

MEASURING SUCCESS OF ACCOUNTING INFORMATION SYSTEM: APPLYING THE DELONE AND MCLEAN MODEL AT THE ORGANIZATIONAL LEVEL

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ABSTRACT

As Information Technology (IT) grows more advanced and competitive pressures for innovation increase, customary ways of providing stakeholders with information have become insufficient for decision needs. Organizations today need a successful Accounting Information System (AIS) that helps them achieve strategic and business objectives. Therefore, the objective of this research was to examine the possible effect of AIS success factors comprised of system quality, information quality and service quality on organizational impact with special reference to the listed Jordanian firms. To that end, our research model has been built upon the DeLone and McLean (D&M) model as a theoretical basis to measure AIS success. A total of 192 questionnaires were distributed to 192 firms listed in the Amman Stock Exchange (ASE) until the end of 2019, out of which 117 answers were valid for further analysis. The research findings showed that system quality, information quality and service quality success have an effect and strong relevance in AIS success at the organizational level. These findings confirmed the validity of the D&M model at the organizational level in the specific context of AIS as a mandatory system. Eventually, it can be inferred from our findings that Jordanian firms can improve their performance and realize organizational benefits by the quality of system, information and service.

Keywords: *Accounting Information System, Amman Stock Exchange, DeLone and McLean Model, Organizational Level.*

1. INTRODUCTION

Traditionally, an AIS involves the collection, storage, and processing of financial and accounting data used by internal users to report information to investors, creditors and tax authorities. It is generally a computer-based method for tracking accounting activity in [1]. In today's business environment, business organizations are adopting the AIS to assist stakeholders both from within the firm as manager and external sources such as government agencies, investors, banks and others for the purposes of making decisions in the field of economics [2]. Romney and Steinbart [3] revealed that the AIS is a system that processes the data to provide information for users to plan, manage, and operate their businesses. In this case, this system helps management in the planning and control process by providing information that is relevant and reliable for decision-making [4], [5]. Similarly,

the fundamental purpose of AIS is to provide accounting information to external parties, the operational and management personnel.

Accounting information help firms make investment decisions, monitor activity, evaluate performance and as a measure for the purposes of the regulation (regulatory measures) [6]. Undoubtedly, organizations today require to measure and evaluate the benefits and costs of IS to justify the expenditure and its contribution to the competitiveness, quality, and productivity of the organization [7], [8]. This is because organizations are facing unprecedented challenges and demands, such as economic conditions and fierce competition, globalization, and a rapidly changing environment that creates pressures to cut costs [9]. Therefore, measuring AIS effectiveness or success is important to understand its efficacy and value [10].

However, researchers and practitioners are still wrestling with the question of which dimensions best stand for AIS successful implementation [11], [12]. In an early attempt, DeLone and McLean [13] proposed a model to measure Information System (IS) success. The model includes six dimensions, which are system quality, information quality, service quality, system use, user satisfaction and net benefits. It is worth mentioning that the considered model is the most valid theoretical basis for use in IS effectiveness or success context for many reasons. First, it is a comprehensive evaluation framework where the suggested association has been validated by several empirical studies [14], [15]; second, there are many validated measures that can be reused to evaluate the suggested success dimensions [8], [16]; third, it is also currently the dominant measure model in the IS success area [15], [17]; and finally, some researchers argue that the model can be applied at multiple analysis levels based on the purpose and objective of the proposed study [18], [19].

Although prior studies that have used this model have increased the understanding of the success factors, more attention seems to be placed on measuring general IS rather than specific IS such as the AIS [9], [10]. Furthermore, most empirical studies used this model to address the individual level instead of organizational [8], [18] and [20]. Consequently, a need exists for more understanding of the relationships among D&M model dimensions from an organizational perspective within the context of the AIS environment. Based on our knowledge, no research has tested the relationship among system quality, information quality, service quality measures, and their combined effects on organizational impact of AIS in the Arab world, especially in Jordan. Therefore, this research aims to fill this gap highlighted by focusing on the specific type of IS, which is AIS. This research, hence, used D&M as a theoretical basis to measure AIS success at the organizational level from listed Jordanian firms' perspective. The remaining paper sections include the D&M IS success model (Section 2), research model and research hypotheses (Section 3) followed by research methods (Section 4). Section 5 presents the research results and discussion of results. Lastly, conclusions, implications, and recommendations for future research are provided in section 6.

