ASSESSING ONLINE REGISTRATION SYSTEM'S (ORS) SUCCESS: AN APPLICATION OF DELONE AND MCLEAN'S MODEL OF INFORMATION SYSTEMS SUCCESS

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ABSTRACT

The study applied DeLone and McLean's IS success model in the mandatory context of online registration system (ORS) in one Jordanian university. Six dimensions were used to asses ORS success from the perspective of system users, i.e. students (information quality, system quality, service quality, user satisfaction, net benefits and intention to use). Consistent with DeLone and McLean's suggestion, the study focused on the "intention to use", rather than "use", dimension to accommodate the mandatory nature of ORS. Quantitative data was collected, through a questionnaire instrument, from a sample of 1360 undergraduate students studying in different faculties at the university. Statistical analysis of the study's model was conducted using "SmartPLS" software, version 2.0.M3. Empirical analysis has underlined the multidimensional and interdependent nature of ORS success. Furthermore, empirical examination of the model's hypotheses has indicated that students' "intention to use" ORS is dependent on system quality, service quality, user satisfaction and net benefits.

Key Words: *IS success model, mandatory IS, online registration, information quality, system .quality, service quality, user satisfaction, intention to use, net benefits*

1. INTRODUCTION

Motivated by the widespread of Internet and associated information technology (IT), organizations are increasingly turning to provide their products and services electronically. Higher education is one filed where organizations are applying Internet technology in order to provide better, more convenient and less costly services to their customers. Encouraged by the IT know-how of current students generations, universities and colleges are investing considerably in changing the traditional way they operate and deliver services to their students, through applying more contemporary IT enabled systems. Most, if not all, universities worldwide operate their own web sites which contain massive volumes of useful information and provide several services students can benefit from electronically.

In Jordan, the human and technological foundations available in the country have enabled Jordanian universities to rapidly expand their e-services to students. Most Jordanian universities operate their own websites providing different forms of e-services such as e-learning, e-libraries, e-databases and e-mails. Some Jordanian universities have introduced online registration systems (ORS) as an effective alternative to the lengthy traditional registration process. ORS is an information and communication enabled system which allows students to electronically choose the modules they wish to study from those available during any academic term. ORS offers time and place convenience for students, they can register from any where at any time. However, the use of such online service is usually involuntary, and students are required to handle ORS by themselves regardless of their IT know-how levels. Hence, the success of such online service depends on the degree of comfort that users, i.e. students, feel with the technology-based interactions between them and their own universities. However, no empirical attempts have been made, in the Jordanian context, to assess the degree of success such online service has achieved.

The purpose of this study is to assess ORS success in one Jordanian university applying the "IS success factors" model developed and updated by DeLone and McLean (1992, 2003). Since its establishment in 1992, more than 300 refereed articles have been reported to site and test this model (Vaidya, 2007). The model might provide a practical way to evaluate user satisfaction and impacts of that satisfaction on the use/use intentions of information systems (Hellsten and Markova, 2006). Hence, while applying the IS success factors model, the study aims to introduce a practical model fit to the mandatory context of ORS.

II. DELONE AND MCLEAN "IS SUCCESS FACTORS" MODEL

Over the past three decades, evaluating the value and success of IT systems for organizations has been a recurring issue (Infinedo, 2007). Researchers have relied on several theoretical models to explain such systems success (Infinedo, 2006; Vaidya, 2007). Noticeably, DeLone and McLean's "IS success factors" model, figure 1, stands out as one of the most empirically applied models in the IS success measurement domain.

As underlined in figure 1, the "IS success factors" model categorized IS success into six dimensions; System Quality, Information Quality, Use, User Satisfaction, Individual Impact and Organizational Impact. The dimensions of system and information quality affect the dimensions of use and user

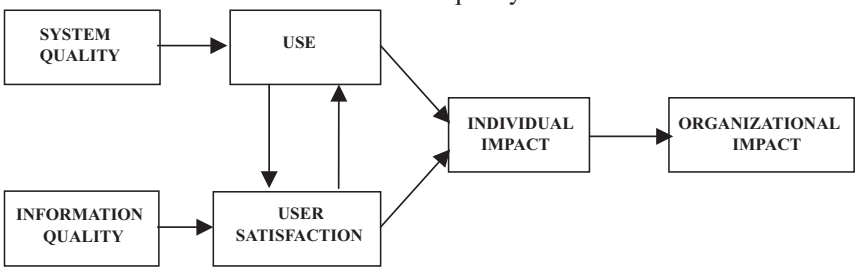

Figure 1: Delone and Mclean's Model (1992)

satisfaction, respectively. Furthermore, use and user satisfaction affect each other while both also affect the dimension of individual impact and finally, individual impact affects organizational impact (Daskalakis and Mantas, 2008). Since its introduction in 1992, the "IS success factors" model has witnessed extensive application and refinement in different contexts (e.g. Almutairi and Subramanian, 2005; Qian and Bock, 2005; Rosemann and Vessey, 2006; Kulkarni et al, 2006; Sedera, 2006; Chae, 2007; Seen et al, 2007). Continuous refining and development of the model's various dimensions support its authority (Stockdale and Porovickaa, 2006) and strengthens its validity and reliability (Vaidya, 2007). Hence, the "IS success factors" model provides a good framework for identifying and developing different measures to assess IS success (Hellsten and Markova, 2006).

