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A Success Evaluation Model for Campus Management Solution (CMS) Systems

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ABSTRACT

Development, implementation, and post implementation success factors of ERP systems have been widely researched and numerous frameworks for determining the systems quality and success have been presented in the literature. However, whether the traditional ERP success models can be extended to investigate the success of a Campus Management Solution (CMS) or Academic ERP system is yet to be explored. We propose an evaluation framework to assess the usefulness of CMS systems and investigate the relationships among the elements of 'Quality' and 'Impact' of CMS systems in Higher Education Institutes (HEIs). We have verified by the analysis of data collected through a survey of the faculty and administrative staff in several renowned universities in Pakistan that success evaluation of a CMS system is a multidimensional concept. Our results reinforce the findings of related research studies regarding ERP success. Eight out of nine hypothesized paths were found to be statistically significant. Our data does not support relationship between 'Service Quality' and 'Departmental Impact'. Our study not only offers nomological validity to an IS success theoretical background but also has valuable implications for the practitioners of CMS systems in HEIs.

KEYWORDS: Campus Management Solution Systems, Information Systems Success, Quality of CMS Systems, CMS Systems Success Factors, Academic ERP Systems

1. INTRODUCTION

The use of information and communications technologies (ICTs) has contributed significantly in changing the teaching, learning, assessment, and administration paradigm worldwide. During the last few years, the practice of incorporating customized information systems in higher education institutions, generally named as Campus Management Solution (CMS) systems, Learning Management Systems (LMS) or Academic ERP (Enterprise Resource Planning) systems, has increased significantly in Pakistan. The Center for Digital Education's Special Report on Campus Management Systems (2010) states, "CMS solutions include the broad class of Enterprise Resource Planning (ERP) systems as well as student information systems . . ., these systems track all business functions, including accounts payable, human resources, alumni support and student support services like attendance, course management and parental communications". In higher education, CMS systems provide institutes more than an efficient technology tool. They are a way to strategically position the institute in a competitive environment. Vendors of the CMS systems claim to offer various opportunities for campus efficiencies, to encourage peer cooperation, and present the head of the academic unit the holistic view of student and instructor performance for analysis and quick decision making.

Most of the work related to CMS systems focuses on their development life cycle, adoption, implementation critical success factors and implementation methodologies. In some institutes, studies have been conducted to examine the use and behavior of the users towards an already implemented Course Management System that is a significant part of a CMS system. An example is the study conducted at the University of Wisconsin System by Glenda Morgan [49]. However, a comprehensive framework to measure the quality and post implementation success of CMS systems has still not been studied and discussed in the literature.

IS development, implementation and post implementation success factors have been widely researched and numerous frameworks for determining IS quality and IS success have been presented in the literature. Delone and McLean [1] [2] IS success model is perhaps the most recognized framework that has been referenced in various IS research studies especially related to traditional ERP systems success models. For example: Sedera et al. [3] and Ifinedo et al. [4]. However, whether the traditional ERP success models can be extended to investigate the success of CMS systems is yet to be explored. The scarcity of research in the CMS systems success evaluation area has been the primary motivator of this research work.

Organizations are generally quite poor in the area of evaluation of the information systems they use, because many companies do not even employ any formal mechanism to assess the benefits of their investments in the IT infrastructure and personnel [5]. Same is the case with educational institutes regarding the

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measurement of success for their CMS systems. Higher education institutes do not employ any systematic approach to evaluate the success of systems they deploy [6].

Our proposed model is based on the ERP success model proposed by Ifinedo et al. [4]. The purpose of this research was to re-specify it for the CMS systems by keeping in view the unique nature of higher education institutes that differentiate them from other organizations. We believe that we are the first to have proposed a success evaluation model for CMS systems.

2. Research Context and Theoretical Background

Along with some similarities with manufacturing organizations, universities have specific and unique administrative needs; and these unique needs differentiate the Higher Education Institutes (HEIs) from other organizations [7]. Traditional ERP systems address basic business administrative functions such as HR (Human Resource), Finance, Operations and Logistics, and Sales and Marketing applications. Yet, the Higher Education sector requires unique systems for: Student Administration, Course Administration, Facilities (Timetabling / Scheduling) requirements, and other applications, not part of a traditional ERP system [6].

Because of these reasons, success evaluation models used for traditional ERP systems may not be adequate for measuring the success of a CMS system. Thus, it can be argued that a specific, more comprehensive framework is required to evaluate the usefulness of a CMS system.

The "effectiveness" and "success" terminologies have been used interchangeably in the IS literature [8] [9]. Effectiveness of an information system is defined byas the degree to which it actually contributes in realizing organizational goals [9]. Some studies used financial indicators to discuss the success of information systems, for example, Stefanou [10]. However, MIS researchers tend to avoid this approach because it is difficult to isolate the effects of IS efforts from other efforts which impact organizational performance [1]. Our study did not operationalize the CMS system success with such financial indicators. Also, our model does not include the technical success parameters of such systems that may embrace cost overrun and time estimates etc. The model proposed and evaluated in this research study primarily used subjective and perceptual measures.