2. THEORETICAL BACKGROUND

The success or effectiveness of IS has been widely discussed in the past two decades. As systems and technologies are being developed and improved, their success and measurements of their success have been continuously debated by practitioners and researchers [21]. Many studies have tried to identify the factors or the courses of action that positively contribute to system success or the probability of successful implementation. Factors that affect the success of IS are user satisfaction [22], [23]; system quality [24]; system use [25], [26], [27]; quality of decision making [28]; and project, service, and economic success [29].

However, early studies to define success of IS were ill-defined due to the complex and multi-dimensional nature of IS success. To address this problem, DeLone and McLean [30] conducted a review of the research published during the period 1981–1990 and created a taxonomy of IS success (see Figure 2). They suggested that system quality and information quality individually and jointly influence use and user satisfaction. Moreover, system use can influence user satisfaction as well as the reverse. These two factors are antecedents of individual impact and eventually have an organizational impact [30].

The description and measures of these six constructs are as follows. System quality refers to system performance itself such as ease of use, system flexibility, system reliability, and ease of learning. Information quality denotes the quality of the system output in terms of relevance, accuracy, completeness and reliability. Use is defined as the frequency with which a system is used such as the amount of connecting time, the number of functions used and frequency of access. User satisfaction represents the satisfaction level of system users including interface satisfaction and overall satisfaction, etc. Individual impact refers to measuring the influences brought about by the IS on system users, including improve decision making and productivity. Organizational impact requires the measurement of the changes caused by the IS to the organization, such as savings in labor costs, decreases in operating costs and growth in profits.

These dimensions were known as a multidimensional model with interdependencies between the success categories. However, several

researchers proposed including more dimensions in the model (e.g. [31], [32]). Seddon [31] criticized the D&M model and claimed that IS use is not a success factor and directions from individual and organizational benefits should be opposite to satisfaction. He also replaced system use with perceived usefulness. Others observed that the different common IS success factors are particularly focused on the products provided rather than services provided by the IS function and suggested to add service quality [33]. Furthermore, many researchers argued that the IS has an impact on multiple levels such as customers [34], society [31] and workgroups [35] not only on individual and organizational level.

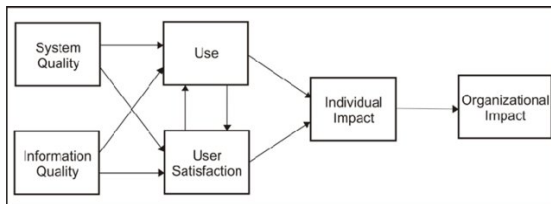


Figure 1: DeLone and McLean (1992) Model

Ten years after the publication of the original D&M model, DeLone and McLean [13] proposed an updated IS success model (see Figure 2). The differences between the original and the updated model: first, adding service quality to reflect the service and support importance in e-commerce systems success; second, adding intention to use to measure user attitude as a measure of use; third, adding feedback links to reflect IS impact; lastly, collapsing individual impact and organizational impact into a parsimonious net benefits.

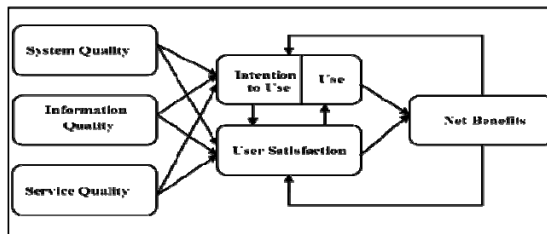


Figure 2: DeLone and McLean (2003) Model

This model provides a valuable framework for understanding the relationship of the multi-dimensionality of IS success and has been tested and validated by several researchers in different levels and contexts. For example, Livari performed research to examine this model on the AIS in Finland [36]. Results indicated that information quality has no impact on system use. No links was found between variable of use and user satisfaction,

an indication that these variables had no mutual influence over each other. The use of mandatory IS cannot be used to measure the satisfaction of the system users. This is because satisfaction is an attitude coming from within and did not occur because of coercion such as the implementation of mandatory AIS.