Based on research contributions since its introduction, in addition to changes in the role and management of information systems, DeLone and McLean (2003) updated the original "IS success factors" model they introduced in 1992. They added service quality as one important dimension to accommodate the emergence of end user computing (DeLone and McLean, 2003), and to reflect the importance of service and support in successful e-commerce (Wu and Wang, 2006) and other web-based interactive systems. In addition, they added "intention to use" as an alternative measure to the "use" dimension because an attitude is worthwhile to measure in some contexts where IS use is mandatory (DeLone and McLean, 2003). Finally, they combined individual and organizational impact into one dimension, named "net benefits"; to broaden the impacts of IS also to groups, industries and nations, depending on the context. (Hellsten and Markova, 2006). Figure 2 shows the updated DeLone and McLean "IS success factors" model.

The updated DeLone and McLean's IS Success Model includes arrows to demonstrate the proposed associations among success dimensions in a process sense, but does not show positive or negative signs for those associations in a causal sense. The nature of these causal associations should be hypothesized within the context of a particular study. For example, in one instance a high-quality system will be associated with more use, more user satisfaction, and positive net benefits. The proposed associations would then all be positive. In another circumstance, more use of a poor quality system would be associated with more dissatisfaction and negative net benefits. The proposed associations would then be negative (DeLone and McLean, 2003). Table 1 exhibits recent empirical research applying DeLone and McLean's both original and updated "IS success factors" model.

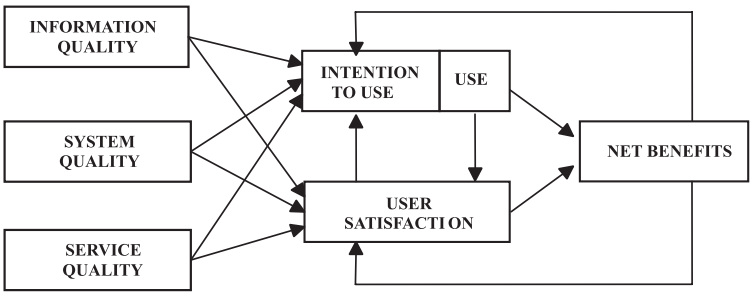

Figure 2: Delone and Mclean's Model (2003)

Table 1: Recent Empirical Research Applying DeLone and McLean Original and Updated Model.

Authors(s)	Research Locale	Methodology	Major Findings/ Research Recommendations
Rai et al (2002)	Student information system	Quantitative	IS success models must be carefully specified in a given context. Future research should examine how IS success models perform in different context, including settings that range from strictly voluntary to strictly involuntary use, and recommend refinements as appropriate.
Stockdale and Borovicka (2006)	Tourism companies websites	Pilot study	Developed an instrument based on DeLone and McLean (2003) updated model to evaluate tourism companies website. Suggested further examination of the instrument for further refinement.
Wu & Wang (2006)	Knowledge Management System/	Quantitative/ SEM	Empirical results provide considerable support for KMS success model with some modifications.
Hussein et al (2007)	e-government systems	Quantitative	IS competency, IS facilities, IS integration, IS structure and user support were significantly correlated with system quality, information quality, perceived usefulness and user satisfaction. Future research should consider the net benefit factor included the DeLone and McLeane (2003) updated model
Lin (2007)	Online learning system (OLS)	Quantitative/ SEM	System quality, information quality and service quality had a significant effect on actual use OLS use through user satisfaction and behavioral intention to use OLS.
Masrek (2007)	University campus portal	Quantitative	IS effectiveness dimensions consisting of service quality and system quality correlated with user satisfaction.
Wang & Liao (2007)	E-Government System	Quantitative/ SEM	Except for the link from system quality to use, the hypothesized relationships between the six success variables are significantly and marginally supported. Future researchers need to clearly and carefully define the stakeholders and the context in which net benefits are to be measured.
Vaidya (2007)	Public e-procurement system	Case study	Developed an e-procurement success model based on DeLone and McLean (2003) updated model. Suggested further empirical examination of the proposed model for further refinement.
Brown and Jaykody (2008)	Online retail sites	Quantitative/ SEM	User intention to continue using an online retail site is directly influenced by perceived usefulness, user satisfaction and system quality. User satisfaction is directly influenced by service quality and perceived usefulness, whilst perceived usefulness is directly influenced by trust and information quality. Trust in online retailer is directly influenced by service quality and system quality.
Wang (2008)	e-commerce system	Quantitative/ SEM	Intention to reuse is affected by perceived value and user satisfaction, which, in turn are influenced by information quality, system quality and service quality.
Teo et al (2009)	e-government website	Quantitative/ SEM	Trust in e-government website is positively related to information quality, system quality and service quality. The quality constructs have different effects on "intention to continue" using the website and "satisfaction". Furthermore, "satisfaction" is significantly related to intention to continue using e-government website.