It is worth mentioning that we studied CMS systems at a generic level, i.e., focusing on the system's basic functionality instead of differentiating among the various brands of CMS systems. In fact, empirical evidence suggests that we can compare the benefits of ERP brands even if system types may differ [11].

2.1 Theoretical background

IS researchers and practitioners are continuously struggling for a consensus on how to measure the value and the benefits of the IS for an organization[12][13][14]. One ideology emphasizes the use of subjective and perceptual measures[15] and the other uses the financial and objective measures[10]. In both cases, the assessment of effectiveness and success cannot be achieved completely when the measures of success are restrictive[12][13]. These two extremes directed Delone and McLean[1] to develop a multidimensional IS success model that has become the leading and widely accepted framework for IS success measurement [16][17].

Sedera et al. [3] designed another framework that redefined the original Delone and McLean IS success model [1]. This new model eliminates the 'Use' and 'User Satisfaction' constructs from the original IS success model [1]. Their model contains 'System Quality', 'Information Quality', 'Individual Impact' and 'Organizational Impact' as the success dimensions for an ERP system (Figure 2.1). In an article, Delone et al. mention that the multidimensional success instrument developed by Sedera[3] provides higher content validity [17].

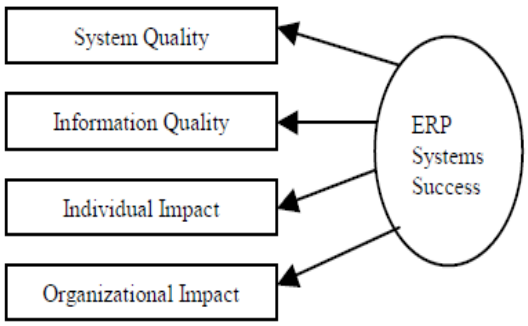

Figure 2.1 ERP success model by Sedera [3]

Ifinedo et al. [4][18][19], who used Sedera[3] model as a base, introduced 'Workgroup Impact' as a new dimension in their model to measure the effectiveness of an ERP system. According to them, in an organization, a subunit or functional department can be considered as a workgroup. Rousseau[20] believes that it would be

worthwhile if individual, subunit and organizational levels are focused separately as these three are highly interdependent. Myers et al. [13] argue that IS success measurement models must not undermine the impacts at workgroup level. Klein et al.[21] says that Delone and McLean's IS success model indicates the existence of individual and organizational impact as well as the prospective intermediate levels in between.

In 2003, Delone and McLean re-specified their IS success model and included the dimension of 'Service Quality' in it. Several other researchers have tested the new model and found that it is valuable to include the 'Service Quality' as a separate dimension for IS success measurement [4][22][23].

The ERP success model re-specified by Ifinedo at al. [4] has six inter-related dimensions: 'System Quality', 'Information Quality', 'Service Quality', 'Individual Impact', 'Workgroup Impact' and 'Organizational Impact' (Figure 2.2).

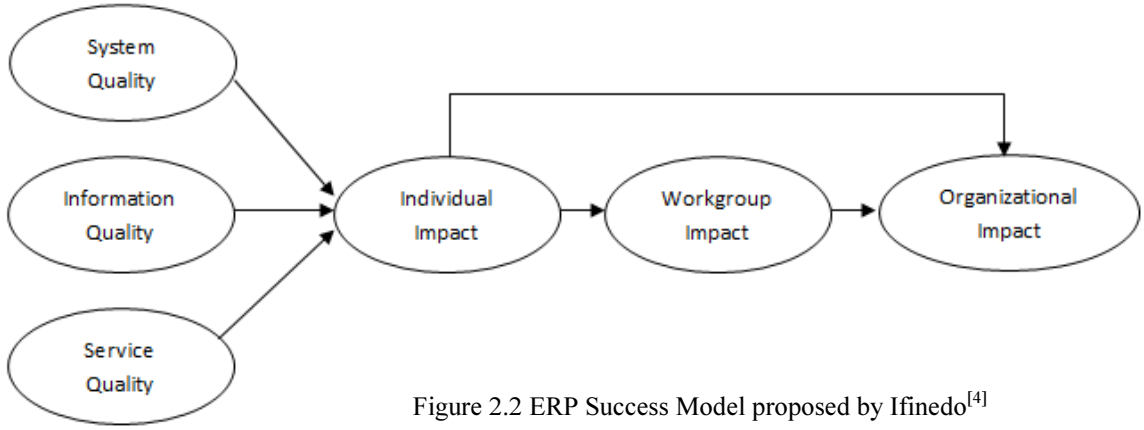

Figure 2.2 ERP Success Model proposed by Ifinedo[4]

3. Our proposed model

We propose a new success evaluation model for a CMS system, shown in Figure 2.4, is based on the Ifinedo et al. [4] ERP system success model. Figure 2.3 also shows the nine hypothesized paths listed and discussed under "Hypothesis Formulation" in Section 4.

