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Article · May 2022

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Information Quality and Information Systems Success: Perspective of Monitoring, Evaluation, Accountability and Learning Information Systems Grounded on DeLone and McLean Model

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Abstract

As focus has shifted from continuum to contiguum approach of humanitarian response, organizations have invested in Information Systems (IS) to support their Monitoring and Evaluation (M&E), Accountability and Learning (MEAL) functions. The purpose of this study was to assess the influence of information quality on MEALIS performance in humanitarian organizations in developing country context using the widely acclaimed DeLone and McLean (D&M) Model of IS Success (ISS) as the theoretical basis. A cross-sectional research design with mixed approach skewed towards descriptive/quantitative method was adopted for the study. A total of 263 respondents submitted responses to the questionnaire and 3 interviews were conducted. IBM SPSS Statistics was used for descriptive and correlation data analysis and hypothesis testing using Partial Least Squares – Structural Equation Modelling (PLS-SEM) technique using SmartPLS 3 software.

The findings of correlation analysis indicated that Pearson's coefficients (with 1-tailed sig. value of 0.000) ranged from 0.514** to 0.770** for dimensions of information quality construct suggesting significant positive relationship between the independent variable (information quality) and MEALIS success. The hypothesis testing results using PLS-SEM technique revealed that information quality (INQ) was found to be positively related with MEALIS performance with path coefficients, β, of 0.556 (p>0.05). The study concluded that, information quality significantly positively influences the success of MEALIS in humanitarian organizations. It is recommended that

Key words: Information Quality; Monitoring, Evaluation, Accountability and Learning Information Systems Success, DeLone and McLean Model; Uganda

Introduction

Considered as a model country for humanitarian operations in the world because of its open-door refugee policy, Uganda is home to over 1.4 million refugees making it the second highest refugee hosting country in Africa, and third highest in the world (Office of the Prime Minister et al., 2020). The increased influx of refugees since December 2013 mainly from South Sudan has attracted hundreds of international and national humanitarians to provide both emergency and development-oriented interventions. These humanitarian organizations have come up with various kinds of Information Systems (IS) to perform Monitoring, Evaluation, Accountability and Learning functions.

Overall, non-governmental organizations (NGOs), more so, humanitarian actors have increased their emphases on measuring and assessing their contributions to economic development alongside the emergency relief work. Increasingly, emphasis is being placed on contiguum approach other than the traditional continuum approach (Carbonnier, 2018; Mosel & Levine, 2014; Ramet, 2012). Overall, their Monitoring and Evaluation (M&E) systems are becoming better equipped to inform decision making for greater development impact. Additionally, the functions of M&E have integrated the aspects of accountability and learning which initially have been treated rather passively. This has necessitated the adoption of different Monitoring, Evaluation, Accountability and Learning Information Systems (MEALIS) also simply known as M&E IS.

Information quality focuses on the characteristics of the information that is produced by the IS (Petter et al., 2008, 2013; Rai et al., 2002). This information is mainly in the form of data and reports. High-quality information is expected to lead to use and user satisfaction of the M&E IS. There is solid support for the association between information quality and system use and between information quality and user satisfaction (Petter et al., 2008, 2013; Rai et al., 2002). Rai et al. (2002) suggest that information quality variable deals with the character of the real information that is produced by the IS and the extent to which the information produced meets the expected needs of the users in terms of accuracy, reliability, relevance, completeness, precision of information, etc.

This will establish the relationship between user perception and information quality based on completeness, accuracy and relevance (Adya et al., 2018; Agourram & Talet, 2006; Lin et al., 2016). Yakubu and Dasuti (2018) used the D&M Model to measure success of E-Learning in a Nigerian University. He used case study and descriptive design as the research design. In another study, Ojo & Popoola (2015) also applied the D&M Model to assess the success of Educational information system in South Africa. He used a descriptive study to measure the success of that information system. They found information quality as key determinant of e-learning (Ojo & Popoola, 2015; Yakubu & Dasuki, 2018).

This study was designed to assess the influence of information quality on success of Monitoring, Evaluation, Accountability and Learning Information Systems Success in

humanitarian organizations in Uganda based on the widely acclaimed DeLone and McLean Model of IS Success (DeLone & McLean, 2003) as the theoretical framework.

Methods

Study Design and Settings

Prabhat & Meenu (2015) define research design as the overall strategy to choose to integrate the different components of a study in a clear and logical way to ensure the research problem is effectively addressed. It consists of the plan for collection, measurement, and analysis of data (Prabhat & Meenu, 2015).