While not attempting to cover all available research, table 1 underlines the application of DeLone and McLean's original and updated model to assess various types of information systems. The table further underlines the validity of the model in different contexts, while findings underline the need for continuous research and empirical application to further validate and refine the model (e.g. Hussein et al, 2007: Wand and Liao, 2007; Vaidya, 2007).

Interestingly, table 1 indicates that several empirical attempts have applied DeLone and McLean's "IS success factors" model in higher education context where different types of information systems were assessed. For instance, Rai et al (2002) empirically and theoretically assessed DeLone and McLean's (1992) original model of IS success in the quasi-voluntary context of an integrated student information system at a Midwestern university/USA. Building on empirical results, Rai et al (2008) declared that DeLone and McLean's model exhibited reasonable fit with the collected data. Appreciating such result, Rai et al (2002) emphasized DeLone and McLean's (1992) argument that IS success models need to be carefully specified in a given context. They further suggested that the IS success factors model should be applied in the special context of mandatory information systems to underline required refinements.

Furthermore, Lin (2007) used the updated IS success factors model to examine the determinants for successful use of online learning systems at a large university located in northern Taiwan. Empirical results showed that system quality, information quality and service quality had a significant effect on actual use of the system through user satisfaction and intention to use. Finally, Masrek (2007) evaluated the success of universities' portal implementation from the perspective of students and users. Adopting a refined IS success model, Masrek (2007) investigated the influence of individual factors comprising attitudes toward the portal, personal innovativeness and web-self efficacy on the success of the portal. Analyzing collected data, Masrek (2007) declared that IS effectiveness dimensions of service quality, and system quality were significantly correlated with user satisfaction. In addition, attitudes towards the portal were found to be significantly correlated with IS success dimensions.

While previous empirical research underlines the applicability and validity of DeLone and McLean's IS success model in evaluating different types of IS applied in universities, this study attempts to contribute to this particular field of IS success research through applying DeLone and McLean's updated IS success model on a special mandatory type of IS in one Jordanian university, i.e. online registration system. Such endeavor aims to further validate IS success model, in addition to exploring the multidimensional and interdependent nature of such system success.

III. RESEARCH LOCALE: ONLINE-REGISTRATION SYSTEM

Online registration (ORS) was introduced in 2006 as a special subsystem of the overall registration system in the case university, one of the largest public universities located to the south of Jordan. ORS was designed to specifically handle students' modules registration during the registration period

which usually lasts for two to three weeks before actual teaching starts. Hence, ORS operates for a specific short period of time to insure that all students have registered in their chosen modules before ceasing to operate until the next term starts. In addition to registration, ORS provides students with specific information about modules' availability, modules' fitness with students' study plans and actual modules registered in during any certain term. The usage of the system is mandatory. While students can get registration information from different alternative sources, they can enroll in any particular module only through ORS. However, in order to be able to use ORS for registration, students need to pay registration fees offline first. Since its introduction, the performance of ORS was not evaluated through a rigorous, empirically sound, method. The only feedback related to ORS performance is that associated with special cases when some students encounter certain problems when using the system.

IV. ORS SUCCESS MODEL

DeLone & McLean (2003) suggested that research should examine how the updated "IS success factors" model performs in different context, including settings that range from strictly voluntary to strictly involuntary use, and recommend refinements as appropriate. Hence, this paper applies the updated "IS success factors" model to the specific mandatory context of online registration system (ORS) in one Jordanian university. The proposed ROS Success Model is shown in figure 3.

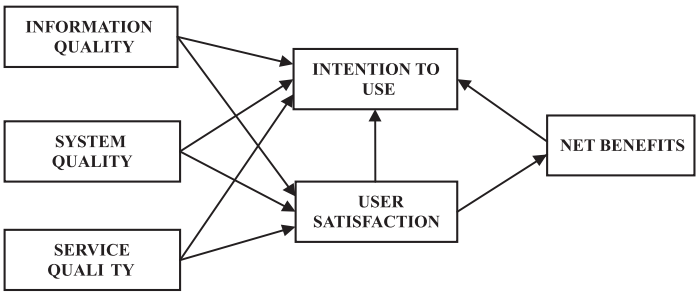

Figure 3: Proposed "ORS Success Model"

Any IS must effectively recognize the primary mechanisms by which users work and build technological solutions (Wu and Wang, 2006). Adopting a socio-technical viewpoint, Garrity and Sanders (1998) and Skok, (2005) suggested that successful models measuring IS success should capture both technological and human elements. Acknowledging the previous suggestion, the above model addresses ORS success from both technological and human perspectives. With regard to the technological perspective, the model addresses it through the constructs of system quality, information quality and service quality. All three constructs are based upon the technological infrastructure provided for ORS. Hence, addressing them should provide useful insights as to the degree to which the technological infrastructure complies with students' requirements. For instance, *System Quality* refers to the elements of a system that affect the end user in the way they interact and use the ORS (Stockdale and Borovicka, 2006). System quality in ORS success model measures ORS reliability and predictability independent of the information it contains. On the other hand, *Service Quality* refers to the role of service provider

in providing quality support to users (e.g. trust building, empathy, personal attention). Consumers demand more service quality in the online environment (Werthner and Klien, 1999). This is particularly important in the context of ORS since it represents a special type of online systems. As for *Information Quality*, it is a major indicator of information value to the intended user. Hence quality of an information entity is always defined by the information customer (Miller, 1996). This customer could be external to the organization boundaries, or could be internal. Information quality in ORS model is addressed from users, i.e. students, perspective.