Although, our proposed CMS success model contains the same six dimensions as are used in Ifinedo et al.'s ERP model, yet the model is different from it. First, all of the six dimensions are redefined to cater specialized aspects of a CMS system by keeping in view the unique nature of HEIs. The elements as well as the instrument items used to operationalize the dimensions for CMS success are more relevant to the academic institutes than that of any other organization using a traditional ERP. A comparison of the elements used in our CMS system success model and ERP success model be Ifinedo et al. [4] can be seen in Table 2.1 and the instrument used in this research to test the model can be seen in Appendix B.

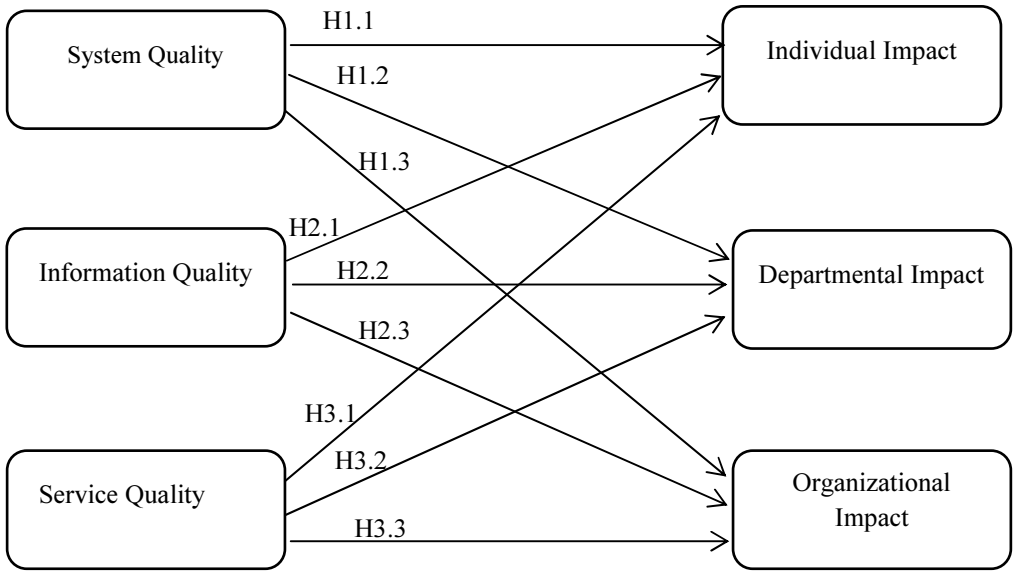

Figure 2.3: The CMS success model proposed and tested in this study.

Second, unlike the Ifinedo et al.'s model, our model tries to test the direct relationship between three quality dimensions and departmental impact, and a direct relationship between three quality dimensions and organizational impact; resulting in nine hypothesized paths. The theoretical articulation for these relationships is discussed in Section 4: Hypotheses Formulation.

Table 2.1. CMS Success Dimensions – Comparison with Ifinedo et al.'s [4] ERP Success Dimensions

Dimensions	Elements –ERP Success Model by Ifinedo et al. [4]	Elements – Our CMS Success Model
System Quality (SysQ)	Ease of use, Accuracy, Reliability, Efficiency, Flexibility	Reliability, Completeness, Flexibility, User Interface, Documentation Quality
Information Quality (IQ)	Timeliness, Relevance, Availability, and Understandability	Accuracy, Completeness, Timeliness, Usefulness, Understandability
Service Quality (ServQ)	Reliability, Dependability, Quality of expertise, up to date facilities	Reliability, Responsiveness, Assurance, Empathy (based on SERVQUAL by Parasuraman et al.[48])*
Individual Impact (II)	Increased individual's productivity, improved decision-makingcapability, enhanced individual creativity	Productivity, Efficiency, Decision making effectiveness, Value
Departmental Impact (DI)	improved inter-departmentalcoordination, communication, and productivity	Efficiency, Productivity, Responsiveness, Inter-departmental coordination
Organizational Impact (OI)	customer service, decision-makingprocesses, competitive advantage	Efficiency, Responsiveness, Competitive Advantage

* Measurement items related to "Tangibles" (SERVQUAL) is already handled in System Quality

4. Hypotheses formulation

This section contains the details along with the associated discussion about our hypotheses that have been formulated to analyze various paths in our proposed CMS success model.

Hypothesis 1 (H1): In the context of CMS system, *'System Quality'*, *'Information Quality'* and *'Service Quality'* are positively associated with *'Individual Impact'*.

According to Delone and McLean [1] IS success model, there is a correlation between the system quality elements of an IS and the benefits gained by the individual using that system. The IS success model advocates that the benefits perceived by using an IS system are also high when the perceived quality elements of that system are high [24]. Other researchers also confirmed the positive relationship between system quality and usefulness [25][4][14][26][27]. So, in the context of CMS system, we hypothesized:

H1.1: *'System Quality'* is positively associated with the *'Individual Impact'*.

The Delone and McLean [1] IS success model was first examined by Seddon and Kiew [50] and found that increase in information quality led to the more usefulness of an IS. Some studies did not find relationship information quality and individual impact [28][4], while other studies reported positive relationship between information quality and the perceived usefulness [29][17][26][27]. So, our second sub-hypothesis is:

H1.2: *'Information Quality'* is positively associated with the *'Individual Impact'*.

