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# **An Empirical Application of Delone and Mclean Model In Evaluating Decision Support System In The Banking Sector of Oman**

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## **ABSTRACT**

*Banks are investing a huge amount on information systems to provide fast services to their customers and to stay competitive. Therefore it becomes necessary to measure the success of these systems. The main objective of this study is to assess the applicability of DeLone and McLean model of information systems in evaluating decision support system in the banking sector of Oman and to check the relationship among variables of the model. In order to achieve the objectives, data was collected from the managers and assistant managers using decision support system in the banks of Oman. Hypotheses were tested using correlation analysis. The results found that most of the relationships between the constructs were supported. System quality, information quality and service quality had a direct positive association with user satisfaction. User satisfaction influenced individual impact positively. The findings supported DeLone and McLean model and suggested its applicability in the evaluation of decision support system in the banking sector.*

## **INTRODUCTION**

It is important to evaluate the information systems to find out their effectiveness in the organizations (Davis, 2005). Literature indicates that information systems evaluation is a critical issue (Kim, 1999). Investment in the information system is comprised of intangible benefits (Powell, 1992) and benefits in these investments can be realized in the long term only (Saarinen, 1994). Decision support systems are a type of information system and are important for the organizations. Decision support systems assist in daily operations and banks are using different types of decision support systems in different departments. Banks need these systems to remain competitive in the market and to make better decisions. Banks invest huge amount for the implementation of decision support system. Therefore it becomes more important to evaluate the decision support systems. Many models have been developed in the past to measure the success of these systems. Among all the models, DeLone and McLean model of information success is the most comprehensive model available in the literature (Brown, 2008). The DeLone and McLean model has been theoretically and empirically evaluated by many studies and has been tested for its applicability in the various sectors. It has also gained wide acceptance among the researchers. Therefore this model is selected to be used in the current study. The main objective of this study is to assess the applicability of DeLone and McLean model in the banking sector to

evaluate the decision support system success at the individual level and to check the relationship between the variables being used in the model.

## LITERATURE REVIEW

Many studies were carried out using DeLone and McLean model of information systems (Ramdan, 2014; Romi, 2013; Khayun, 2012). In the banking sector empirical studies have been carried using DeLone and McLean model (Aburas, 2013; Vannirajan, 2009; Hussein, 2009; Mashhour, 2008). Most of the studies were on electronic banking (Okechi, 2013; Olatokun, 2012; Andoh-Baidoo, 2010; Zhu, 2010). Few studies were carried on mobile banking (Koo, 2013; Koo, 2010; Masrek, 2012; Saleem, 2011). Okechi (2013) in his study showed that ATM was the most heavily used and customers were not satisfied by the service quality of ATM and banks should encourage their customers to use ebanking. In another study by Aburas (2013) found that level of information services provided to the customers was an important and critical factor to affect perceived quality. Results of study by Koo (2013) indicated that trust in e-banking was associated with customer satisfaction.

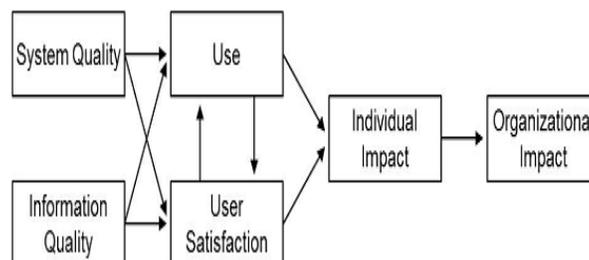
Few studies were carried in decision support system field also. Elbeltagi et al. (2005) in their study on factors affecting DSS usage by managers in Egypt found that to affect the DSS usage were perceived ease of use (PEU) and perceived usefulness (PU). In a study on satisfaction with web based decision support systems, Bharati et al. (2004) found that main factors to impact decision making satisfaction were information quality and system quality.

Literature provides evidence that studies in the context of decision support system in the banking sector especially Sultanate of Oman are not available. This study tries to fill in the existing gap. This study will also contribute to the existing body of the literature by providing insight into the factors affecting decision support system in the banks. It will also help banks to know about the areas of improvement and also lead them to utilize the systems properly.