As for the human perspective, the ORS model addresses it through three constructs; user satisfaction, intention to use and net benefits. *User Satisfaction* measures the user's response to the use of IS and its output, i.e. information (DeLone and McLean, 1992). It is one of the most frequently measured aspects of IS success (Wu and Wang, 2006). Despite the mandatory nature of ORS, user satisfaction remains a valuable measure with far reaching implications with regard to the system's future implementation. *Intention to Use* is a measure of the likelihood a person will employ the application. It is a predictive variable for system use (Wu and Wang, 2006). DeLone and McLean (2003) contend that use and intention to use are alternatives in their model, and that intention to use may be a more acceptable variable in the context of mandatory usage (Wang and Liao, 2007). Hence, intention to use was chosen in the context of ORS, due to the involuntary nature of its use. With regard to *Net Benefits*, they capture the balance of the positive and negative impacts of IS on intended users. DeLone and McLean (2003) introduced net benefits to address the fact that IS impacts have evolved beyond the immediate user to include other groups such as work group impacts, inter-organizational and industry impacts. However, they declared that the choice of where the impacts should be measured will depend on the system or systems being evaluated and their purposes. Since that ORS is a system intended to provide convenient services to students, net benefits refers to the impact of ORS on students.

1. "ORS Success Model" Hypotheses

The ORS success model, figure 3, suggests that information quality, system quality, service quality, user satisfaction, intention to use and perceived net benefits are all success dimensions of ORS success.The hypothesized effects of system quality, information quality and service quality on user satisfaction are based on the theoretical and empirical work reported by DeLone and McLean (2003). They have been further empirically examined in several more contemporary contexts (e.g. Wu and Wang, 2006; Marsek, 2007; Wang, 2008). In ORS context, and since it intends to facilitate the registration process for students, the study proposes that:

H1: ORS information quality positively affects students' satisfaction.
H2: ORS quality positively affects students' satisfaction.
H3: ORS service quality positively affects students' satisfaction.

While the effect of system quality, information quality and service quality on "use" has also been theoretically and empirically underlined (e.g. Lin, 2007;

Wang and Liao, 2007; Daskalakis and Mantas, 2008). The "intention to use" variable has not been widely addressed in empirical IS research, perhaps due to the voluntary nature of most examined systems. However, this paper acknowledges the mandatory nature on ORS, in addition to DeLone and McLean's (2003) suggestions that intention to use is an alternative to use, and suggests that ORS quality variables will affect students' intentions to use the system. Hence:

H4: ORS information quality positively affects students' intentions to use ORS..

H5: ORS quality positively affects students' intentions to use ORS.

H6: ORS service quality positively affects students' intentions to use ORS.

Since that the use of ORS is mandatory for students, the "use" variable, proposed in DeLone and McLean (2003) updated model, was excluded from ORS success model since that both satisfaction and dissatisfaction will not affect the actual use of the system. However, and with regard to the relationship between user satisfaction and intention to use, DeLone and McLean (2003) suggest that increased "user satisfaction" will lead to increased "intention to use". Hence, it is anticipated that, while the use of ORS is currently mandatory, greater user satisfaction will lead to greater intention to use the ORS in the future if it becomes voluntary. Thus:

H7: Students' satisfaction with ORS positively affects their intentions to use it.

As a result of user satisfaction with ORS, it is anticipated that certain net benefits will occur for students. While such benefits will be sensed by students through convenient, easier and quicker registration procedures, it is hypothesized that:

H8: Students' satisfaction with ORS positively affects their perceptions of ORS net benefits.

Finally, DeLone and McLean (2003) assume that, if the users perceptions of IS net benefits are positive, they will influence and reinforce subsequent "use" and "user satisfaction". While the context of ORS is mandatory, thus the variable of "use" is excluded, it is anticipated that the net benefits achieved have a positive effect over student's "intention to use" ORS. Thus, and in accordance with previous empirical findings (i.e. Zhang and Prybotuk, 2005; Wang, 2008, Teo et al, 2009), this paper hypothesizes that:

H9: Students' perceived net benefits of ORS positively affect their intentions to use it.

With regard to DeLone and McLean's (2003) assumption that "net benefits" will influence "user satisfaction", the proposed ORS success model excludes such influence. The exclusion decision was based on authors' belief that students' satisfaction with ORS will form their perceptions about the net benefits of the system, and not the opposite. Such procedure was under taken by previous research, i.e. Wang and Liao (2007), which excluded the link between "net benefits" and "user satisfaction" in order to avoid model complexity.

V. METHODOLOGY

1. Constructs measurement

Measures of all the constructs in the ORS success model were adopted from previous research. Each construct was measured through a number of items using a five-point Likert scale ranging from (1) strongly disagree to (5) strongly agree. Table 2 presents the ORS success model constructs, their associated items and the sources of those items. The items were modified, and rephrased, in order to suite the special context and purpose of ORS.