Quality of service that IS venders and consultants provide make the use of complex IS (e.g. ERP) an easy one for the adopting organizations [30][8][3]. Petter[17] found moderate support for the relationship between service quality and benefits of IS. While other studies reported that benefits gained from the IS service support can be increased if service provider personnel have required knowledge and expertise [31][9]. Same are the findings of Sedera et al. [4] with respect to ERP system success; they specified that benefits for employees are higher when service provider of ERP software are perceived to be expert and helpful. Ifinedo et al. [4] also found significant, positive relationship between service quality and individual impact ($\beta = 0.25$). we hypothesized:

H1.3: *'Service Quality'* is positively associated with the *'Individual Impact'*.

Hypothesis Two (H2): In the context of CMS system, *'System Quality'*, *'Information Quality'* and *'Service Quality'* are positively associated with *'Departmental Impact'*.

Most of the IS success related research studies have dealt with Individual benefits instead of dealing with other levels of benefits [17][32]. Instead of testing a direct relationship between IS quality dimensions and departmental impact, some research studies tested and verified the relationship between individual impact and workgroup impact [4]. On the contrary, we believe that three quality constructs are directly associated with departmental impact. A high quality IS will result in higher productivity and efficiency not only at individual level but at departmental level as well. Poor information quality of an IS lead to adverse effects for an organization at operational, tactical and strategic levels [33]. Moreover, reliable service quality of an IS will improve efficient decision making that consequently lead to higher level efficiency [34]. The above discussion allows us to formulate following set of sub-hypotheses:

H2.1: *'System Quality'* is positively associated with the *'Departmental Impact'*.
H2.2: *'Information Quality'* is positively associated with the *'Departmental Impact'*.
H2.3: *'Service Quality'* is positively associated with the *'Departmental Impact'*.

Hypothesis Three (H3): In the context of CMS system, *'System Quality'*, *'Information Quality'* and *'Service Quality'* are positively associated with *'Organizational Impact'*.

There is a positive relationship between system quality and organizational impact [35]. Moreover, in order to achieve a competitive advantage, the software for an organization must be of high quality. Other research studies also suggest this sort of relationship between system quality and organizational impact. For example, it was stated that a highly sophisticated system will result in increased profitability for an organization [36]. So, we hypothesize:

H3.1: *'System Quality'* is positively associated with the *'Organizational Impact'*.

Information quality is positively related to the organizational impact (β = 0.27)[34]. As discussed earlier, poor information quality leads to adverse effects for an organization at operational, tactical and strategic levels [33]. On the other hand, high information quality can lead to high organizational impact and internal organizational efficiency [34]. Thus, we hypothesize:

H3.2: *'Information Quality'* is positively associated with the *'Organizational Impact'*.

There was reported a positive relationship between service quality and organizational impact (β=0.30)[34]. Reliable service quality of an IS will result in effective decision making that consequently leads to organizational efficiency [34]. Other research studies also support this sort of relationship between service quality and organizational impact. For example, Bharadwaj[37] states that human IT resources that provide technical and managerial services related to an IS, serve as the sources of competitive advantage. Therefore, our next sub-hypothesis is:

H3.3: *'Service Quality'* is positively associated with the *'Organizational Impact'*

5. RESEARCH METHODOLOGY

5.1 Sample

Our sample consisted of employees (i.e. faculty and administrative staff) from the renowned academic institutes of Pakistan.

To make the results of our research work more general, we included both public and private sector institutes in our sample. Moreover, the institutes in our sample are using different brands of CMS software: LogiCampus (Open Source), PeopleSoft Campus Solution, Radix, and some in-house developed systems.

5.2 Instrument development

Six dimensions of information systems success have been operationalized in many different ways. With the help of our literature review, we operationalized the dimensions for the CMS success measures. It is worth mentioning that the dimensions used to test the proposed model discussed in our research study are primarily measured through subjective and perceptual items. All of the six dimensions are initially split into different related elements and then various items are prepared to measure the impact of each element comprehensively. Table 5.1 highlights the success dimensions of CMS systems with the elements and their sources. The complete 50-item questionnaire can be seen in Appendix B.

Table 5.1: CMS Success Dimensions, Elements and their Sources

Dimensions	Elements	Sources
System Quality: the performance characteristics of the CMS system itself	Reliability, Completeness, Flexibility, User Interface, Documentation Quality	DeLone and McLean [1], Gable et al.[12], Hamilton and Chervany [38], Ifinedo et al.[4], Sedera et al.[3], Seddon [5]
Information Quality: the characteristics of the output produced by the CMS system	Accuracy, Completeness, Timeliness, Usefulness, Understandability	Ifinedo et al.[4], Gable et al.[12], Sedera et al.[3], Seddon[5], DeLone and McLean[1]
Service Quality: the support that the users receive from the CMS maintenance and Technical Support Service (TSS) personnel	Reliability, Responsiveness, Assurance, Empathy (based on SERVQUAL by Parasuraman, Zeithaml and Berry, 1988)*	Ifinedo et al.[4], Ko et al.[31], Kettinger and Lee[23], Pitt et al.[39], Thong et al.[9]
Individual impact: the effects of a CMS on the individual users	Productivity, Efficiency, Decision making effectiveness, Value	DeLone and McLean[1], Gable et al.[12], Ifinedo et al.[4], Myers et al.[13], Sedera et al.[3]
Departmental impact: the impact of the CMS system on the departments within the institute	Efficiency, Productivity, Responsiveness, Inter-departmental coordination	Ifinedo et al.[4], Ifinedo and Nahar[18], Myers et al.[13]
Organizational impact: the benefits that the institute gains from its CMS system.	Efficiency, Responsiveness, Competitive Advantage	DeLone and McLean[1], Gable et al.[12], Ifinedo et al.[4], Sedera et al.[3]

