Information Technology Governance Structures, Processes and Mechanisms in Ghanaian Universities

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Abstract. This preliminary study seeks to explore the existence and the level of implementation of formal information technology governance structures, processes, and mechanisms in Ghanaian universities. This study employs information technology (IT) Governance Matrix (framework) to examine how IT governance mechanisms: decision rights and domains, structures, processes, and relational mechanisms are being implemented. A survey was conducted and the data were analysed based on the responses received from 66 information technology (IT) and non-IT leaders. The results show that IT governance decision-making forms a pattern of the centralized IT governance with only top executives and IT leaders making IT decisions with regards to all IT decision domains: IT principle, IT investment, IT application, IT infrastructure, and IT architecture. Further, the study reveals that IT governance processes were not sufficiently formalized and the majority of the universities do not use any IT governance standards, frameworks and best practices. The majority of the universities do not have permanent IT strategic/steering committees.

Keywords:
IT governance and mechanisms, IT governance decision rights and domains, IT governance processes, IT governance structures, IT governance relational mechanisms.

I. INTRODUCTION

The growing dependence on information technology (IT) systems for improved decision making, operational excellence, competitive advantage, new product development and services, customer and supplier intimacy, and for day-to-day survival [1] coupled with the increasing legal, regulatory and compliance environment, and the prevalence of IT risks [2] [3] has necessitated the adoption of formal IT governance by institutions in the past decade. According to [4], IT governance "is about systematically determining who makes each type of IT decision (a decision right), who has input to the decision (an input right) and how these people (or group of people) are held accountable for their role" (p.3). From this view point, IT governance is the locus of IT decision making, distribution and pattern of managerial responsibilities, and controls that ultimately affect how IT resources are applied and implemented. IT Governance Institute, [5] presented IT governance as the "responsibility of the board of directors and an integral part of enterprise governance and consists of the leadership and organizational structures and processes that ensure that the organization's IT sustains and extends the organization's strategy and objectives" (p. 17). Thus, good IT governance draws on corporate governance principles in determining roles and responsibilities within the organizational structure to govern IT assets, manage, and use IT resources to realize corporate goals. Therefore, IT governance is regarded as part of corporate governance and the boards of directors have

the ultimate responsibility for IT success [6] [7].

According to [8], IT governance spans all the three levels of management - *strategic*, *tactical*, and *operational*. Firstly, IT governance practices at the *strategic* management level involve provision of oversight, policy enactment, direction and control, strategic planning, resource allocation, and accountability [10]. Secondly, the *tactical* level managers translate the directives from top executive level into policy documents, company standards, and procedures. Specifically, the tactical level managers act on the directives with input from various departments by writing policies, assigning roles and responsibilities, analyzing risks and vulnerabilities, setting up security infrastructure, selecting security control frameworks that contain standards, measures, best practices, and establishing monitoring procedures, and performing regular reviews [11]. Finally**,** the *operational* level managers receive the policies, standards, and procedures developed from the tactical level managers and expand them into a set of administrative guidelines and procedures [11]. The administrative procedures, policies, and standard must be aligned with the board's directives. Following, the operational level management implements the procedures by performing the day-to-day IT operations [12].

Again, IT governance can be categorised into three: *structures, processes*, and *relational mechanisms*. IT governance *structures* involve who makes IT decisions, who makes input to the decision, how IT functions are structured, who participates in IT, which committees are put in place, what are the roles and the composition of IT committees [4]. Decisions made on IT are critical for the success or failure of institutional IT goals. IT governance *processes* entail strategic decision making through use of IT governance frameworks that contain monitoring and performance measurement tools and best practices. IT governance *relational* mechanisms are the means by which IT processes and decisions are communicated to the stakeholders. These may include strategic dialogue, shared knowledge, training, knowledge sharing, and effective communication [13]. In particular, universities are investing heavily in IT systems (infrastructure, architecture, applications) to support tens of thousands of ever increasing students' population in order to enhance teaching and learning, manage enterprise resource planning systems (ERP) that comprise of large databases of students' sensitive personal and academic records, and library databases of research publications. Moreover, universities are increasingly collaborating with each other through affiliations [14] and delivering distance and online education through IT systems. These IT systems need to be governed by the university authorities.

Therefore, universities need to ensure that formal IT governance mechanisms are put in place. In contrast, if for instance, universities fail to put in place IT structures, do not employ standard IT processes, and do not implement relational mechanisms, the institutional IT goal may not be achieved. This can lead to lose of competitiveness, inefficiencies in operations, and even vulnerabilities of critical IT systems leading to breaches of sensitive students' records and proprietary information and trade secrets. Overall, university that fail to govern their IT systems may be sanctioned by the inspectorate agencies such as National Accreditation Board (NAB). This study aims at exploring the existence and implementation of formal information technology (IT) governance structures, processes, and relational mechanisms [4] [13] [15] [33] in selected Ghanaian universities. For IT to meet business objectives, [32] emphasise the need for institutions to examine how their IT governance mechanisms are being implemented. Based on this recommendation, this study attempts to provide an answer to the research question: *What are the information technology governance structures, processes, relational mechanisms*

put in place in Ghanaian universities? In order to provide an answer to the research question, the following sub research questions were posed.