Likewise, prior studies argued that through system quality and information quality can user satisfaction be assessed [37], [18], [38], [39] and [40]. On the other hand, system use is does not relevant dimension of IS success in case of a mandatory system [18], [19], [38], [39], [41] and [36]. Although D&M suggested feedback loops to quality factors [9], we also excluded these links since the nature of our research is a cross-sectional survey. From this point, we seek to examine the effect of AIS success factors, namely system quality, information quality and service quality on organizational impact of listed Jordanian firms according to the D&M model.

3. RESEARCH MODEL AND HYPOTHESES

The model for this research (see Figure 3) was built on the success model of DeLone and McLean information system. As noted above, our research adopted the model because it has been tested and validated by several researchers in the IS studies and was found to be appropriate for both conceptual and empirical research. In this research, however, we modified the D&M model by excluding intermediated dimensions (i.e. system use and user satisfaction). This is because the listed Jordanian firms have already implemented AIS, thus these dimensions are not relevant dimensions in case of mandatory systems. Therefore, three major hypotheses were proposed to investigate the relationship among research variables. The variables are system quality, information quality and service quality as independent variables and organizational impact as a dependent variable.

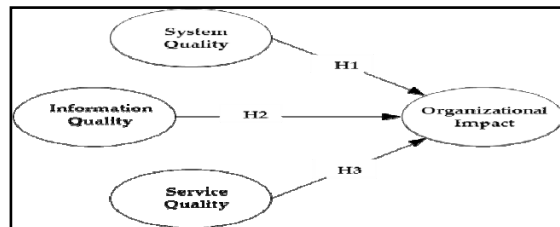


Figure 3: The Research Model

The following sub-sections discuss our hypotheses details:

3.1 System Quality

One well-researched factor to the IS success is system quality. DeLone and McLean [30, p.64] defined it as “measures of the information processing system itself”. Since early days, researchers have tested the technique aspects of the system such as response time, reliability, accuracy and flexibility [13]. However, other researchers investigated human perceptions of the system such as ease of use, learning and access and perceived usefulness [9]. These measures were classed by D&M under the name system quality. As a dimension of their model, it is critical that the system is well implemented and accepted by users in order for the companies to reap both financial and non-financial benefits [18]. Therefore, a system that is well developed from a technically sound point of view has a positive influence on organizational efficiency as shown by [42] in a study including USA entrepreneurial companies, whereas a study of industrial firms in Hong Kong found significant effect on organizational benefits through information quality [18]. Others claimed that a system that enhances business processes by the integration of software is expected to result in increased profitability and help the companies get a better competitive advantage [10]. Thus, we hypothesize:

H1: System quality positively influences the organizational impact.

3.2 Information Quality

Information quality is defined as “measures of information system output” [30, p.64]. Several researchers investigated information generated by the AIS rather than system performance [43]. This is through the information features produced from a system in terms of timeliness, accuracy, formatting, currency, relevance, readability and clarity [8], [9]. The literature provided us much evidence that considered the influence of information quality on the organizational benefits (e.g. [10], [18]). In its natural condition, poor information quality has unfavorable influences on companies at different levels, such as tactical and operational levels [18], [44]. At the tactical level, irrelevant information will have negative influence on the decision-making process resulting in difficult execution and selection of a good business strategy due to delayed or inaccurate information. At the operational level, incomplete information will adversely affect customer and user satisfaction, thus leading to a lack of job satisfaction. Therefore, high information

content in terms of meeting users or customer needs can lead to high organizational benefits including improving decision making and market information support. Consequently, we posit:

H3: Information quality positively influences the organizational impact.