* Measurement items related to "Tangibles" (SERVQUAL) is already handled in System Quality

The survey instrument required from participants to specify their agreement on the various statements about the CMS system they are using. Each statement is anchored on a 5-points Likert scale that ranges from "Strongly Agree" to "Strongly Disagree". The questionnaire also asks participant's information such as job title, education and some other profile related fields.

5.3 Data collection

To collect the data for our study, we used a cross-sectional field survey. As discussed earlier, our sample consists of the CMS users from some of the most famous and mostly top-notch public and private universities of Pakistan. In these HEIs, the use of CMS systems is mandatory for all stakeholders; so the respondents are experienced CMS users. The questionnaire along with the cover letter were sent to around 300 potential participants from eight academic institutes via email through an online survey tool titled as Kwik Surveys (www.kwiksurveys.com). After two rounds of reminders through emails, 108 questionnaires were filled out and returned (response rate of 36%) in which the useable responses for the research were 102. Six returned responses were not included in the analysis due to incomplete questionnaires.

Our sample space had 72% male and 28% female respondents. 88.3% of the respondents were academics (teachers and/or researchers) and 11.7% were from administration. 78.4% of the respondents were under 40 years and 28.4% had PhD degrees, mostly from technologically advanced countries. 45.1% of the respondents were 30-39 years old and had 18-year (MS or MPhil) education. Most of the respondents were fairly experienced: 54.9% had 6-20 years professional experience and 39.2% had up to 5-year experience. The complete demographic profile of the respondents is shown in Appendix A.

6. Data Analysis

We analyzed our model in two steps. During the first step we assessed the measurement model and during the second step we assessed the structural model. The tools used for analysis were SPSS 16.0 and SmartPLS 2.0. For the assessment of measurement model, reliability and validity of instrument items are examined while the structural model assessment presents the information about the strengths of paths in the model and the variance explained by independent constructs.

6.1 Reliability and validity of measurement items

For validation of the measurement model, internal consistency can usually be confirmed when for each item in the scale, the reliability is of greater than 0.70 [40][41]. In our research, we used Cronbach's α as the reliability indicator and factor analysis as the convergent validity indicator. Each of the six measurement dimensions has Cronbach's α greater than the recommended value of 0.70, ranging from 0.887 (Information Quality) to 0.966 (Service Quality) indicating ample internal consistency. Moreover, we performed factor analysis for all 50 items included in our instrument. It is generally recommended that to demonstrate convergent validity, the factor loadings should go above 0.60 for all items in a measuring scale [42]. In our case, the factor loadings of all items are greater than the recommended level; demonstrating convergent validity of the instrument. The values of Cronbach's α for six dimensions are presented in Table 6.1 and the factor loadings of 50 questionnaire items are presented in Appendix B.

Table 6.1 Reliability Statistics

Dimensions	Number of Items	Cronbach's Alpha
System Quality	14	0.925
Information Quality	6	0.887
Service Quality	11	0.966
Individual Impact	7	0.921
Departmental Impact	6	0.911
Organizational Impact	6	0.917

We also performed the tests for Discriminant validity, i.e., the extent to which each latent construct discriminates from other latent constructs. For constructs with reflective measures, a method of comparing Average Variance Extracted (AVE) for each construct with the square of correlation between those constructs has been suggested [44].

Table 6.2 shows the AVE values for all constructs, the square roots of AVE values on the diagonal (Bold Faced) and the correlation values between the constructs. For all constructs, the square root values of AVE are greater than the correlation between the constructs; implying adequate discriminant validity.

Table 6.2 AVE, the square root of AVE and inter-construct correlations

	AVE	System Quality	Information Quality	Service Quality	Individual Impact	Departmental Impact	Organizational Impact
System Quality	0.6427	0.8017					
Information Quality	0.6453	0.7484	0.8033				
Service Quality	0.8156	0.7048	0.6616	0.9031			
Individual Impact	0.7720	0.8114	0.7422	0.7046	0.8786		
Departmental Impact	0.7721	0.7415	0.6817	0.6116	0.7844	0.8787	
Organizational Impact	0.7972	0.7786	0.6497	0.5931	0.7888	0.8356	0.8929

6.2 Hypothesis testing results

For hypothesis testing, we used the squared multiple correlations (R2) for each dimension in the proposed model as well as the path coefficients (β) with other dimensions for each path of the model. SPSS 16.0 generates the path coefficients for each path in the model separately rather than generating the single goodness-of-fit for entire model. R2 and β are sufficient for analysis, and β values between 0.20 and 0.30 yield meaningful interpretations[45].