ORS Information Quality: This construct is a major indicator of the value of information provided by ORS to students. Appreciating the multi dimensionality of the "information quality" construct (Wu and Wang, 2006), five items were used to measure it and address the dimensions of information presentation, clearness, accuracy, sufficiency and timeliness.

ORS Quality: This construct refers to the elements of ORS that affect students in the way they interact and use the system. In accordance with previous IS studies (Wu and Wang, 2006; Rai et al, 2002), four items were used to measure this construct and reflect ORS's stability, acceptable response time, user-friendly interface and ease of use.

ORS Service Quality: This construct refers to the role of ORS personnel in providing quality support to students. Three items were adopted from Wang and Tang's (2003) EC-SERVQUAL to measure service

Table 2, "ORS Success Model": Constructs and Related Items

Construct	Items in questionnaire	source
ORS Quality	System ease of use	(Doll and Torkzadeh, 1998;Wu and Wang, 2006; Wang and Liao, 2007)
	System stability	(Rai et al, 2002; Wu and Wang, 2006)
	Responsiveness	(Rai et al, 2002; Wu and Wang, 2006)
	Ease to learn	(Armstrong et al, 2005)
ORS Service Quality	Empathy of system provider	(Wang and Tang, 2003; Wang and Liao, 2007)
	Safety	(Wang and Tang, 2003; Wang and Liao, 2007)
	Personal attention	(Wang and Tang, 2003; Wang and Liao, 2007)
ORS Information Quality	Presentation	(Wu and Wang, 2006)
	Clearness	(Wu and Wang, 2006)
	Accuracy	(Doll and Torkzadeh, 1998; Wu and Wang, 2006; Wang and Liao, 2007)
	Sufficiency	(Doll and Torkzadeh, 1998; Wang and Liao, 2007)
	timeliness	(Doll and Torkzadeh, 1998; Wang and Liao, 2007)
User Satisfaction	information	(Armstrong et al, 2005)
	efficiency	(Sedon and Kiew, 1994; Wu and Wang, 2006)
	effectiveness	(Sedon and Kiew, 1994; Wu and Wang, 2006)
	Overall satisfaction	(Wu and Wang, 2006)
Intention to Use ORS	Dependency	(Rai et al, 2002; Heo and Han, 2003; Wang and Liao, 2007)
	Intention of future use	(Lin, 2007)
ORS Net Benefits	Providing information	(Wu and Wang, 2006)
	Information management	(Wu and Wang, 2006)
	Tasks accomplishment	(Wu and Wang, 2006)
	Tasks performance	(Wu and Wang, 2006)
	Quality of tasks	(Wu and Wang, 2006)

quality dimensions of empathy, security and personal attention. The same items were applied by Wang and Liao (2007) to measure "knowledge management system" service quality.

User Satisfaction: This construct refers to students' response to the use of ORS output, i.e. registration information. Four items were adopted from literature to measure this construct in terms of its efficiency, effectiveness, satisfaction with registration information and overall satisfaction with ORS.

Intention to Use: This construct refers to students' likelihood to employ ORS in the future. It reflects students' positive/negative attitudes towards the system. Two items were used to measure this construct in terms of students dependency on ORS and future intentions to use it.

Net Benefits: This construct captures the balance of positive and negative impacts of ORS on students. Measures of net benefits need not to be hard and financial, but can be soft and non-financial (Holsapple and Joshi, 2000). Therefore, and in accordance with previous research, i.e. Wu and Wang (2006), five non-financial items were used to measure ORS net benefits to students in relation to providing needed registration information and enhancing students' capabilities to manage, perform and accomplish their registration tasks.

2. Sample and Data Collection

A convenience sampling technique was adopted. During the first week after ORS was shut off, and registration process was completed, data for the study was collected using a questionnaire survey administered in class to 1360 of case university's students. The decision to address students immediately after the end of the registration process was deemed more insightful since that students can base their evaluations and responses upon their last overall experiences with ORS. All 1360 administered questionnaires were returned but only 1345 students provided usable survey responses. The high response rate attributed to the fact that the researchers disseminated and collected the questionnaires in class. Detailed descriptive statistics of respondents' characteristics are shown in Table 3.

3. Data Analysis and Results

Table 3: Sample characteristics

characteristic		*Frequency*	*Percentage*
Gender	Male	614	45.7
	Female	731	54.3
Education Level	First year	374	27.8
	Second year	413	30.7
	Third year	325	24.2
	Fourth year	188	14.0
	Fifth year	45	3.3
College	Humanitarian colleges	548	40.7
	Science colleges	797	59.3

The study adopted "SmartPLS" software, version 2.0.M3, to perform data analyses with the PLS path modeling (Hnasmann and Ringle, 2004). Following Hulland's (1999) procedure, a two-phased approach was used for data analysis. First, the measurement

model (called the outer model relating the manifest variables to their own latent variables) was estimated using confirmatory factor analysis (CFA) to test the overall fit of the model, as well as its validity and reliability to ensure that only reliable and valid measures of the constructs were used before drawing conclusions about the nature of the construct relationships (Hulland, 1999). Second, the structural model (called the inner model relating some endogenous latent variables to other latent variables) was tested by estimating the paths between the constructs in the model. T-values and their statistical significance were assessed for that purpose, as indicators of the model's predictive ability.