For this study, cross-sectional study design was employed which was used to gather data from different respondents at one point in time (Macdonald & Headlam, 2008) in relation to the usage of a MEALIS in work organizations. This design has been suggested as effective for IS success measurement in different contexts (Mohamad & Deraman, 2020).

On the other hand, this descriptive study adopted a combination of quantitative and qualitative research methods. Macdonald et al. (2008) argue that choosing a research method should depend on the purpose of the research, questions being investigated and the available resources. For this study, quantitative research methods were used for unbiassed measurements, statistical, mathematical and numerical analysis of data collected through questionnaire and qualitative methods for the interviews and documentary reviews.

The descriptive method helped to provide answers to the questions of 'who', 'what', 'when', 'where', and 'how' associated with M&E IS in humanitarian organizations operating in West Nile (Etyang, 2018). This design was used to obtain information concerning the status of the M&E IS and to describe "what exists" with respect to the variables tested in this study. Similar design was used by Al-Fraihat et al., (2020) to evaluate e-learning system success in a University in United Kingdom (UK).

Sample Size and Study Variables

A sample is a sub-set of some pre-determined size from a population of interest (Etyang, 2018) so that by studying the sample, results may be generalised back to the population from which they were chosen. An adequate sample size reduces the likelihood of sampling error and the optimal size for a study may be estimated from several parameters (Glenn, 2003). The population for this study consists of about 1,000 M&E/IT practitioners, Programs staff and Managers performing various functions in West Nile (Office of the Prime Minister et al., 2020).

The sample of this research will be calculated by using Taro Yamane formula (Yamane, 1967) with 95% confidence level and 5% margin of error (precision). The calculated sample size was 278 respondents. This sample size is considered also acceptable for Structural Equation Modelling (SEM) technique (Choi, 2017; Wong, 2019) employed for this study.

The content scope of this study was limited to information systems (IS) that are deployed and used to support M&E/MEAL functions in the humanitarian organizations. These functions include data collection, storage (databases), analysis, visualization, reporting, mapping,

accountability, and participation of stakeholders, learning, tools, surveys, platforms and other technologies to support M&E/MEAL activities

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In this study, information quality was conceptualized as the independent variable and MEALIS success/performance as dependent variable. Information quality attributes measured included completeness, accuracy, relevance, consistency, conformity, integrity, timeliness and reliability of data/information (Al-Fraihat et al., 2020; Dalle et al., 2020; Mohamad & Deraman, 2020). The dependent variable was measured in terms of system net benefits at individual level such as enhanced decision making, effectiveness, efficiency, enhanced learning and accountability, among others.

Data Analysis

Quantitative data of this study was analysed by computer software – IBM SPSS Statistics. These were used for producing descriptive statistics, correlation analysis, among others. SmartPLS 3 was used for PLS-SEM for hypothesis testing (Choi, 2017; Ringle et al., 2015, 2020; Wong, 2019). However, prior to analysis, Microsoft Excel was used for data collation and cleaning. A correlation analysis technique was used to measure relation between variables. Five-point Likert scales were used for the items under each variable to measure respondents' level agreement or disagreement with the statements to denote optimal conditions of the indicators/factors/items.

In this study, partial least squares structural equation modelling (PLS-SEM) was used a technique to examine the research hypothesis. This technique has been preferred instead of regression analysis because of the following reasons: (i) PLS-SEM is better where the theory is not well developed (Hair et al., 2014) which fits this study since D&M ISS theoretical model has been extended and explored to find out whether additional constructs (i.e. MAQ) are valuable for extending the theory being tested rather than validating it (Hair et al., 2016). (ii) PLS-SEM is suitable for exploring relationships between variables and testing the hypotheses. (iii) PLS-SEM is also ideal for predicting or explaining the target constructs since this study seeks to predict the key determinant factors for success of MEALIS (Choi, 2017). (iv) PLS-SEM is ideal where number of constructs and indicators is big (Hair et al., 2014; Wong, 2019). Since this study has 36 indicators and 5 constructs, PLS-SEM fits well. (v) Lastly, PLS-SEM has been widely used in information systems research which will ease comparison with other similar studies (e.g. Al-Fraihat, 2020). SmartPLS version 3.3.2 software (Ringle et al., 2015) has been utilized for the data analysis to test the research hypotheses.

Reliability

Reliability refers to the consistency of measure of a concept. Researchers usually refer to three factors when considering a measurement is reliable or not. These factors are stability (which considers whether a measure is stable over time or not), internal reliability (which considers whether the indicator that make up the scale are consistent or not) and inter-observer consistency (which refers to the subjective judgement where more than one observers are involved in activities which may produce lack of consistency in their decisions/responses).

