A Conceptual Framework for IT Governance Mechanisms in Uganda's Higher Institutions of Learning

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ABSTRACT

Poor implementation of information technology governance (ITG) leads to several IT systems performing poorly, resulting in discontinuity of services, user frustration, loss of IT investment, increased redundancy, duplication of efforts, poor decision making, and reputation loss. In Uganda, implementation of ITG is low as many public sector organizations are yet to streamline. Yet, for higher institutions of learning (HILs), the implementation of ITG is unexplored. Therefore, this study sought to determine the required mechanisms to design an ITG framework for HILs in Uganda (IGHU). A descriptive field study was conducted, and the data were analyzed using SmartPLS 2.3.9 software. The causal relationships and validity of the constructs of IGHU were tested using partial least square path modeling. The coefficient of determination was 0.35; the path coefficient indicated both positive and negative relationships of independent to dependent constructs, and hypotheses such as accountability of IT projects and awareness campaigns were statistically significant.

KEYWORDS

Coefficient of Determination, Conceptual Framework, Higher Institutions of Learning, Hypothesis Tests, IT Governance, IT Governance Mechanisms, Path Coefficient, Structural Equation Modelling

INTRODUCTION

Today, several organizations rely on Information Technology (IT) for their daily operations and as a key driver for their economic growth (NITA-U, 2019), which has increased investment in IT systems (Adaba & Rusu, 2014). Public sector organizations are among them. NITA-U (2018c) points that IT in public sector organizations improves effectiveness and efficiency in public service delivery. For Higher Institutions of Learning (HILs), IT enables automated access to public services using government IT platforms (Montenegro & Flores, 2015). However, many IT systems do not perform as expected (Anjoga & Kituyi, 2016), either failing at the inception stage or fail to meet desired objectives (Ali & Nisar, 2016; Mayoka & Kyeyune, 2012). Leading to discontinuity of services, user frustration, loss of IT investment, increased redundancy, duplication of efforts, poor decision-making, and reputation loss (Ali, 2018). Mohamed and Singh (2012) note that 67% of IT systems in public sector organizations of developing economies are challenged with justifying their investments. IT in

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HILs is complex, consisting of a heterogeneous set of technologies involving various applications, platforms, educational systems, and cloud applications to support their teaching, learning, research, and administrative processes (Bianchi et al., 2017a). Managing IT systems necessitates implementing Information Technology Governance (ITG) (Nyeko et al., 2018) to encourage and realize desirable behavior of IT use.

IT governance enables strategic alignment of IT to business objectives (Ali, 2018; Laita & Belaissaoui, 2017), increases optimal use of IT resources while mitigating risks as a crucial element for the success and future for IT in organizations (Altemimi & Zakaria, 2015). ITGI (2008) notes that globally 18% of companies have implemented ITG, 34% are in the process of implementing, and 24% are considering it. Furthermore, there is a 20% increase in profits for organizations with a high ITG implementation than those with poor performance adopting the same strategy (Weill & Ross, 2004; Lunardi et al., 2014).

Despite the benefits of ITG, ITG implementation for public sector organizations of developing economies is still low (Niyonsenga & Mwaulambo, 2018). Due to limited or no implementation of ITG mechanisms and frameworks (Adaba & Rusu, 2014), difficulty in achieving institution-wide IT alignment with strategic business objectives (Gartlan & Shanks, 2007); challenges in setting and measuring IT performance and contribution to business goals (De Haes et al., 2013); the complexity of IT systems (Bianchi & Sousa, 2015), and lower managerial autonomy (Bojinov, 2017) where the limitation of IT staff to provide technical and administrative services lessens the role of IT management concepts in the general running of the educational institution.

Studies on ITG exist, such as Control Objectives for Information and related Technology (COBIT) which provides policies and good practices for IT security and control (ISACA, 2004). Information Technology Infrastructure Library (ITIL) describes managing IT services (Zhang et al., 2013). ITG for the public sector of developing countries (Laita & Belaissaoui, 2017) provides mechanisms for implementing ITG in public sector organizations. A conceptual model for ITG in the public sector of developing countries (Tonelli et al., 2017) provides proportions and interconnection relations of IT governance. These studies point to frameworks that are generic, complex, expensive to implement, and time-consuming (Bianchi et al., 2017). Frameworks from these studies fail to address mechanisms to implement ITG in resource-constrained environments such as HILs in Uganda. Therefore, this study investigates the mechanisms for designing the conceptual framework to implement ITG in HILs in Uganda.

IT Governance Mechanisms

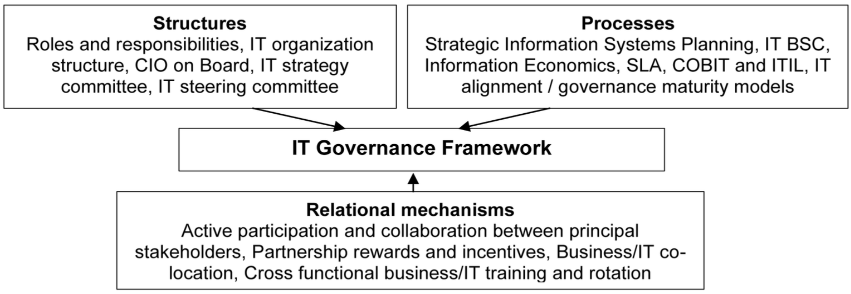
Weill and Ross (2004) state that ITG involves applying appropriate principles and practices to ensure that IT activities align with the organization's mission, strategy, and objectives. IT Governance Institute (ITGI) is universal association affianced in developing, implementing and use of worldwide recognized knowledge and practices of information system. Wiedenhoft et al. (2017) refer to ITG mechanisms as practices and arrangements in organizations responsible for meeting the goals and principles of ITG. Implementing ITG involves applying appropriate mechanisms that help make IT decisions and desirable use of IT (Nyeko et al., 2017). ITG can be implemented using a combination of structures, processes, and relational mechanisms (Bianchi et al., 2017).