3.1. Measurement model

The measurement model consists of relationships among the conceptual factors of interest and the measures underlying each construct. The measurement model included (1) the estimation of internal consistency reliability of individual items; and (2) the convergent and discriminant validity of the measures associated with individual constructs. First, individual reliability was examined according to the loadings of the items on their respective constructs. Reliabilities of individual items are considered adequate, when items' loading on their respective constructs are higher than 0.70 (Chin, 1998; Fornell and Larcker, 1981; Hair et al, 2006). All loadings in the model were greater than the recommended level of 0.70, showing adequate item reliability. The data indicated that the measures were robust in terms of their internal consistency reliability as indexed by the composite reliability. A composite reliability of 0.70 or greater is considered acceptable (Fornell and

Table 4: Confirmatory factor analysis

Constructs	Constructs Items	Item loading	CR*	AVE**	Cronbachs' Alpha
Information Quality (INFQUAL)	IQ1	0.835972	0.913213	0.678002	0.881124
	IQ2	0.816806			
	IQ3	0.825448			
	IQ4	0.846612			
	IQ5	0.791122			
Intention To Use (INTUSE)	ITU1	0.905099	0.899126	0.816739	0.775629
	ITU2	0.902372			
Net Benefit (NETBEN)	NB1	0.812592	0.913615	0.679460	0.881332
	NB2	0.853000			
	NB3	0.856685			
	NB4	0.840856			
	NB5	0.753949			
Satisfaction SATIS)	SAT1	0.840096	0.921327	0.745446	0.886101
	SAT2	0.868014			
	SAT3	0.870056			
	SAT4	0.874974			
Service Quality (SERQUAL)	SERQ1	0.832709	0.897459	0.744980	0.828296
	SERQ2	0.906009			
	SERQ3	0.848931			
System Quality (SYSQUAL)	SQ1	0.852344	0.891264	0.672229	0.837094
	SQ2	0.832876			
	SQ3	0.796890			
	SQ4	0.796058			

*CR: Composite Reliabilities

**AVE: Average Variance Extracted

Larcker, 1981). All composite reliabilities of the different measures exceeded the recommended threshold value of 0.70, indicating adequate internal consistency (table 4).

With regard to convergent validity, it measures the degree to which items on a scale are linked in theory. Convergent validity was examined using the average variance extracted measure. For all constructs, table 4, the values of average variance extracted (AVE) were all higher than the recommended minimum of 0.50, indicating high convergent validity (Fornell and Larcker, 1981).

As for discriminant validity, it represents the extent to which a construct truly differs from neighboring constructs (Hulland, 1999). This was assessed from the latent constructs correlations matrix, reporting the square roots of the average variance extracted (AVE) along the diagonal. In order

Table 5: Latent Variable Correlations

	INFQUAL	INTUSE	NETBEN	SATIS	SERQUAL	SYSQUAL
INFQUAL	**0.823409**					
INTUSE	0.613980	**0.903736**				
NETBEN	0.746339	0.731556	**0.824294**			
SATIS	0.771274	0.677464	0.812158	**0.863392**		
SERQUAL	0.640238	0.692719	0.700200	0.658525	**0.863122**	
SYSQUAL	0.713632	0.626913	0.709089	0.731202	0.618667	**0.819896**

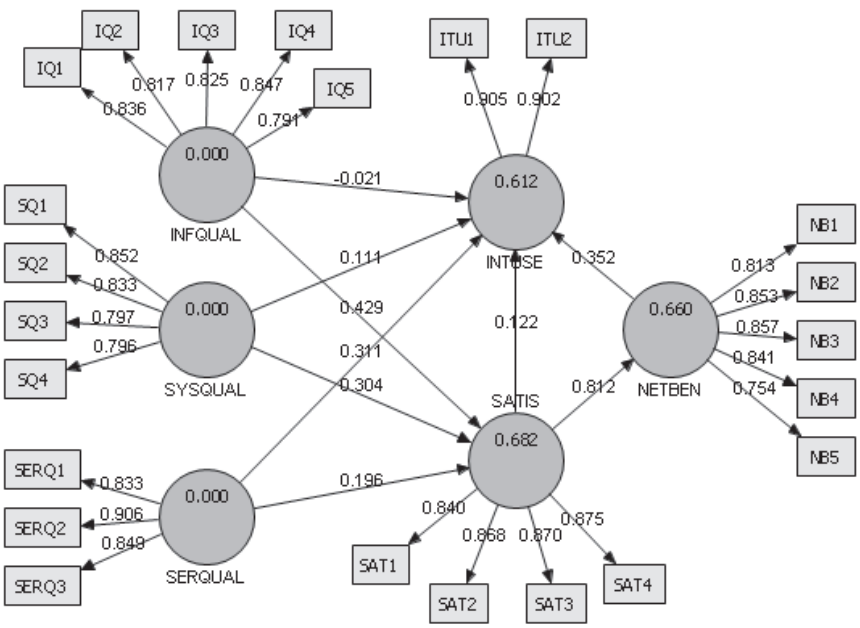

Figure4: ORS Structural Model

to show adequate discriminant validity, the square roots of each construct's AVE needed to be higher than the correlations of that construct with all other constructs (Fornell and Larcker, 1981). Thus, discriminant validity is satisfied when the diagonal elements (square root AVE) are greater than the off-diagonal elements in the same row and column. As table 5 shows, all constructs satisfied this criterion.

