia's e-government systems were successful. However, there is some variability in perceived relative success of each application. The majority of end-users of PMS, ELX and GOE indicated higher satisfaction and higher value in information quality and service quality compared to those for E-services, E-procurement and HRMIS. This research contributes to theoretical knowledge in that the findings from correlation analysis show that the up-stream model of e-commerce success can be used to evaluate Malaysia's e-government flagship applications. Furthermore, the measures show internal consistency in Malaysia's public sector; which support previous studies. The research contributes to practical knowledge in at least the following ways: (i) it enhances our knowledge and understanding in the status of Malaysia's flagship applications from the internal users' perspective as to the best of the authors' knowledge there has been no similar published articles that had discussed this matter (ii) it provides us with a base of evidence towards continued improvement for the flagship applications. The tools used could give public managers an insight on a clear view of the issues that were needed to focus to deliver ultimate satisfaction to the internal users. This includes the applications and services rendered by IT staff. The following limitations of the study are acknowledged: (i) the study examined only the perspective of internal users' in lead implementing agencies (ii) the survey research approach only identified variability that exists among users of PMS, ELX, GOE, E-services, E-procurement and HRMIS. Future studies should strive to examine internal users in other than lead implementing agencies or external users' perspectives such as business owners for e-procurement applications or citizens who are job seekers for electronic labor exchange application. Also, future studies could take on case studies and interview approaches to understand reasons or specific issues that account for variability in users' perception of each flagship application.

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