Structures: Consist of organizational units, and roles and responsibilities for making IT decisions that enable fusion between business and IT management functions. In addition, ITG structures indicate the location of the IT department on the organogram (Adaba & Rusu, 2014).

Processes: These are established formal organizational processes used to monitor and ensure that IT plans are aligned with business needs. They incorporate management techniques and procedures consistent with existing IT strategies and policies (Tonelli et al., 2017).

Relational Mechanisms: Involve participation and collaboration between organizational executives, IT, and business management. These ensure knowledge sharing throughout the organization to support business and IT strategies alignment (Bianchi et al., 2017).

Figure 1. Example of ITG practices (De Haes & Van Grembergen, 2008, p. 6)



Ugandan Context

There is heavy investment in IT systems to support operations at Uganda's HILs. However, IT systems continue not to work to users' expectations. The different system types, structures, processes, and technology instituted in HILs contribute to the complexity and poor performance of IT systems (Anjoga & Kituyi, 2015; NITA-U, 2019). A survey on IT performance for public sector organizations in Uganda indicated a low maturity level of ITG as many public sector organizations are yet to streamline ITG (NITA-U, 2018b), HILs inclusive. The survey indicated that: Information Communication and Technology (ICT) technical committee was at 29.9%, the ICT steering committee was at 28.6%, whereby 53.9% at unit-level and 33.9% at the department level. The high ITG practices at unit level and low at department level reveals senior managers' failure to fully understand the impact of IT in achieving the institution's goals which limits their support.

RESEARCH METHODOLOGY

Sample Size

Eight public degree awarding HILs were studied. The exploratory survey indicated 382 IT and business representatives, specifically directors/managers of IT and business and IT technicians. The sample size for the descriptive field study was based on the sample size determination table by (Bukhari, 2020). This defines the sample size required to represent a given population (Singh & Masuku, 2014). Population size between 300 and 400 and confidence level of 95% (degree of accuracy/margin of error of 5%) results in a sample size between 169 and 196. 272 questionnaires were circulated, and 181 were completed. Thus, 181 respondents were representative sample size for this study. The HILs were Makerere University, Mbarara University of Science and Technology, Gulu University, Kyambogo University, Busitema University, Kabale University, Lira University, and Soroti University.

Research Process

Data were collected using a questionnaire that consisted of a five Likert scale ranging from strongly agree to strongly disagree. The constructs of the questionnaire were based on the study of a baseline for ITG mechanisms (De Haes & Van Grembergen, 2008) that provides mechanisms organizations can leverage to implement ITG in reality as in earlier studies (such as Ali, 2018; Nfuka, 2012) to derive the requirements for the conceptual framework (IGHU). Also, more mechanisms concerning the implementation of ITG for public sector organizations for developing economies were derived from the literature (see table 1).

Constructs for IGHU were compared with the existing studies for implementing ITG. The tick indicates the existing ITG mechanisms, while the x denotes the absence of ITG mechanisms.

Table 1. Comparison of existing studies of implementation of ITG

IT governance mechanisms (conceptual framework)	Existing studies for implementing IT governance				
	COBIT 4.1 (ISACA, 2004)	ITIL (Zhang et al., 2013)	National IT project management methodology V.3 (NITA-U, 2013)	The conceptual model for IT governance in the public sector (Janahi et al., 2015)	IT governance conceptual framework for public sector (Laita & Belaissaoui, 2017)
Internal Environment					
Structures					
IT steering committee (ISC)	x	x	x	x	x
IT strategy committee (IST)	x	✓	✓	x	✓
CIO on board (CB)	x	x	✓	x	x
CIO reporting to CEO (CRC)	x	x	x	x	x
Architecture steering committee (ASC)	x	x	x	x	x
Processes					
IT performance measurement (IPM)	✓	✓	x	✓	x
Service level agreement (SLA)	✓	✓	x	x	✓
IT governance frameworks – COBIT and ITIL (IGF)	✓	✓	x	x	✓
IT governance maturity models (IMM)	x	x	x	x	x
Monitoring (MN)	✓	✓	x	✓	✓
Accountability (AIP)	x	x	x	✓	x
Relational Mechanisms					
Training (TN)	✓	x	x	x	✓
Involvement of senior management (ISM)	x	x	x	✓	x
IT leadership (IL)	x	x	x	x	
IT and business partnership (IBP)	x	x	x	x	✓
Awareness campaign (AC)	x	x	x	✓	x
External Environment					
Culture (CE)	x	x	x	x	✓
Government, Industry, and Customers (GIC)	x	x	x	x	✓
Regulatory requirements (RR)	x	x	x	x	x
Stakeholders' participation (SHP)	x	x	x	x	✓