3.3 Service Quality

Originally, the concept of quality service was limited to the degree of discrepancy among clients’ normative expectations for service and their perceptions of service provided [18]. In the mid-1980s, the computing evolution placed companies in the dual role of both information and support and service provider [9]. Based on that, some researchers have suggested adding service quality to the D&M model to assess user’s satisfaction with the support from the IS provider relying on the SERVQUAL instrument (e.g. [45], [46]). This instrument utilizes the dimensions such as responsiveness, reliability, empathy and assurance. Therefore, organizations obtain high and positive benefits from IS service when service providers possess sufficient knowledge and expertise [18]. The benefit levels of users using the system are higher where the IS service providers are seen to be knowledgeable and useful rather than lacking in such features. Other findings show that the IS services provided on time and with error-free performance via the IS department (IS service quality reliability) will lead to an efficient and effective decision-making process that in turn results in increasing the internal organizational efficiency [18], [47]. Hence, our last hypothesis is:

H3: Service quality positively influences the organizational impact.

4. RESEARCH METHODS

The data collection relies on a quantitative research approach by using a survey questionnaire. The questionnaire was developed based on previous research to confirm instrument validity and reliability. Therefore, the questionnaire was split into two parts: the first part of the questionnaire is demographic information, where the second part measures the main variables of research. The variables in this research include: system quality, information quality, service quality and organizational impact. The measurement items used in our questionnaire to measure research variable were adapted from previous studies.

In total, 21 measurement items were used. For system quality we adapted measures from [16]. Measures used for information quality were obtained from [48]. Service quality was measured using five items which were adapted from [49]. The measures used to operationalize the organizational impact came from [39]. A full list of the items used in this research is provided in the Appendix (1). Meanwhile, we used 7 point Likert scale ranged from 1 “Strongly Disagree” to 7 “Strongly Agree”.

Table 1: Characteristics of Respondents

Category	Frequency	%	
Gender	Male	112	95.7%
	Female	5	4.3%
Age	Less 30 years	3	2.5%
	30-40 years	47	40.2%
	41-50 years	60	51.3%
	Over 50 years	7	6%
Educational Level	Diploma	1	0.9%
	Bachelor	86	73.5%
	MSc	26	22.2%
Experience	Master	38	23.2
	Less 1 year	0	0%
	1-3 years	12	10.2%
	4-6 years	38	32.5%
	Over 6 years	67	57.3%

The final questionnaire was forwarded to 192 financial managers operating in Jordanian listed firms on ASE until the end of 2019. These managers have sufficient knowledge of business activities as decision-makers and AIS based on their experiences in utilizing the AIS regularly. Of these, 117 valid answers for subsequent analysis were returned. The descriptive analysis of these respondents is shown in Table 1.

5. RESEARCH RESULTS AND DISCUSSION

This research utilized the Partial Least Squares-Structural Equation Modeling (PLS-SEM) technique for data analysis. The PLS model analyses by two models, which are the measurement model and the structural model [50]. The measurement model was tested based on reliability and validity of convergent and discriminant. Convergent validity is interested in the relationship between the indicators and their associated variables [50]. Discriminant validity

strives to verify that each indicator highly correlates with the associated variable and not with others. For convergent validity, we used Composite Reliability (CR) to test internal reliability. The CR value for each variable should be higher than 0.7 [50], while the items used to measure the variables should be larger 0.7 [50]. Furthermore, Average Variance Extracted (AVE) was used to analyze convergent validity, with acceptable values greater than 0.5 [52]. The outputs of convergent validity are summarized below in Table 2.

Table 2: Results of Reliability and Validity.

Construct	Code	Loading	AVE	CR
System Quality (SQ)	SQ1	0.881	0.912	0.676
	SQ2	0.848		
	SQ3	0.726		
	SQ4	0.863		
	SQ5	0.784		
Information Quality (IQ)	IQ1	0.769	0.888	0.614
	IQ2	0.744		
	IQ3	0.834		
	IQ4	0.811		
Service Quality (SV)	SV1	0.751	0.892	0.625
	SV2	0.780		
	SV3	0.719		
	SV4	0.815		
	SV5	0.877		
Organizational Impact (OI)	OI1	0.859	0.945	0.689
	OI2	0.917		
	OI3	0.868		
	OI4	0.919		
	OI5	0.910		
	OI6	0.895		

For discriminant validity, on the other hand, each variable should have greater variance than other variables [51]. It can be analyzed using three tests, namely Cross Loading (CL), the square root of AVE, known as the Fornell and Larcker Method, and a new test called Heterotrait_Monotrait Ratio of Correlations (HTMT<1). From Table 3, 4 and 5, the results show that all our variables have discriminant validity.