For this study, internal reliability was adopted since it has multiple indicator/item measures where individual answers to each question are combined to form an overall score. One of the best ways to test internal reliability is the Cronbach's Alpha. The reliability analysis results have revealed that all the constructs in the study have Cronbach's Alpha coefficient value

of above 0.963 which represents high reliability for all the constructs thereby highlighting internal consistency of the scales.

Table 1 Reliability statistics of study variables

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.963	.963	8

Results

Demographic Characteristics

Table 2 Demographic Characteristics of the Respondents

Characteristics	Categories	Frequency	Percent
Gender	Female	24	9.2
	Male	236	90.8
Age range	18-35 years	178	68.5
	36-45 years	74	28.5
	46-59 years	8	3.1
Level of education	Certificate	2	.8
	Diploma	6	2.3
	Bachelor's Degree	100	38.5
	Postgraduate Diploma	56	21.5
	Master's Degree	92	35.4
	PhD	4	1.5
Level of experience	0-2 years	76	29.2
	3-5 years	92	35.4
	6-10 years	70	26.9
	Over 10 years	22	8.5
Category of organization	Private Sector	44	16.9
	NGO and Aid Agencies	190	73.1
	Public Sector	6	2.3
	Education and Research)	8	3.1
	Others	12	4.6
Level of interaction with system/user role	M&E/MEAL Practitioner	216	83.1%
	IT/ICT/IS/ICT4D Practitioner	40	15.4%
	Data Practitioner	112	43.1%
	Education (Teaching/Lecturing)	22	8.5%
	Programs Staff	48	18.5%
	Management)	44	16.9%
	Consultant/System Developer	24	9.2%
	Beneficiary/System User	14	5.4%
	Other (unspecified)	4	1.5%

Source: Primary Data (2020)

From the demographic characteristics of the study respondents, 90% of the respondents were males and 10% female, 69% of the respondents were aged between 18 and 35 years, 28% and 3% were aged between 36 and 45 years, and 46 years or older respectively. With

education, 38% of the respondents had bachelor's degree, 35% had master's degrees, 21% had postgraduate diplomas, 2% were PhD holders, 2% and 1% of the respondents had undergraduate diplomas and certificates respectively. About 62% of respondents has between three- and 10-years' experience in using their MEALIS, 29% and 9% had experiences with their MEALIS of less than two years and over 10 years respectively. Regarding organization category, 73% of the respondents were from NGOs, 17% were from the private sector, 3% and 2% were from the public sector and education/research institutions respectively. Others (5%) never stated their organization category. Three interviews were also conducted three informants (1 female, 2 male).

In relation to system characteristics, 43% of the respondents had interacted with the MEALIS as data practitioner, 19% as program/project staff, 17% as management, 15% as Information Technology (IT) practitioner, 9% as consultant/system developer, 8% as education/learning and 5% as beneficiary/system user. Typical uses of the MEALIS were monitoring and evaluation (88%), program/project MIS (58%), learning and knowledge management (48%), and accountability and stakeholder engagement (45%).

Key Findings

The objective of this study was to assess the influence of information quality and MEALIS success in humanitarian organizations. The mean score from descriptive statistics of management quality indicators using IBM SPSS Statistics version 22 ranged from 3.60 with standard deviation of 1.102 (for resource allocation) to 3.77 with standard deviation of 1.021 (for strategy alignment). Internal reliability testing for the items of management quality found Cronbach's Alpha value to be 0.948.

Descriptive Statistics

The information quality construct was meant to capture the respondents' opinions and perceptions about the desired characteristics of the data or information generated by the MEALIS. The indicators used to gauge the INQ of MEALIS included completeness, accuracy, relevance, consistency, conformity, integrity, timeliness and reliability.
The scale of measurement used in the study questionnaire was a five-point Likert scale as: 1=Strongly Disagree, 2=Disagree, 3=Neutral/not sure, 4=Agree, 5=Strongly Agree. The sample size achieved for the survey after data cleaning was 260 respondents. To effectively describe the data in terms of measures of central tendency and dispersion, mean and standard deviation are the main statistical indicators used respectively. Generally, the mean and standard deviation values indicate a positive response to the variables used in this study.

The descriptive statistics of indicators of INQ of MEALIS as shown in Table 4.14 indicate that the mean values of the items/factors range from 3.84 with standard deviation of 0.969 (for data integrity) to 3.94 with standard deviation of 0.961 (for relevance of data/information) and 1.030 (for completeness of data/information). These results indicate a strong positive attitude of respondents towards the INQ of the MEALIS.