The comparison showed that the ITG conceptual framework for the public sector by Laita and Belaissaoui (2017) had the highest number of ITG mechanisms compared to other existing studies. Also, this framework consisted of external and internal environment mechanisms for implementing ITG and was designed for public sector organizations of developing countries. An internal environment shows established organizational structures that affect the overall strategic objectives and IT position (Ako-Nai & Singh, 2019). Yet, it is also necessary for an organization to consider the external environment to obtain strategic goals. The external environment specifies IT-related dynamics outside the organization's direct control and board (Ako-Nai & Singh, 2019). Scholars like Mohamed et al. (2012) and Ako-Nai and Singh (2019) show internal and external environments contributing to ITG implementation. Also, the institutional theory (Xue et al., 2008) offers ITG internal and external environments that contribute to organizations' decision-making. Thus, this study extended the ITG conceptual framework for the public sector by Laita and Belaissaoui (2017) to design IGHU.

Reliability and Validity

Composite reliability was used to measure internal consistency in scale items. Composite reliability gives actual score variance relative to the total scale score variance. Validity was tested using convergent validity that tests the degree to which two measures of constructs theoretically should be related are related (Taherdoost, 2016). To find convergent validity, the factor loading of the construct, composite reliability, and the average variance extracted have to be considered and the value ranges from 0 to 1. The average variance extracted value should be above 0.50 for convergent validity to be accepted (Hair et al., 2016) (see table 2).

Discriminant validity refers to the extent to which the construct empirically differs from another construct (Hair et al., 2016). Discriminant validity was established using the Fornell-Lacker criterion by comparing the square root of the Average Variance Extracted (AVE) with the correlation of latent constructs (Hair et al., 2016) (see Table 4).

Data Analysis

Responses were coded into Ms. Excel, cleaned, and analyzed with SMARTPLS 2.9.2 software which is based on the partial least square method (PLS-PM) and designed for analyzing more intricate models (multivariate regression) (Rueda et al., 2017). The SMARTPLS that associates principal components analysis with ordinary least squares regressions, is a statistical tool that estimates multipart models and is viewed as a third generation multivariate data analysis simulation (Vanalle et al., 2017). PLS-PM model assumes a causal relationship between the indicators and their constructs, and is used to test the causal relationships between the independent and dependent constructs.

RESULTS

Demographics

The study respondents were people who were most productive to provide information and key informants. Most of them were directors/managers of business (38%) and the least were IT technicians (27%), most of whom were male (69%) and female were (31%). Most respondents were aged 41-45 years (29%) and the least were 55-60 years (1%). In addition, majority had worked for 1-5 years (52%) and the least had worked for 16-20 years (2%). Further, most had masters (48%) and the least had PhD (25%) degrees.

Reliability and Validity

The data from the questionnaire was sorted and entered in SmartPLS 3.2.9 computerized data analysis software. Results for composite reliability and AVE are in table 2.

Thirteen constructs met the acceptable level of composite reliability of 0.70. Two constructs were above 0.9. They were; OS (1.00) and TN (1.00), indicating excellent reliability. One construct ranged between 0.80 and 0.90. This was; ISM (0.83). Ten constructs ranged between 0.70 and 0.80. However, ten constructs were below the acceptable level of 0.70. They were; AIP (0.67), CE (0.62), CRC (0.69), IBP (0.69), IGF (0.60), IMM (0.65), IPM (0.50), ISC (0.66), RR (0.62) and SHP (0.68).

Satisfactory convergent validity should be above 0.50. Results in Table 2 showed that nineteen constructs met the AVE. Four constructs whose validity was below 0.50 were; CE (0.46), IPM (0.33), ISC (0.40) and RR (0.38).

Constructs whose composite reliability was below 0.70 and AVE was below 0.50 were discarded. They were; CE (0.62, 0.46), IPM (0.50, 0.33), ISC (0.66, 0.40) and RR (0.62, 0.38).

Table 2. Composite reliability and AVE

Constructs	Composite reliability	AVE
AC	0.71	0.53
AIP	0.67	0.54
ASC	0.72	0.53
CB	0.71	0.55
CE	0.62	0.46
CRC	0.69	0.53
ITG	0.77	0.63
GIC	0.74	0.59
IBP	0.69	0.53
IGF	0.60	0.52
IL	0.74	0.59
IMM	0.65	0.55
IPM	0.50	0.33
IRM	0.73	0.51
ISC	0.66	0.40
ISM	0.83	0.71
IST	0.71	0.55
MN	0.73	0.58
OS	1.00	1.00
RR	0.62	0.38
SHP	0.68	0.55
SLA	0.71	0.56
TN	1.00	1.00

Factor Loadings

The relationship of each item to the underlying construct was shown with factor loading. Factor loadings show how many items are loaded on their constructs. These are regression weights and show the relative importance of items, and the minimum acceptable value is 0.50.

Maskey (2018) suggested retention of factor loadings above 0.50. Henson and Roberts (2006) observed that it is unnecessary to keep all factors as they do not contribute much to the overall result. Hence, items that negatively affected their constructs were removed during analysis since they did not add value. Items whose factor loadings were below 0.50 were suppressed and not considered for IGHU. These were; AIP1 (0.41), IPM1 (0.04); IRM4 (0.02); IGF4 (0.21); RR2 (0.24); and SHP1 (0.45).