3.2. Structural Model

The structural model can be described as a set of one or more dependence relationships linking the model constructs (Gefen et al, 2000). A structural model gives information as to how well the theoretical model predicts the hypothesized paths. The structural model in PLS was assessed by examining: (1) the β coefficients (standardized betas) of each path, (2) T statistics to assess the significance of these path coefficients, and (3) R^2 as an indicator of the overall predictive strength of the model. Figure 4 shows the standardized PLS path coefficients model. The coefficients are shown on top of the arrows. The R^2 values are shown inside the circles of the relevant constructs.

In accordance with Chin's (1998) recommendation, a bootstrapping procedure using 200 sub-samples was performed. For each path, t-values and the significance of the structural coefficients (β) were computed, table 6.

Table 6 shows the results of the calculations for significance of path coefficients. The significance of the path coefficients was determined using t-statistics calculated using the bootstrap technique. Information quality had a significant positive effect on user satisfaction, but had no significant effect on intention to use. Thus, H1 was supported (β =0.43) while H4 was rejected (β = -0.02). System quality had a significant positive effect on both user satisfaction and intention to use. Hence, both H2 (β = 0.30) and H5 (β = 0.11) were supported. Service quality had a significant positive effect on both user satisfaction and intention to use. Thus, H3 and H6 were supported (β = 0.20 and β = 0.31, respectively). In addition, user satisfaction had a significant positive effect

Table 6: Structural model results

Path	*Coefficients (β)*	*T-values*	*Hypothesis testing*
H1: SYSQUAL -> SATIS	0.303860	3.301025***	Supported
H2: SERQUAL -> SATIS	0.195850	2.161509*	Supported
H3: INFQUAL -> SATIS	0.429039	4.795364***	Supported
H4: SYSQUAL -> INTUSE	0.110694	2.141750*	Supported
H5: SERQUAL -> INTUSE	0.310779	3.641478**	Supported
H6: INFQUAL -> INTUSE	-0.020726	1.307913	Not Supported
H7: SATIS -> INTUSE	0.122301	3.061218**	Supported
H8: SATIS -> NETBEN	0.812158	18.53558***	Supported
H9: NETBEN -> INTUSE	0.351597	2.616478**	Supported

****** p< .001, ** p<.01, * p<.05***

on both intention to use and net benefit. Thus, both H7 ($\beta = 0.12$) and H8 ($\beta = 0.81$) were supported. Finally, net benefit had a significant positive effect on intention to use. Thus H9 was supported ($\beta = 0.35$).

The ability to explain variance in the constructs of interest was one of the criteria for evaluating the model. Table 7 shows that R^2 values for intention to use, user satisfaction and perceived net benefits were very strong. Information quality, system quality and service quality explained 68.2 % of the variation in user satisfaction with ORS. on the other hand, information quality, system quality, service quality, user satisfaction and net benefits explained 61.2 % of the variation in intention to use ORS. Furthermore, user satisfaction explained 66.0% of the variation in the perceived net benefits of ORS.

Table 7: R^2 values

Construct	*R^2*
User Satisfaction (SATIS)	68.2%
Intention To Use (INTUSE)	61.2%
Net Benefits (NETBEN)	66.0%

VI. DISCUSSION OF RESULTS

Adopting a socio-technical viewpoint, ORS success model included six dimensions representing both technological and human perspectives (i.e. information quality, system quality, service quality, user satisfaction, net benefits and intention to use). By focusing on intention to use, rather than actual use, the study aimed at underling the effects exerted by both technological and human dimensions over students' willingness to employ ORS in the future, if it becomes voluntary. Empirical results provided considerable validation to the applied model. Furthermore, eight of the nine hypothesized effects in the model were significantly supported.

1. "Technological dimensions" Effects

The technological dimensions of information quality, system quality and service quality have all exerted significant positive effects over students' satisfaction with ORS. Information quality exerted the highest effect over satisfaction (B = 0.429), followed by system quality (B = 0.304) and service quality (B = 0.196). The three technological dimensions explained 68.2% of variation in students' satisfaction (R-square = 0.682). Such results underline that students' satisfaction with ORS is driven mostly by the quality of information provided by ORS, ORS quality and the quality of services associated with, or provided by, ORS. However, R-square results indicate that some other factors , external to the model, could affect students' satisfaction with ORS. Such factors might include students' IT know-how, the availability of computer labs for registration purposes, the time assigned for online registration, etc.