The t-statistics are used to test the significance of corresponding regressor, the larger the absolute value of t, the more likely that the actual value of the parameter could be non-zero. The t values produce meaningful interpretations when combined with the p values; where p is significance level of the result.

Testing results of hypothesis 1. All sub hypotheses (H1.1, H1.2 and H1.3) are supported by our data, i.e., all three paths are confirmed. System Quality has significant, positive relationship with Individual Impact having β = 0.403 with significance level of < .001 to provide support for H1.1. Information Quality as well as Service Quality have significant, positive relationships with Individual Impact having β = 0.246 and 0.257 respectively with significance level of < .01 to provide support for H1.2 and H1.3. Using three constructs simultaneously, **R2 = 0.615**. It shows that the three constructs together explained **61.5%** of the variance in the Individual Impact.

Testing results of hypothesis 2. All except one of the three sub hypotheses are supported by our data, i.e., one path is not confirmed. Contrary to our expectation, H2.3 is not supported by our data, i.e., Service Quality is not found to be associated with Departmental Impact having β = 0.041. Rest of the two sub hypothesis are supported by our data, i.e., System Quality as well as Information Quality have significant, positive relationships with Departmental Impact having β = 0.384 and 0.369, respectively, with significance level of < .001 to provide support for H2.1 and H2.2. Using three constructs simultaneously, **R2 = 0.490**. It shows that the three constructs together explained **49%** of the variance in the Departmental Impact.

Testing results of hypothesis 3. All sub hypotheses (H3.1, H3.2 and H3.3) are supported by our data, i.e., all three paths are confirmed. System Quality as well as Service Quality have significant, positive relationships with Organizational Impact having β = 0.414 and 0.252, respectively, to provide support for H3.1 and H3.3. For H3.2, though β value is slightly higher than cutoff level (0.20) but still it provides support for our prediction. That is, Information Quality has significant, positive relationship with Organizational Impact having β = 0.207 with significance level of < .1 to provide support for H3.2. Using three constructs simultaneously, **R2 = 0.575**. It shows that the three constructs together explained **57.5%** of the variance in the Organizational Impact. Summary of the results can be seen in Table 6.3.

Table 6.3 Summary of the results

Hypothesis	Path	β	t	p	Result
H1.1	System Quality –> Individual Impact	0.403	4.615	< .001	Strongly Supported
H1.2	Information Quality –> Individual Impact	0.246	2.876	< .01	Supported
H1.3	Service Quality –> Individual Impact	0.257	2.954	< .01	Supported
H2.1	System Quality –> Departmental Impact	0.384	3.821	< .001	Strongly Supported
H2.2	Information Quality –> Departmental Impact	0.369	3.746	< .001	Strongly Supported
H2.3	Service Quality –> Departmental Impact	0.041	0.415	= .679	*Not Supported*
H3.1	System Quality –> Organizational Impact	0.414	4.513	< .001	Strongly Supported
H3.2	Information Quality –> Organizational Impact	0.207	2.304	< .1	Supported
H3.3	Service Quality –> Organizational Impact	0.252	2.763	< .01	Supported

7. DISCUSSIONS

This research was conducted to propose a CMS Success Model and examine the relationships among the dimensions of this model. Our proposed model contains six dimensions, exclusively defined for the CMS system success based on the recently proposed ERP success model by Ifinedo et al.[4]. The results of our data analysis indicate that our proposed framework has ample predictive power. Results of our research provide support to all of our hypothesized paths (except one sub-hypothesis) and our findings are in agreement with prior studies of IS in various other contexts.

Our first hypothesis (H1) anticipated that three quality dimensions are positively associated with Individual Impact. H1.1, that predicted a positive relationship between 'System Quality' and 'Individual Impact', is supported by the findings of our research. This finding indicates that such relationship also exists for the CMS system success, which were previously tested and supported by various other studies for the success of IS and ERP systems [4][14][25][26][27].

H1.2, that anticipated a positive relationship between 'Information Quality' and 'Individual Impact', is also supported by the analysis of our data. Although some previous research studies did not find such a relation in the context of IS and ERP system success [4][28] but other studies for IS and ERP system success provided support for this relationship [14][27][29]. Thus, on the basis of our results, we can safely say that in the context

of a CMS system, the quality of information produced by the system has a significant, positive relationship with the impact of that system.

Results of our data analysis provide support for the positive relationship between 'Service Quality' and the 'Individual Impact', i.e., H1.3. So, in the context of a CMS system, the higher the quality of service delivered by the system vendor and consultant, the higher the effectiveness of that system is. This result too is consistent with similar results of earlier studies in the IS and traditional ERP system success context [3][4][30][31].