## RESEARCH MODEL AND HYPOTHESIS

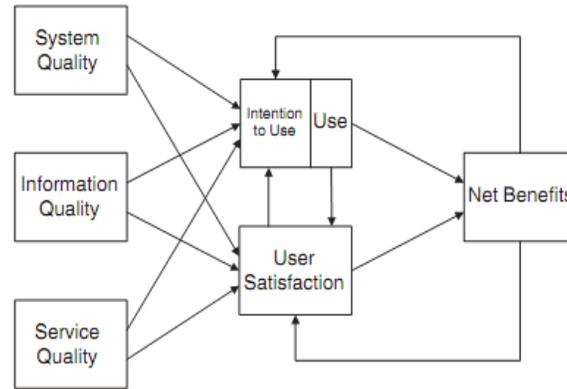
DeLone and McLean (1992) developed a model to identify the factors of information systems success (DeLone W. a., 1992, 2003). DeLone and McLean reviewed the prior research on information systems. The research prior to the development of this model was not consistent. DeLone and McLean organized the research work done before and developed a model of IS success. They identified six main dimensions of IS success: information quality, system quality, use, user satisfaction, individual impact and organizational impact. Figure given below depicts the model.

**Figure 1: DeLone and McLean Model (1992) of IS success.**



This model was updated in year 2003 by including Service Quality dimension and replacement of individual impact and organizational impact by net benefits. The six dimensions of new model were: System quality, information quality, service quality, usage, user satisfaction and net benefits. The figure below depicts the updated model.

**Figure 2: Updated DeLone and McLean Model (2003) of IS success.**



The arrows indicate the associations among these success dimensions. According to the context of the study, the casual relations among dimensions should be hypothesized (DeLone and McLean, 2003). Following hypothesis are proposed to answer the research questions and in relation to the context of present study:

- H1a: A positive relationship exists between system quality and system use of decision support system in the banking sector.**
- H1b: A positive relationship exists between system quality and user satisfaction of decision support system in the banking sector.**
- H2a: A positive relationship exists between perceived information quality and system use of decision support system in the banking sector.**
- H2b: A positive relationship exists between perceived information quality and user satisfaction of decision support system in the banking sector.**
- H3a: A positive relationship exists between perceived service quality and system of decision support system in the banking sector.**
- H3b: A positive relationship exists between perceived service quality and user satisfaction of decision support system in the banking sector.**
- H4a: A positive relationship exists between system use and user satisfaction of decision support system in the banking sector.**
- H4b: A positive relationship exists between system use and individual impacts of decision support system in the banking sector.**

**H5: A positive relationship exists between user satisfaction and individual impacts of decision support system in the banking sector.**

**RESEARCH DESIGN AND METHOD**

*Measures of constructs*

The items chosen for the constructs were adapted from the previous studies. Doll and Torkzadeh (1988) instrument having 12 items was used to measure system quality and information quality. To measure service quality, SERVQUAL instrument containing 22 items developed by (Parasuraman, 1988) was used. To measure system use, instrument developed by Igbaria et al. (1989) containing 4 items was used. Responses ranged from "not at all" to "great extent". To measure user satisfaction Seddon and Yip (1992) instrument containing four items was used. Instrument developed by Doll and Torkzadeh (1999) with 12 items was used to measure individual impact. Prior studies in this research area had adapted 5-Likert scale and this research is adapted from previous studies so to remain consistent in this study Likert scales (1-5) ranging from "strongly agree" to "strongly disagree" was used for all the questions. SPSS 21.0 was used for data analysis.

**DATA COLLECTION**

The Sultanate of Oman has four Governorates namely Muscat, Dhofar, Musandam and Al Buraymi. It was not possible to cover all the four Governorates for data collection. So keeping this in mind in this study convenience sampling technique was used. Banks located in Muscat Governorate were included in this study. To test the decision support system success in the banking sector and the hypotheses, data was collected from the managers of various departments, branch managers and assistant managers of the banks using a questionnaire. 405 questionnaires were distributed in all and 335 were collected back. 28 questionnaires were incomplete and were discarded. The total number of useable questionnaires was 307.

*Respondent's profile*

Demographic data from Table 1 show that most of the respondents are male (63.5%), 43.3% are in the age group of 30-39 years, 49.5% are having bachelor degree. Most of the (41.7%) employees are in the banking sector from 6-10 years and 45.9% are working in the same bank from last 6-10 years.