Discriminant Validity

Discriminant validity was used to determine if each construct loaded higher than any other construct it measured. Fornell-Larker criterion was used to assess discriminant validity.

Constructs loaded higher than the constructs they measured and were all above 0.5. Basing on the results, discriminant validity was achieved.

Structural Equation Modeling

This section presents the relationship of constructs used in IGHU. The coefficient of determination, path coefficient, and hypotheses tests are as follows.

Coefficient of Determination (R^2)

R^2 is the proportion of the total variability of the dependent variable that is accounted for by the regression equation in the independent variable. Figueiredo et al. (2011) note that R^2 is between 0 and 1, and a high R^2 value indicates that the framework is good fit for the model. Latent constructs consist of exogenous and endogenous constructs. Figueiredo et al. (2011) point R^2 values for endogenous

Table 3. Factor loadings: outer loadings

	AC	AIP	ASC	CB	CE	CRC	ITG	GIC	IBP	IGF	IL	IMM	IPM	IRM	ISC	ISM	IST	MN	OS	RR	SHP	SLA	TN
AC2	0.56																						
AC3	0.84																						
AIP1		0.41																					
AIP2		0.94																					
ASC1			0.57																				
ASC2			0.86																				
CB1				0.90																			
CB3				0.53																			
CE1					0.54																		
CE3					0.79																		
CRC1						0.60																	
CRC2						0.84																	
ITG1							0.85																
ITG2							0.72																
GIC2								0.75															
GIC4								0.78															
IBP1									0.60														
IBP3									0.84														
IGF3										0.99													
IGF4										0.21													
IL4											0.63												
IL5											0.89												
IMM1												0.55											
IMM2												0.89											
IPM1													0.04										
IPM3													0.64										
IPM5													0.76										
IRM1														1.00									
IRM4														0.02									
ISC3															0.55								
ISC4															0.53								
ISC6															0.79								
ISM1																0.77							
ISM3																0.90							
IST3																	0.82						
IST5																	0.66						
MN2																		0.63					
MN4																		0.87					
OS1																			1.00				
RR1																				0.72			
RR2																				0.24			
RR3																				0.76			
SHP1																					0.45		
SHP3																					0.94		
SLA1																						0.86	
SLA2																						0.61	
TN5																							1.00

Table 4. Discriminant validity (Fornell-Larker criterion)

	AC	AIP	ASC	CB	CE	CRC	ITG	GIC	IBP	IGF	IL	IMM	IPM	IRM	ISC	ISM	IST	MN	OS	RR	SHP	SLA	TN
AC	0.73																						
AIP	0.09	0.73																					
ASC	0.01	0.12	0.73																				
CB	0.03	0.00	0.17	0.74																			
CE	-0.19	0.28	0.10	0.05	0.68																		
CRC	-0.01	-0.16	0.01	0.04	-0.09	0.73																	
ITG	0.38	0.19	0.06	-0.09	0.01	0.17	0.79																
GIC	0.01	-0.09	0.33	0.23	0.01	0.18	0.01	0.77															
IBP	-0.11	-0.08	0.15	-0.10	0.04	0.08	0.02	0.21	0.73														
IGF	0.26	0.06	0.15	0.00	-0.06	0.06	-0.01	0.23	-0.06	0.72													
IL	-0.12	0.06	0.02	0.06	0.18	-0.11	0.04	0.08	0.04	-0.04	0.77												
IMM	-0.00	-0.26	0.18	0.10	-0.08	0.11	-0.10	0.22	0.11	0.18	-0.02	0.74											
IPM	0.14	0.03	0.01	0.06	-0.04	-0. 04	-0.13	-0.02	-0.03	0.16	-0.15	-0.04	0.57										
IRM	-0.06	-0.14	-0.04	-0.07	-0.16	0.00	0.10	0.04	0.00	-0.04	-0.04	-0.05	-0.09	0.70									
ISC	-0.10	-0.25	-0.09	-0.04	-0.36	-0.04	-0.12	-0.13	0.04	-0.03	-0.00	-0.08	-0.05	0.28	0.64								
ISM	-0.04	-0.20	-0.16	-0.25	-0.04	-0.04	-0.05	-0.17	-0.10	-0.06	-0.15	0.04	-0.09	0.10	0.04	0.84							
IST	-0.10	-0.02	-0.16	-0.19	0.02	-0.09	0.05	-0.25	-0.16	-0.18	0.02	-0.12	0.14	-0.01	0.04	0.08	0.74						
MN	-0.11	0.17	0.20	0.06	0.37	-0.06	0.00	-0.09	0.02	-0.03	-0.05	-0.12	-0.11	-0.00	-0.26	-0.09	-0.16	0.76					
OS	-0.06	0.04	-0.02	0.01	0.07	0.00	-0.14	0.14	-0.05	0.13	0.03	0.08	0.18	-0.05	-0.08	0.03	-0.05	-0.04	1.00				
RR	0.14	-0.04	0.06	0.32	-0.04	0.12	0.01	0.44	-0.11	0.15	0.03	0.09	0.22	-0.06	-0.22	-0.05	0.03	-0.03	0.24	0.62			
SHP	-0.03	-0.06	-0.01	0.12	-0.07	0.16	-0.22	0.15	-0.01	0.11	-0.32	0.14	0.02	-0.12	-0.09	0.05	-0.05	-0.18	-0.07	0.16	0.74		
SLA	0.00	0.18	0.08	0.02	0.21	0.25	-0.03	0.31	0.01	0.06	0.02	-0.09	0.11	-0.07	-0.27	0.10	-0.12	0.10	-0.06	0.14	0.11	0.75	
TN	-0.00	0.02	0.01	-0.09	-0.28	0.08	0.01	-0.18	-0.00	-0.04	0.22	0.04	-0.05	0.03	0.16	0.17	0.06	-0.14	-0.02	-0.17	-0.07	-0.02	1.00

latent variables between 0.75 – 0.50 as substantial, between 0.50 – 0.25 as moderate, and below 0.25 as weak.