Table 3: The Cross-Loading Results.

Items	IQ	OI	SQ	SV
IQ1	0.769	0.686	0.743	0.566
IQ2	0.744	0.568	0.492	0.448
IQ3	0.834	0.593	0.610	0.480
IQ4	0.811	0.466	0.425	0.351
IQ5	0.756	0.427	0.397	0.217
OI1	0.529	0.859	0.493	0.617
OI2	0.603	0.917	0.543	0.778

OI3	0.596	0.868	0.505	0.639
OI4	0.670	0.919	0.595	0.701
OI5	0.572	0.910	0.523	0.791
OI6	0.630	0.895	0.568	0.660
SQ1	0.610	0.548	0.881	0.398
SQ2	0.480	0.400	0.848	0.303
SQ3	0.458	0.451	0.726	0.413
SQ4	0.473	0.416	0.863	0.314
SQ5	0.747	0.716	0.784	0.601
SV1	0.432	0.477	0.449	0.751
SV2	0.345	0.542	0.298	0.780
SV3	0.517	0.706	0.510	0.719
SV4	0.418	0.572	0.407	0.815
SV5	0.443	0.692	0.391	0.877

Table 4. The Fornell and Larcker Method Results.

Constructs	IQ	OI	SQ	SV
IQ	0.784			
OI	0.720	0.830		
SQ	0.708	0.652	0.822	
SV	0.552	0.773	0.525	0.790

Table 5. The HTMT Ratio Results.

Constructs	IQ	OI	SQ	SV
IQ				
OI	0.791			
SQ	0.747	0.680		
SV	0.614	0.837	0.564	-

The structural model was analyzed to test our research hypotheses. This model included 5 tests: path coefficients, R square, effect size, prediction relevance and lastly goodness of fit. The path coefficients findings are illustrated in Table 6. The results in Table 6 show that OI is positively and significantly ($\beta= 0.333$, $t=3.697$, $p<0.00$) affected by SQ. Consequently, H1 is supported. Moreover, IQ is positively and significantly related to OI ($\beta= 0.148$, $t=2.408$, $p<0.016$), therefore, H2 is supported. Also, H3 is supported because SV is positively and significantly ($\beta= 0.512$, $t=6.423$, $p<0.00$) associated with OI. In general, all the research hypotheses are supported. The total variance of SQ, IQ and TQ accounts for 0.732 of OI, which indicates a strong model proposed [52].

Separately, the effect of SQ (0.039), IQ (0.188) and SV (0.644) represent small, medium and large effects, respectively, as suggested by [53]. Another important test is prediction relevance, which amounted to 0.492, indicating a large predictive ability of our model. Finally, our model

depicted obtained goodness of fit value of 0.69, which means the proposed model has an adequate level of global PLS model validity according to criteria given by [54].

Table 6: Hypotheses Testing Results.

Hypothesis	Std. Beta	t- value	p-value	Decision
SQ → OI	0.333	3.697	0.000	Yes**
IQ → OI	0.148	2.408	0.016	Yes*
SV → OI	0.512	6.423	0.000	Yes**

Significant at $p^* < 0.05$; $p^{**} < 0.0$.

In the light of our findings, we can conclude that system quality has positive effects on organizational impact among listed Jordanian firms. This finding agrees with prior works such as [10], [55]. The necessary prerequisites for realizing organizational benefits are well-designed, implemented, and developed systems that play significant roles to run the organization properly and improve business performance. The benefits derived from high system quality include reduced cost, increased revenues and improved process efficiency.

The findings from empirical data also showed that organizations can enhance their overall performance and objective by quality information. This occurs because information quality causes reduction in the operating cost activities that are external to the system of information processing. High information quality in content context (completeness, accuracy relevance to decision making) can cause high organizational impact in terms and internal organizational efficiency (high-quality decision making) and market information support (i.e., anticipating customer needs). This result is consistent with the research result done by [10], [18], and [56].