**Table 1: Demographic data of respondents.**

Gender		Male	Female					Total
	number	195	112					307
	%	63.5	36.5					100
Age		20-29	30-39	40-49	>=50			
	number	23	133	95	56			307
	%	7.5	43.3	30.9	18.2			100
Education		High School	Diploma	Bachelor	Master			
	number	8	106	152	41			307

	%	2.6	34.5	49.5	13.4			100
Length of service in the banking industry		<1 year	1-5 years	6-10 years	11-15 years	16-20 years	>20 years	
	number	1	37	128	82	39	20	307
	%	3	12.1	41.7	26.7	12.7	6.5	100
Length of service in the current bank		<1 year	1-5 years	6-10 years	11-15 years	16-20 years	>20 years	
	number	4	76	141	67	20	5	307
	%	1.3	22.8	45.9	21.8	6.5	1.6	100

Source : Survey

## DATA ANALYSIS

### *Item reliability test*

From the table 2 given above we can see that the values of alpha for the constructs were as follow: system quality .770, information quality .805, service quality .805, system use .693, user satisfaction .836 and individual impact .875. From these results it is concluded that the value of alpha coefficient for all the constructs are acceptable and the items belonging to these constructs have good internal consistency. The results from table 2 also show that the corrected-item total correlation for all the items of these six constructs is more than 0.3 and it indicates that these items are highly reliable except for first two items of system use. Cronbach's alpha if item deleted will not go up for these two items if deleted so these items were retained for further analysis.

**Table 2: Cronbach's alpha values.**

Construct	Cronbach's alpha
System quality	.770
Information quality	.805
Service quality	.805
System use	.693
User satisfaction	.836
Individual impact	.875

### *Testing hypothesis*

To test the hypothesis Pearson's correlation analysis was performed. Pearson correlation coefficient is used to measure the strength of the relationship between variables. It is represented by r. Here in this study we have tried to measure the relationship between model variables so Pearson's correlation was done. Table 3 gives the results obtained from Pearson's correlation analysis.

**Table 3: Correlation matrix of the constructs.**

		System use	User satisfaction	Individual impact
System quality	Pearson Correlation	.030	.363**	---
	Sig. (2-tailed)	.601	.000	
Information quality	Pearson Correlation	.086	.426**	---
	Sig. (2-tailed)	.132	.000	
Service quality	Pearson Correlation	.076	.256**	---
	Sig. (2-tailed)	.183	.000	
System use	Pearson Correlation	---	-.107	.004
	Sig. (2-tailed)		.060	.942
User satisfaction	Pearson Correlation	---	---	.555**
	Sig. (2-tailed)			.000

\*\* . Correlation is significant at the 0.01 level (2-tailed). N=307

According to the results from Table 3 it is apparent that there is no significant relationship between system quality and system use ( $r=.030$ ,  $p=0.601$ ) and it does not support H1a. So we can say that system quality does not influence system use. Further results from the table given above it is seen that there exists a significant direct association between system quality and user satisfaction ( $r=0.363$ ,  $p=0.000$ ) of decision support system in the banking sector. This result support H1b and we can say that system quality positively influence user satisfaction with decision support system in the banking sector.

Statistical results from the table 3 display that there is no significant relationship between information quality and system use ( $r=0.086$ ,  $p=0.132$ ) and hypothesis H2a is not supported. Further results of Pearson correlation from table 3 show that there is a positive relationship between information quality and user satisfaction ( $r=0.426$ ,  $p=0.000$ ). So hypothesis H2b is supported and it is concluded that information quality influences user satisfaction of decision support system in the banking sector.

Hypothesis H3a is not supported by the statistical values ( $r=0.076$ ,  $p=0.183$ ). So we can say that there is no significant correlation between service quality and system use of decision support system in the banking sector. Hypothesis H3b is supported by the results from table 3 ( $r=0.256$ ,  $p=0.000$ ) and we can say that there is direct positive association between service quality and user satisfaction of decision support system in the banking sector.

The statistics from table 3 indicate that there is marginal significant correlation between system use and user satisfaction ( $r=-.107$ ,  $p=0.060$ ) and we can say that hypothesis H4a is not supported by the statistical data.

Furthermore there is no significant correlation between system use and individual impacts of decision support system in the banking sector ( $r=0.004$ ,  $p=0.942$ ) and hypothesis H4b is not supported by the

Hypothesis H5 states that user satisfaction influences individual impacts of decision support system in the banking sector and is also supported by the results from table 3. The value of  $r$  is 0.555 and is significant ( $p=0.000$ ). This supports hypothesis H5. So user satisfaction impacts individual of decision support system in the banking sector.