Our second hypothesis (H2) predicted that three quality dimensions are positively associated with Departmental Impact. H2.1, that predicted a positive relationship between 'System Quality' and 'Departmental Impact', is supported by the findings of our research. Similarly, H2.2, that anticipated a positive relationship between 'Information Quality' and 'Departmental Impact', is also supported by the findings of our research. However, contrary to our expectation, H2.3, that anticipated a positive relationship between 'Service Quality' and 'Departmental Impact', is not supported by our data. Other studies did not directly hypothesize and test quality dimensions with departmental/workgroup impact[4].

Our third hypothesis (H3) anticipated that three quality dimensions are positively associated with Organizational Impact. All of three sub-hypotheses are supported by the analysis of our data. Support for information quality and service quality was also found to be positively associated with organizational impact with $\beta = 0.27$ and 0.30 respectively[34] but did not find any support for the relationship between system quality and organizational impact.

The findings of our research offer some worthwhile implications not only for the researchers but also for practitioners. We present the discussion about the implication of our research in the following section.

7.1 Research implications

Our research has several implications for the field of CMS systems success. To the best of our knowledge, our work is perhaps among the first to have proposed and investigated a model specifically designed to assess the post implementation success of the CMS systems. We believe that findings of our research would motivate other IS researchers to work in the field of CMS systems.

Our research endeavor strives to deepen our understanding of the theory of evaluation of ERP systems success. It supports the findings of other related research studies with respect to the systems success dimensions' relationships. Such correlated findings strengthen the very domain of IS success evaluation as well. Moreover, our data provide empirical support that a CMS system in higher education institutes will be more effective and successful if the system quality, the quality of information and the quality of service extended by the vendor and consultant are perceived to be high. Thus, these three quality parameters positively impact the work of individuals in an institute, departments of the institute, and, eventually, the whole institute. Thus, by improving these quality parameters of a CMS system, institutes can maximize the effectiveness of all three aforementioned levels. Our research work also offers nomological validity to the systems success model's theoretical context. When a model or an instrument works as expected in terms of other theoretically related constructs, it means the model or an instrument has nomological validity [47].

The important aspect of these kinds of research studies is to update and guide the adopting institutes about how to improve the effectiveness of their CMS systems. The results of our research also have valuable implications for the practitioners. First, as one of the stimuli for this study was the need to provide the higher education institutes with guidelines on how to evaluate the usefulness of their CMS systems. Our simple yet comprehensive framework will serve as an evaluation mechanism for the higher education institutes to evaluate the usefulness of their CMS systems. Second, our instrument has clearly separated measurement items designed to capture the perceived quality of three dimensions (System Quality, Information Quality and Service Quality) related to a CMS system. Thus, it is very easy for practitioners to noticeably assess the actual issue of deficiency regarding the quality of a CMS system. Third, our CMS success evaluation framework allows the educational institutes to evaluate the usefulness of their CMS systems on several levels of analysis, including individual level, departmental level and the organizational level. Furthermore, this research draws the attention of practitioners to the issues related to post-implementation phase of the CMS systems success, which should not be jumbled with the critical success factors related to the implementation of the system.

7.2 Limitations and future research directions

Our research has some inherent limitations. First, we employed perceptual and subjective procedures in our research work. It might be possible that objective measures (such as financial indicators) of CMS success may produce different results. Also, the combination of objective and subjective measures of the success of a CMS system may produce more meaningful results. Second, although we believe that the results of our study may be generalized because the CMS systems under study included some of the world-renowned systems (PeopleSoft Campus Solution and LogiCampus), it may or may not be true as we collected data from one region of the globe, i.e. Pakistan. It is probable that data collected from other regions of the globe, especially from technologically advanced world, may produce different results from ours. Also, different cultural parameters may have an impact on the results discussed in this research.

Future research should address the limitations mentioned in this research. A single study cannot validate the findings of a research. So, to establish the validity of our research findings, the proposed model must be tested in other contexts as well. The data collected for our study is cross-sectional; longitudinal data can be collected for future studies to measure the success and effectiveness of a CMS system in the adopting institutes. Moreover, future research can incorporate various stakeholders' perspectives regarding the success of a CMS system. For example, students are one of the major stakeholders. We did not include them as respondents because we had specifically designed our questionnaire for employees to assess the impact of CMS especially for 'Departmental' and 'Organizational' Impact. Future research can compare the viewpoints of students, administrators and faculty members concerning CMS systems.

Other research areas that may be pursued are comparative impact of CMS systems based on academic institutions (public, private), gender and/or age of the user etc.

8. CONCLUSION

We proposed an evaluation framework to evaluate the usefulness of the CMS systems (also known as Academic ERPs) for HEIs. Our framework was primarily derived from previous schemas related to the IS success literature. With sufficient explanatory and predictive power, our research tried to verify that the success evaluation of a CMS system is a multi-dimensional concept.

The results of our research study reinforces the findings of related research studies regarding the relationships of the dimensions of IS success. In this regard, eight out of nine hypothesized paths were found to be statistically significant. Thus, our study not only offers nomological validity to an IS success theoretical background but also has valuable implications for the practitioners of CMS systems in higher education institutes. To the best of our knowledge, our work is perhaps the first to have proposed a model to assess the post implementation success of a CMS system. We believe that our findings will motivate other IS researchers to work in the field of CMS systems.