The R^2 for ITG is 0.35 (35%). R^2 is reasonable since a moderate R^2 should be between 0.50 (50%) and 0.25 (25%) for the endogenous latent construct.

Path Coefficient

Path coefficient (Beta (β)) is a form of multiple regression statistical analysis used to describe directed dependencies among given constructs. Hair et al. (2016) point β value ranges between -1 and +1, whereby -1 indicates a negative relationship and + 1 shows a positive relationship. Path coefficient

Figure 2. Coefficient of determination

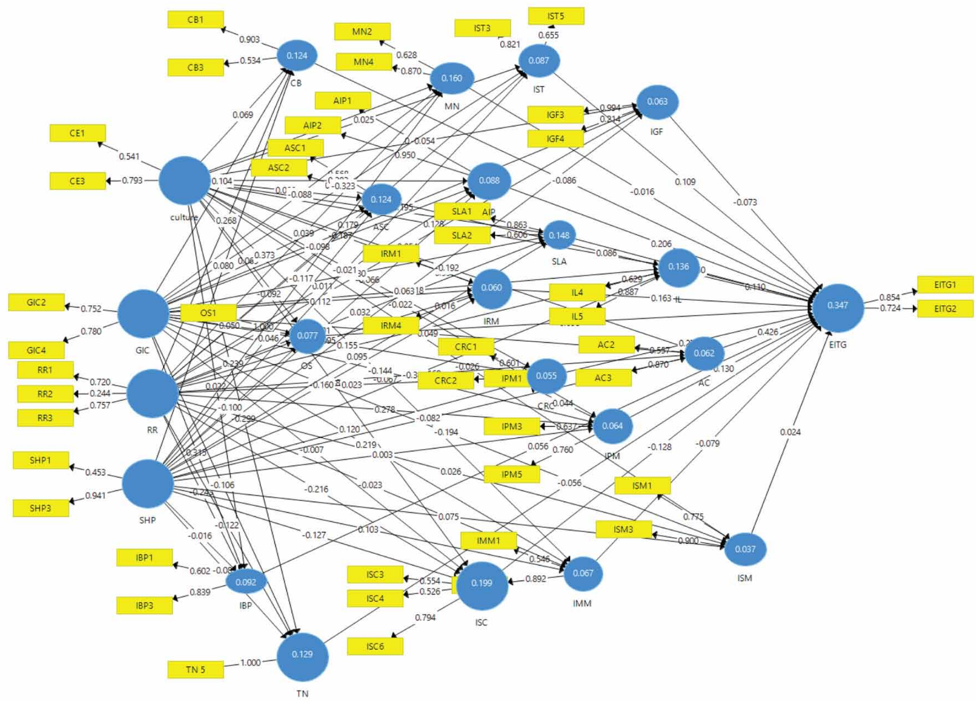


Table 5. Coefficient of determination

Constructs	R^2
AC	0.06
AIP	0.09
ASC	0.12
CB	0.12
CRC	0.06
ITG	0.35
IBP	0.09
IGF	0.06
IMM	0.07
IL	0.14
IRM	0.06
ISM	0.04
IST	0.09
MN	0.16
OS	0.08
SLA	0.15
TN	0.13

technique was done to find the correlation coefficients between external constructs and internal constructs. Also, between internal constructs and ITG. A path diagram was used to illustrate the path analysis of the constructs (see figure 3)

Both positive and negative path coefficients indicate the direct and indirect correlation between endogenous and exogenous constructs. This result is in line with previous scholars (Drikvand et al., 2011; Khayatnezhad et al., 2010) that reported both positive and negative correlations between constructs.

Proposed Hypotheses

The proposed hypotheses are as follows.

H1: Government, industry, and customers has a significant positive effect on the architecture steering committee for implementing ITG in HILs in Uganda.
H2: Stakeholders' participation has a significant positive effect on IT risk management for implementing ITG in HILs in Uganda.
H3: IT strategic committee has a significant positive effect on implementing ITG in HILs in Uganda.
H4: CIO reporting to CEO has a significant positive effect on implementing ITG in HILs in Uganda.
H5: The architecture steering committee has a significant positive effect on implementing ITG in HILs in Uganda.
H6: Accountability for IT projects has a significant positive effect on implementing ITG in HILs in Uganda.
H7: IT risk management has a significant positive effect on implementing ITG in HILs in Uganda.
H8: IT leadership has a significant positive effect on implementing ITG in HILs in Uganda.
H9: IT/business partnerships has a significant positive effect on implementing ITG in HILs in Uganda.
H10: The involvement of senior management has a significant positive effect on implementing ITG in HILs in Uganda.
H11: Awareness campaigns have a significant positive effect on implementing ITG in HILs in Uganda.