Similarly, the results support the relationship between service quality and organizational impact in the context of listed Jordanian firms and is consistent with [18]. A good service quality may help users to define their advantages and disadvantages as well as to assist in making an important enhancement that reflects increasing customer service, overall productivity and satisfaction. Measuring service quality might assist management to provide dependable information that can be used to observe and keep enhanced service quality. Service quality assessment allows management to better understand

various dimensions and how they influence service quality and customer satisfaction.

Hence, it can be concluded that organizational performance can best be influenced by system quality, information quality and service quality can enhance a successful AIS implementation, thus providing for the flow of organizational benefits of listed Jordanian firms. Therefore, policymakers in Jordanian firms should focus on factors that lead to successful AIS implementation so that users feel satisfied, which motivates them to work more devotedly. Eventually, it can be inferred from our findings that Jordanian firms can improve their performance by AIS success factors (i.e. quality of system, information and service).

6. CONCLUSION AND FUTURE RESEARCH

As information technology grows more advanced and competitive pressures for innovation increase, customary ways of providing stakeholders with information have become insufficient for decision needs. Organizations today need a successful AIS that helps them achieve strategic and business objectives. Therefore, measuring AIS success or effectiveness at the organizational level over time is necessary due to continuous technological improvement and development. As discussed before, our research objective is to examine the possible effect of AIS success factors: system quality information quality and service quality on organizational impact with special reference to the listed Jordanian firms in ASE. The empirical evidence confirms the validity the D&M model in a non-US environment, namely Jordan.

The research also expands the literature through investigating the D&M model in the AIS context. Additionally, this research used D&M model to address the organizational level rather than individual level. However, the factors derived in our research may not be generalizable and further research is required to validate the results across other contexts and cultures. Therefore, several recommendations that should be taken into account to conduct future works studies. First, we recommend that future works should incorporate a larger sample size to cover the companies that are not listed in ASE in order to increase the generalizability of our research findings, such as foreign firms working in Jordan. Second, future studies could test the relationship presented in our

research to see if the results are applicable to other developing countries.

Third, a longitudinal survey is recommended for future work to measure the evolving nature of AIS and test the extent of AIS benefits in Jordanian firms. Fourth, it is recommended to conduct a similar study using other research approaches, such as qualitative approach, since it may afford a better understanding and yield more in-depth knowledge of the topic discussed in our research. To provide additional insight, the last recommendation is to expand our model through testing the impact of the training quality, which is a critical factor in the Jordanian context and seldom mentioned as an independent variable in AIS success literature focused at the organizational level.

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Appendix 1. Summary Of The Measurement Items.

Construct	Items Description
System Quality (SQ)	SQ1 Our AIS is reliable.
	SQ2 Our AIS is flexible.
	SQ3 Our AIS is easy to use.
	SQ4 Our AIS is easy to learn.
	SQ5 The response time of our AIS is acceptable.
Information Quality (IQ)	IQ1 Information provided by our AIS is up to date.
	IQ2 Information provided by our AIS is accurate.
	IQ3 Information provided by our AIS is easy to read and understand.
	IQ4 Information provided by our AIS is sufficient for the task at hand.
	IQ5 Information content provided by our AIS meets and fits our needs.
Service Quality (SV)	SV1 The staff of technical support for the AIS is available when we need it.
	SV2 The staff of technical support for the AIS provide assistance with fast service.
	SV3 The staff of technical support for the AIS is empowered to resolve user problems.
	SV4 The staff of technical support for the AIS understand the specific needs of users.
	SV5 When a user has a problem, the staff of technical support for the AIS show sincere interest in solving it.
Organizational Impact (OI)	OI1 Our AIS reduces organizational costs.
	OI2 Our AIS improves overall productivity.
	OI3 Our AIS supports decision making.
	OI4 Our AIS provides us with competitive advantage.
	OI5 Our AIS increases customer service and satisfaction.
	OI6 Our AIS allows for better organizational data exchange.