9. Appendix A

Profile of respondents (number = 102)

Measure	Frequency	Percent (%)
Institute		
Public	50	49.0
Private	52	51.0
Job title		
Lecturer	37	36.3
Assistant Professor	38	37.3
Associate Professor	7	6.9
Professor	5	4.9
Coordinator/Program Advisor	5	4.9
Dean/Registrar	4	3.9
Chairman/Principal	3	2.9
Research Scholar	3	2.9
Gender		
Male	73	71.6
Female	28	27.5
Missing data	1	1.0
Age (years)		
20 – 29	34	33.3
30 – 39	46	45.1
40 – 49	12	11.8
50 – 59	6	5.9
60 and above	3	2.9
Missing data	1	1.0
Education		
Masters (16 yrs. Education)	26	25.5
MS/MPhil (18 yrs. Education)	46	45.1
PhD	26	25.5
Post Doc	3	2.9
Missing data	1	1.0
Experience (years)		
Less than 5	40	39.2
6 – 10	31	30.4
11 – 20	25	24.5
more than 20	5	4.9
Missing data	1	1.0

10. Appendix B

Questionnaire

Measurement item		
System Quality	Cronbach's α = 0.925	**Factor Loadings**
System reliability		
Our CMS is reliable; it works well with right Inputs.		0.806
Our CMS is "Bug Free"; It handles incorrect inputs appropriately.		0.730
Whenever I try to access CMS, it is always available.		0.722
Completeness		
Our CMS is a complete IT solution; it helps me automate my work completely.		0.864
Our CMS contains all sub systems to manage the campus i.e. course management, attendance management, document management, student financials etc.		0.755
System flexibility		
Our CMS is flexible; it allows me to add new classes, evaluation instruments and sub instruments as per my work requirement.		0.836
Our CMS allows for customization such as customized interface and/or customized reports.		0.715
User interface		
The interface of our CMS is user friendly.		0.875
Our CMS is easy to use.		0.877
Our CMS is easy to learn.		0.814
Our CMS has online help and tutorials.		0.737
Documentation quality		
User Manual of our CMS is available.		0.865
User Manual of our CMS is easily understandable.		0.891
User Manual of our CMS is comprehensive; it contains complete information about each and every feature of our CMS.		0.818
Information Quality	Cronbach's α = 0.887	**Factor Loadings**
Accuracy		
The information generated by our CMS is always accurate.		0.772
Completeness		
The reports generated by our CMS contain complete information, as per my work requirements.		0.812
Timeliness		
Our CMS has timely information.		0.763
Usefulness		
The information on our CMS is useful.		0.915
The information on our CMS is important.		0.886
Understandability		
The information on our CMS is understandable.		0.795
Service Quality	Cronbach's α = 0.966	**Factor Loadings**
Reliability		
When I have a problem or a need, the TSS shows genuine interest in solving them.		0.870
The TSS is known for generating information without errors.		0.879
The TSS employees provide the right solution to requests and reported problems.		0.890
Responsiveness		
If I have an urgent need, the TSS employees immediately address it.		0.871
The TSS employees resolve my questions at the appropriate time, even if they are busy.		0.845
Assurance		

The behavior of the TSS employees is trustworthy.		0.879
I have confidence on responses of the TSS employees to my questions.		0.921
The TSS employees have the required knowledge and training to resolve my questions.		0.838
Empathy		
The TSS has employees who give proper attention to my needs.		0.942
The TSS employees understand my specific needs.		0.850
The TSS employees show real importance to my essential needs.		0.883
Individual Impact	Cronbach's α = 0.921	**Factor Loadings**
Productivity and efficiency		
Our CMS improves individual productivity.		0.912
Our CMS saves time for individual tasks and duties.		0.919
Our CMS enhances organizational learning and recall for individual worker.		0.876
Decision making effectiveness		
Our CMS enhances quality of decision making.		0.812
Our CMS enhances individual creativity.		0.856
Value		
Our CMS is beneficial for an individual's tasks.		0.868
The value our CMS generates for me is … (5 for Max., 1 for Min.)		0.720
Departmental Impact	Cronbach's α = 0.911	**Factor Loadings**
Productivity and efficiency		
Our CMS improves departments' productivity.		0.824
Our CMS improves the efficiency of departments in the institute.		0.930
Responsiveness		
Our CMS helps to improve workers' participation in organization's activities.		0.822
Our CMS creates a sense of responsibility.		0.759
Inter departmental coordination		
Our CMS improves organizational-wide communication.		0.790
Our CMS improves inter-departmental coordination.		0.774
Organizational Impact	Cronbach's α = 0.917	**Factor Loadings**
Productivity and efficiency		
Our CMS reduces organizational costs.		0.796
Our CMS improves overall productivity of the institute.		0.923
Our CMS allows for better use of institute's data resource.		0.885
Responsiveness		
Our CMS supports decision making at all levels.		0.816
Our CMS allows our institute to respond to the market needs in a timely manner.		0.805
Competitive advantage		
Our CMS provides us with a competitive advantage over other institutes.		0.846

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