## CONCLUSION

DeLone and McLean's model (2003) applicability in the banking industry is studied. Research hypothesis were proposed. Data was collected from managers of various departments, branch managers and assistant managers who were working with decision support system in the banks. Correlation analysis results supported hypothesis and relationships were found significant. Few relationships of the model were not significant. System use did not have significant relationship with system quality, information quality, service quality, user satisfaction and individual impact. System quality, information quality and service quality had significant relationship with user satisfaction. Also user satisfaction was found to have significant positive relationship with individual impact. So it can be concluded that increased user satisfaction for decision support system led to increase impact of system on the users. This study also contributed by finding the applicability of DeLone and McLean model in the banking sector of Oman.

Review of reports can also give insight on the trend of usage of these systems. Also interviewing the managers and assistant managers may lead to know better about their satisfaction with the decision support systems.

The main limitation of this study was that only local banks from Muscat Governorate were included. In future this study can be extended to the foreign banks as well. Another scope of extension for this study would be to include banks from all the Governorates of Sultanate of Oman.

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## **APPENDIX**

### **Measures of constructs**

Respondents were asked to give their responses for each scale item using a 5-point scale (1=strongly agree, 5= strongly disagree)

#### **A. System Quality**

1. The DSS provides precise information that you need.
2. The DSS content meets your need.
3. The DSS provides reports that seem to be just about exactly what you need.
4. The DSS provides sufficient information.
5. The DSS is user friendly.
6. The DSS is easy to use.

#### **B. Information quality**

1. The DSS is accurate.
2. You are satisfied with the accuracy of the DSS.
3. The DSS present's output in a useful format.
4. The information is clear.
5. You get the information that you need in time.
6. The DSS provides up-to-date information.

#### **C. Service quality perception regarding the IT department**

1. IT department has latest hardware.
2. IT department's physical facilities are visually appealing.
3. IT department employees are neat appearing.
4. Physical facilities of IT department associated with the service are visually appealing.
5. When IT department promises to do something by a certain time, it does so.
6. When users have a problem, IT department shows a sincere interest in solving it.
7. IT department performs the service right the first time.
8. IT department provides the services at the first time it promises to do so.

9. IT department insists on error-free records.
10. Employees of IT department will tell users exactly when services will be performed.
11. Employees of IT department give prompt service to users.
12. Employees of IT department are always willing to help users.
13. Employees of IT department are never too busy to respond to user requests.
14. The behaviour of IT department employees instils confidence in users.
15. Users feel safe in their transactions with IT department employees.
16. Employees of IT department are consistently courteous with users.
17. Employees of IT department have the knowledge to answer user's questions.
18. IT department gives users individual attention.
19. IT department has operating hours convenient to all its users.
20. IT department has employees who give users personal attention.
21. IT department has user's best interests at heart.
22. Employees of IT department understand the specific needs of its users.

#### **D. Usage of DSS**

1. On an average working day usage of DSS (measures were time slots in hours).
2. On average frequency of DSS use (measures were from several times a day to almost never).

#### **Measures for the following question ranged from not at all to almost never**

3. With respect to the requirements of your current job extent of DSS use to perform the following tasks
  - (i) Looking for trends of historical reference
  - (ii) Finding problems
  - (iii) Planning
  - (iv) Budgeting
  - (v) Communicating with others
  - (vi) Controlling and guiding activities
  - (vii) Making decisions

### **Measures for user satisfaction and DSS impact**

Respondents were asked to give their responses for each scale item using a 5-point scale for user satisfaction with DSS and DSS impact on job. (1=strongly agree, 5= strongly disagree)

#### **E. User satisfaction with DSS**

1. DSS meets the information processing needs of your area of responsibility.
2. DSS is efficient.
3. DSS is effective.
4. Overall, your satisfaction with DSS.

#### **F. DSS impact**

1. DSS application saves my time.
2. DSS application increases my productivity.
3. DSS application allows me to accomplish more work than would otherwise be possible.
4. DSS application helps me create new ideas.
5. DSS application helps me come up with new ideas.
6. DSS application helps me try out innovative ideas.
7. DSS application improves customer service.
8. DSS application improves customer satisfaction.
9. DSS application helps me meet customer needs.
10. DSS application helps management control the work process.
11. DSS application improves management control.
12. DSS application helps management control performance.