Hypotheses were done using PLS-PM to test the statistical significance of the constructs of the conceptual framework. The confidence level was 95% (degree of accuracy/margin of error of 5%), and a p-value of 5% or $p<0.05$ was used. Four hypotheses were statistically significant, while seven were statistically insignificant, as shown in table 7.

The IGHU Conceptual Framework

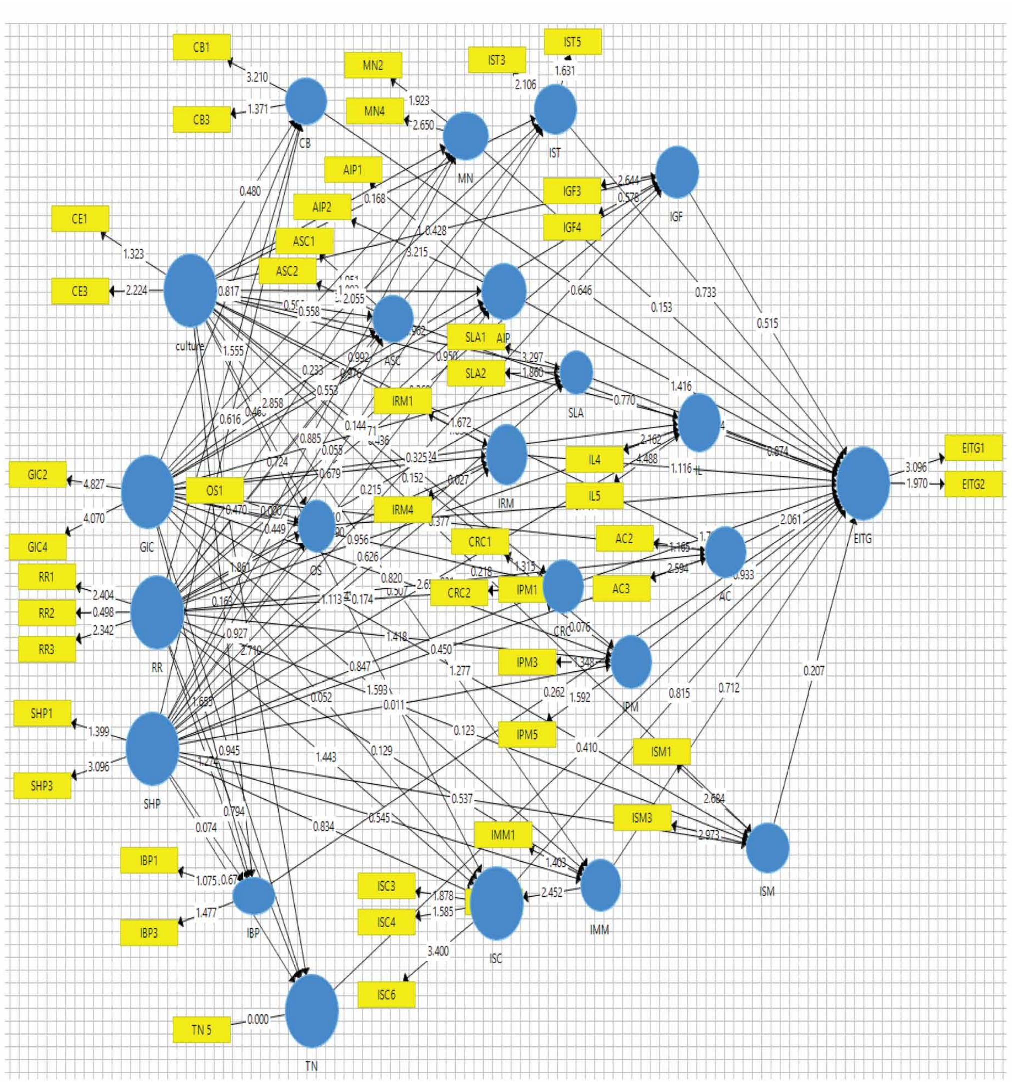
The conceptual framework consists of external and internal environment ITG mechanisms. The external environment mechanisms influence ITG through internal environment constructs. The internal environment mechanisms are further categorized as structures, processes, and relational mechanisms which constitute the ITG framework (Bianchi et al., 2017). The external environment consists of government, industry, and customers, and stakeholders' participation. Structure mechanisms are; IT strategy committee, CIO reporting to CEO, and architecture steering committee. Process mechanisms are; accountability for IT projects and IT risk management. Relational mechanisms are; IT leadership, IT/business partnership, involvement of senior management, and awareness campaigns. The resultant conceptual framework for implementing ITG in HILs in Uganda is in figure 4.

DISCUSSION OF RESULTS

Contribution of Theory to the IGHU Conceptual Framework

The IGHU is based on a synthesis of IT governance mechanisms from IT governance conceptual framework for the public sector (Laita & Belaissaoui, 2017), exploratory study into the design of an

Figure 3. Path Coefficient (β)



IT governance minimum baseline through Delphi research (De Haes & Van Grembergen, 2008a), and a conceptual model for ITG in public sectors (Janahi et al., 2015). IGHU consists of two categories of ITG mechanisms: internal environment and external environment.