Table 3 Descriptive Statistics of Information Quality (INQ)

Item statements	Factor/ Indicator	N	Mean	Std. Deviation
INQ3.1: Our M&E/MEALIS provides complete data/ information needed for our reports or decision making	Completeness	260	3.94	1.030
INQ3.2: Our M&E/MEALIS provides accurate data/ information	Accuracy	260	3.89	.940
INQ3.3: Our M&E/MEALIS provides relevant data/ information	Relevance	260	3.94	.961
INQ3.4: Our M&E/MEALIS always provides consistent data/ information whenever needed	Consistency	260	3.85	.925
INQ3.5: The data/information provided by our M&E/MEALIS conforms to our reporting formats/needs	Conformity	260	3.88	.960
INQ3.6: Our M&E/MEALIS maintains data integrity whenever required	Integrity	260	3.84	.969
INQ3.7: Our M&E/MEALIS always provides timely data/ information whenever required	Timeliness	260	3.88	.947
INQ3.8: Our M&E/MEALIS provides reliable data/ information for reporting or decision making	Reliability	260	3.88	.987
Valid N (listwise)		**260**		

Source: Primary Data (2020)

The correlation analysis between management quality and MEALIS performance is shown in Table 3.

Table 4 Correlation analysis between information quality and MEALIS performance

		MEALISS Performance	Information Quality
MEALISS Performance	Pearson Correlation	1	.829**
	Sig. (1-tailed)		.000
	N	260	260
Information Quality	Pearson Correlation	.829**	1
	Sig. (1-tailed)	.000	
	N	260	260

**. Correlation is significant at the 0.01 level (1-tailed).

Source: Primary Data (2020)

Results from the correlation statistics indicate that all the dimensions of information quality are significantly correlated with all the indicators of MEALIS performance studied. The Pearson's correlation coefficient was 0.829** implying a strong positive relation between information quality and success of MEALIS. The dimensions of data/information quality with highest and most significant correlation coefficients include data integrity, reliability, accuracy, consistency, and relevance. Nevertheless, other dimensions such as completeness,

conformity and timeliness are also important with significant correlation coefficients. The results of regression analysis indicated R squared value of 0.688.

PLS-SEM technique using SmartPLS version 3.3.2 software was used for testing the underlying hypothesis. Thus, it was hypothesised that information quality positively influences success of M&E/MEAL IS in organizations. The results indicated that there was a positive relation between system quality and MEALIS performance with path coefficient of 0.556 (ρ=0.000) with p-value of 0.000 and standard deviation of 0.060 which suggests a strong positive influence of information quality on success of MEALIS used by humanitarian organizations. Which implies that about 56% of MEALIS performance can positively be influenced by or attributed to information quality? Hence, the hypothesis that information quality positively influences success of MEALIS in humanitarian organizations was supported.

Discussions

The information quality refers to the desired characteristics of the data or information generated by the MEALIS. It also refers to the content and format of the system output encompassing the dimensions of data quality. This study hypothesised that information quality positively influences MEALIS performance (H3). The results from this study found that information quality significantly positively influences MEALIS performance thus supporting the hypothesis. Important aspects to be considered include consistency, reliability and integrity with coefficients above 0.9 are more critical in affecting MEALIS performance.

Efiloglu (2019) examined the relation between information quality and e-learning system in Italy. He found that information quality had a significant impact on user satisfaction and thus system success with R2 of 0.539 and 0.440 respectively (Efiloğlu, 2019). Additionally, findings of several other studies (Ahmad et al., 2017; Al-Fraihat, 2019; Almalki, 2014; Argyropoulou, 2013; Dalle et al., 2020; Mohamad & Deraman, 2020; Muhaise et al., 2019; Petter et al., 2013) also support the findings of this study.

Conclusion

Information quality strongly influences success/performance of MEALIS deployed by humanitarian organizations. Outputs from the system such as reports should have the basic characteristics such as timeliness, accuracy, conformity, integrity, etc. if objectives of establishing a MEALIS are to be achieved. Otherwise, poor data and inadequate reporting quality will negatively affect staff, decision makers and other stakeholders. As a result, the strategic objectives of the system will be difficult to achieve.

Recommendations

System developers and MEAL practitioners should work hand-in-hand with the program staff, managers and other stakeholders in understanding the information/data needs of the different stakeholders. This will ensure that information needs such as project indicators of the different stakeholders are catered for

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