With regard to the effects of technological dimensions over students' intentions to use ORS, some contradicting results have emerged. Service quality exerted the highest significant effect over intentions (B = 0.311), followed by system quality (B = 0.311), while information quality had no direct significant effect over students' intentions to use ORS. Careful examination of the whole registration process has explained the insignificant effect of information quality over students' intentions to use ORS. Students can usually get the same quality registration information from different alternative sources such as university registration letters, academic faculties, registration offices, academic departments and ORS. However, they

can enroll in any particular module only through ORS. So, if students are not to use ORS, they expect to find the same quality information they need elsewhere, but with more time and effort. Therefore, the fact that ORS provides required information with less time and effort is a major driver of student's satisfaction. However, it does not represent a direct significant determinant in their intentions to use ORS in the future, due to the availability of alternative information sources. Instead, other technological characteristics of ORS such as ease of use, responsiveness, stability, security and personal attention are major determinants in future intentions to use the system.

2. " Human dimensions" Effects

The study's empirical results have underlined the existence of positive significant effects between the model's human dimensions. Firstly, students' satisfaction with ORS had a significant, positive and high effect over their perceptions of the net benefits they gained from using the system (B = 0.812). Such result means that students' perceptions of net benefits are highly dependent on their satisfaction with the ORS information quality, system quality and service quality. However, and appreciating the holistic nature of net benefits, the fact that students' satisfaction has explained 66% of net benefits (R-square = 0.660) suggests that, while satisfaction is the major deriver of net benefits, other factors might contribute to students' perceptions of the net benefits gained from using ORS.

Secondly, students' satisfaction with ORS had a positive significant effect over their intentions to use the system (B = 0.122). Such result underlines the simple fact that when students are satisfied with ORS's information, system and service quality, they intend to use it in the future. Thirdly, students perceptions of ORS's net benefits had a significant positive effect over their intentions to use the system (B = 0.352). Such result indicates that when the positives of using ORS outweigh the negatives, students will intend to use the system again. The fact that net benefits have exerted higher effect on students' intentions to use ORS than students' satisfaction (B = 0.122) underlines the suggestion that students perceptions of ORS net benefits is a wider construct which might be affected by other factors in addition to satisfaction. The existence of such factors might have contributed to the higher effect of perceived net benefits . Furthermore, and with regard to the effect of all the model's dimensions over intentions to use ORS, information quality, system quality, service quality, satisfaction and net benefits have all explained 61.2% of variation in students' intentions to use ORS (R-square = 0.612). Such result further underlines that students' intentions to use ORS could depend on other, external to the model, factors.

VII. CONCLUSIONS AND RECOMMENDATIONS

Empirical results have validated the application of DeLone and McLean's (2003) updated model in the mandatory context of ORS. The results have also validated the application of information quality, systems quality, service quality, user satisfaction, net benefits and intentions to use as dimensions of ORS success. Furthermore, the results have underlined the multidimensional and interdependent nature of such dimensions. Such nature requires considerable attention paid to all the dimensions underlined in ORS success model, especially intentions to use as it represents a major predictor of ORS future. For instance, and since it represents a major driver of students' satisfaction which, in turn, affects their intentions to use ORS, special attention should be given to the enhancement of information quality in

terms of presentation, clearness, accuracy, sufficiency and timeliness. Furthermore, both system quality and service quality of ORS should be improved due to their direct influence over students' intentions to use the system. Improvements to system quality could include making the system easier to understand and use and increasing the system's responsiveness to students inquiries and demand. On the other hand, improvements to service quality could include, adding helpful notes, module(s) description and online contact links to the system. Finally, and in order to increase students perceptions of net benefits they gain from using ORS, careful examination of all registration procedures, both on and offline, should take place. Considerable attention should be paid to all registration procedures students undertake separate from ORS, e.g. payment procedures, academic consultation, etc.

VII. MANAGERIAL IMPLICATIONS

Management responsible for ORS should not rely on the fact that the system is mandatory in nature. Continuous assessment and improvement to the system's quality and to the quality of its services can increase students' satisfaction and net benefits, which could consequently enhance their learning experience. While the study has suggested a number of recommendations to improve ORS performance, continuous developments in technology can provide new avenues for creative improvements to ORS.

IX. LIMITATIONS AND FUTURE RESEARCH

The study's findings and contribution should be addressed in relation to some limitations. Firstly, the study applied a convenience sampling procedure for data collection. Despite providing adequate data, fit for analysis, such procedure still has a generalizability limitation. Secondly, the research locale of this study was online registration system in one university, therefore, its results can be generalized only to the context of research locale. Thirdly, the study measured students' perception of the six dimensions of ORS success after the system was shut off, hence, a comparison between students' expectations of the system and their perceptions of its actual performance was not possible. Future research can test the applicability of the model to all online registration systems in all Jordanian universities. Furthermore, and while the study represents a snap-shot examination of the current state of ORS, longitudinal studies examining ORS success are needed to further assess and explore the dimensions that affect its success. In addition, future research can measure students' perceptions of the system before and after usage to underline any differences between ORS's expected and perceived performance. Finally, empirical results of this study have indicated that other factors external to ORS model could effect ORS success, further exploration of such factors could be a worthwhile area for future research.

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