The external environment mechanisms extended from Laita and Belaissaoui (2017) were; Government, industry, and customers, and stakeholders' participation, while the internal environment mechanisms were; IT strategy committee, IT leadership, IT/business partnership. Accountability for IT Projects, IT risk management, involvement of senior management, and awareness campaigns were obtained from a conceptual model for IT governance in public sectors by Janahi et al. (2015). The architecture steering committee and CIO reporting to CEO were adopted from an exploratory study into the design of an IT governance minimum baseline through Delphi research by De Haes and Van Grembergen (2008a).

Table 6. Path Coefficient (β)

	AC	AIP	ASC	CB	CRC	ITG	IBP	IGF	IL	IMM	IRM	ISM	IST	MN	OS	SLA	TN
AC						0.43											
AIP						0.21											
ASC						0.09											
CB						-0.09											
CRC						0.27											
GIC	-0.05	-0.10	0.37	0.10	0.15		0.31	0.19	0.12	0.22	0.11	-0.19	-0.32	-0.09	0.05	0.28	-0.11
IBP						0.06											
IGF						-0.07											
IL						0.11											
IMM						-0.08											
IRM						0.16											
ISM						0.02											
IST						0.11											
MN						-0.02											
OS						-0.10											
SHP	-0.08	0.00	-0.05	0.08	0.12		-0.02	0.06	-0.32	0.10	-0.16	0.08	-0.02	-0.12	-0.10	0.10	-0.08
SLA						-0.15											
TN						-0.06											

Table 7. Hypotheses tests

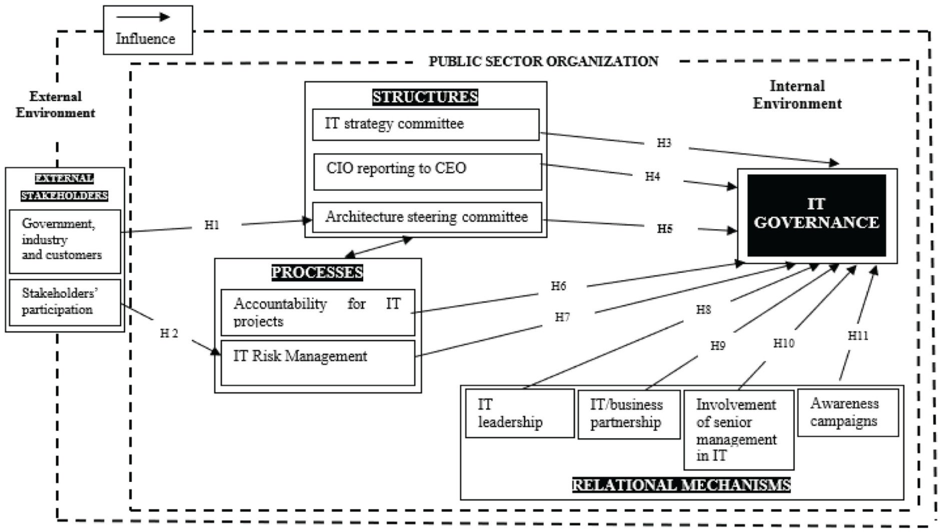
Hypotheses	Path	Original Sample	Sample Mean	Standard Deviation	P-Value (P)	Significant Test
H1	GIC→ ASC	0.37	0.36	0.13	0.00	Supported
H2	SHP→ IRM	0.10	0.06	0.19	0.59	Not supported
H3	IST → ITG	0.11	0.06	0.15	0.46	Not supported
H4	CRC→ ITG	0.27	0.23	0.15	0.03	Supported
H5	ASC→ ITG	0.09	0.07	0.11	0.44	Not supported
H6	AIP → ITG	0.21	0.18	0.15	0.04	Supported
H7	IRM→ ITG	0.16	0.12	0.15	0.26	Not supported
H8	IL → ITG	0.11	0.11	0.13	0.38	Not supported
H9	IBP →ITG	0.06	-0.00	0.21	0.79	Not supported
H10	ISM→ ITG	0.02	0.01	0.12	0.84	Not supported
H11	AC→ ITG	0.43	0.35	0.21	0.04	Supported

IGHU differs from Laita and Belaissaoui (2017) because of the additional internal environment mechanisms: awareness campaigns, accountability for IT projects, architecture steering committee, CIO reporting to CEO, IT risk management, and involvement of senior management in IT. IGHU differs from De Haes and Van Grembergen (2008a) because of the additional external environment and internal environment mechanisms: awareness campaigns, accountability for IT projects, IT risk management, and involvement of senior management in IT. IGHU differs from Janahi et al. (2015) by adding external environment and internal environment mechanisms such as architecture steering committee, CIO reporting to CEO, IT/business partnership, IT leadership, IT risk management, and IT strategy committee.

Discussion of the Study Findings

Hypotheses were tested for the constructs that had positive relationships with the dependent constructs. Four hypotheses were statistically significant, while seven were statistically insignificant. Quertemont (2011) notes that some constructs may be substantial, although they are not statistically significant. Schneider (2015) urges researchers to clarify why results with significant statistical tests

Figure 4. Conceptual Framework for implementing ITG in HILs in Uganda (IGHU)



are insignificant in a given study. Scholars (such as Borja et al., 2018; Ali et al., 2009; Banker et al., 2011; Ferguson et al., 2013) have included statistically insignificant constructs in the developed framework. Therefore, both significant and insignificant constructs were considered for IGHU since they were assumed necessary for implementing ITG for HILs in Uganda. The discussion of findings is as follows.

IT strategy committee: The study did not find a significant influence. A possible explanation of insignificant results may be the confusion of the wording of IT strategy committee with the IT committee, commonly used in institutions. The study findings were inconsistent with prior literature that indicated IT strategy committee positively influences ITG (Ali & Green, 2005). Also, there was a lack of dedicated IT strategy committees in HIL. This contends with Huff et al. (2004), who indicated a lack of board IT committees in organizations.

CIO reporting to the VC: The findings were consistent with prior literature that indicated CIO reporting structure is one of the decisions an organization should make because it involves the organization's highest IT executive, which affects its performance (Csaszar & Clemons, 2006). Banker et al. (2011) support the direct reporting relationship of the CIO to the CEO because it helps the CIO promote a vision for IT, expose ideas of IT initiatives, and IT proposals are heard by the concerned executive who eventually facilitates the CIO's role.

IT risk management: Findings showed a significant negative influence of IT risk management on implementing ITG in HILs in Uganda. This was inconsistent with scholars (such as Alkhaldi et al., 2017; Lunardi et al., 2017) that indicated a significant relationship between risk management and ITG and also proposed risk management as a factor with the highest impact on ITG application where managers should ensure all essential roles in managing IT risks are well defined and staffed. The negative significance could be explained by the limited budget allocated to IT, and IT risks were noted to be handled as they came. The null findings may also be explained by existing standards insufficient to address IT risks (Jordan & Musson, 2003).

IT leadership: In respect to IT leadership significantly influencing ITG implementation in HILs in Uganda, results showed a significant negative influence. Findings deviated from previous studies (Nfuka & Rusu, 2013), indicating IT leadership management of business goals. It was revealed that IT leadership inspires, inñuences, and guides IT's strategic integration in an organization (De Haes &

Van Grembergen, 2008a). However, Nfuka and Rusu (2010) indicated a need to enhance IT leadership because of insufficient capacities and involvements in a setting whose IT knowledge and culture are not mature. This study revealed that HILs in Uganda recognized the importance of IT leadership and had all introduced IT directorates/departments.

IT/business partnerships: For IT/business partnerships that significantly influences ITG implementation in HILs in Uganda, findings showed a negative influence. This was inconsistent with previous literature (such as Lee et al., 2008) that widely investigated IT/business partnerships, including understanding and involvement in each other's requirements and initiatives to enhance value from IT. For example, Nfuka and Rusu (2010) reveal a leveled ground by IT and business people about IT prospects and business requirements as a path-way for ITG if lower awareness and broader coordination exist. A possible explanation for negative significance could be that many respondents were unfamiliar with the practice and indicated inadequate IT and business alignment that negatively affects ITG performance in situations requiring relational mechanisms.

Involvement of senior management in IT: The findings showed insignificant influence. This differed from several studies (such as Appleby, 2008). The null finding in this study may be explained by limited support by top managers in applying ITG, which is seen as a challenge. This is because IT's strategic importance is undervalued by the board of directors (Boritz & Lim, 2007). The finding, however, is in line with one that found an insignificant effect of the committee on IT innovations (Héroux & Fortin, 2016). Nolan and McFarlan (2005) note the boards' failure to fully understand IT impacts on the firm strategy and its role in measuring and monitoring IT.

Awareness and advocacy: In respect to awareness and advocacy significantly influencing ITG implementation in HILs in Uganda, the statistical results of this study were positive. This is consistent with Kambil and Lucas (2002) that suggested the sensitization of corporate management on technological trends and integration of IT with corporate strategy is the most crucial task of the board concerning IT. In this practice, engineers innovate and optimize IT capabilities and governance. A possible explanation for the positive influence is that workshops are usually held to sensitize stakeholders in HILs on new IT systems being introduced and refresher training for implemented IT systems.

Contribution of the Study to Practice

IGHU provides people in IT leadership and decision-making with appropriate mechanisms for implementing IT governance.

IGHU enables public managers and decision-makers to improve IT-related plans, prioritize limited IT resources for sustainability of public service delivery, and enhance the continuing strategies for the successful alignment of IT and business.

Future Work

Although this study provides mechanisms for implementing IT governance in the public sector of developing countries such as HILs in Uganda. Nevertheless, further research on the following is still required.

Institutions may align IT to business strategy to realize business objectives like improved efficiency and high return on investment. However, due to the fast changes in the business environment and technology, the expected goals may not be achieved; it may be difficult to anticipate such distractions when setting IT and business strategies. Thus, further research is required to investigate the challenges of IT alignment to business strategy for developing countries.

IT performance measurement is required since IT management is still a problem in the public sector of developing countries. Measuring IT performance enables IT/business planners to assess its optimal use while mitigating risks in such a resource-constrained environment.

CONCLUSION

The study developed a conceptual framework for implementing ITG in HILs in Uganda (IGHU). A descriptive field study was conducted. The unit of analysis was IT and business representatives, and the unit of inquiry was IT and business directors/managers and IT technicians. Data were analyzed using Smart PLS 2.3.9 software. The constructs of IGHU were validated, and their relationships were tested using PLS-PM. R^2 was moderate, the path coefficient had both positive and negative relationships of the independent to dependent constructs, and the hypotheses were statistically significant and insignificant. Thus, we can safely conclude that IGHU is well stipulated, accurate, and the constructs with their relationships are correct. Furthermore, the design of IGHU is complete since it consists of valid ITG mechanisms.

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