a. *What are the IT governance structures (decisions rights, IT strategic and steering committees) implemented in Ghanaian universities?*

b. *What are the IT governance processes put in place to support teaching and learning, research, and administrative processes in Ghanaian universities?*

c. *What are the relational mechanisms employed to communicate IT governance processes and decisions (within the university community) in Ghanaian universities?*

II. LITERATURE REVIEW

Management of IT functions is a challenging and a complex task as a result of constant changes in business needs and rapid technological changes. This requires that top institutional leaders should put in place IT structures, processes, and relational mechanisms [31] to meet the challenges. According to [15], effective IT governance requires that institutions deploy a mixture of structures, processes, and relational mechanisms. The following section discusses the literature on IT governance models, structures, processes, and relational mechanisms.

A. IT Governance Models

The three basic IT governance models extensively discussed in the literature are *centralized*, *decentralized*, and *federal* models [4]. Under the *centralized* model, decision authority rests on the corporate IT executives or central IT organizational body [34]. With the *decentralized* model, the decision authority lies mainly with the business unit executives [30]. The *federal* model, business executives in business units have the authority to make decisions for strategic business applications with the involvement of IT executives. [4] expanded the primary models of IT governance (centralized, decentralized, and federal) to address people or group of people who have decision rights (political archetypes) and the specific types of IT decision that could be made (decision domains).

IT Governance Matrix (framework) mapped the key IT decision domains to IT governance decision rights [4]. The model was to assess and compare five major IT decisions organizations normally make on IT to the six decision rights. The key IT decision types (domains) include (a) *IT principles* - high-level decisions about how IT will be used to achieve institutional goals. (b) *IT architecture* - technical guidelines and standards used to achieve a desired level of business/academic and technical solutions and standardization, (c) *IT infrastructure* - strategies that address shared IT services used by multiple systems and applications, providing a foundation for enterprise-wide IT capabilities, (d) *IT Application* - involve specifying the requirements of major IT applications and choosing applications to meet the needs of the business, and (e) *IT investment* and prioritization - addresses how much the institution spends on IT investments, IT investment decisions and project approval [4].

The six decision rights (political archetypes) consist of (a) *business monarchy* (i.e., mainly senior business executives and may include chief information officer), (b) *IT monarchy* (i.e., individual or group of IT executives), (c) *federal* (i.e., business executives, representatives, together with IT involvement), (d) *IT duopoly* (i.e., decision making involves IT executives and a group of business leaders), (e) *feudal* (i.e., business unit making decisions based on the needs of the unit), and (f) *anarchy* (i.e., decisions made by individual user or small group). A careful study of [4] political archetypes closely

mirrored the models found in the literature (i.e., centralized, decentralized, and federal). The business monarchy and IT monarchy represent centralized structure; duopoly is closely aligned with the federal model; and the feudal and anarchy closely connected to decentralized model [34].

B. IT Governance Structures

IT governance *structures* refer to the design of roles and responsibilities assigned to IT and business committees. For example, IT *steering* committee and IT *strategic* committee may be set up to oversee IT projects and to ensure that the executives are engaged in IT governance by establishing the locus of IT decision making and the line of reporting [15]. The board of directors govern IT through IT strategic and IT steering committees [17]. IT *strategic* committee operates at the board level and assists of the board of directors in overseeing the organization's IT-related matters.

On the other hand, IT *steering* committee operates at the executive management level and has specific responsibility for overseeing various major IT projects, managing IT priorities, costs, resource allocation, and making sure that policies are understood throughout the organization [15]. The executive participation in IT governance is important. De Haes and van Grembergen disclosed that the board, business and IT management have a crucial role to play in ensuring success of IT governance; maintaining that the chief executive officer (CEO) is responsible for carrying out the strategic plans and policies established by the board, and that the chief information officer (CIO) should be included in the senior-level decision-making process and should report directly to the board. But, [16] suggested that CIO should rather report to the CEO.
Evidence suggested that the boards of directors governing through IT strategic committee and IT steering committee would bring about effective IT governance. [17] examined the effectiveness of IT governance practices and decision structures; focusing on IT steering committees and IT-related communication policies.This qualitative study showed that centralized IT governance structure, effective IT steering committee, and other governance-related communication policies directly impact firms' effective use of IT. [17] suggested that it is important that organizations employ formal IT steering committees, which should compose of senior level management from among IT and business senior managers.

An earlier study found that effective IT governance depends on effective use of IT strategic committee and clear corporate communication systems in the organizations [18]. [19] also found relationship between effectiveness of IT steering committee and organization's IT management. But, do universities have IT strategic and IT steering committees? What role do these committees play?

C. IT Governance Processes

In an environment of increasing regulatory controls, adoption IT frameworks, standards and best practices enhances IT governance in organizations [5]. The application of IT processes, which are detailed in IT frameworks, standards and best practice documents, would assist institutions to adhere to regulatory compliance, realize value from IT investments and IT services, and benefit from increased efficiency; thereby reduce coTo aid organizations meet compliance and realize other business objectives, institutions have been established to provide guidelines and develop frameworks to aid IT governance efforts.

The IT Governance Institute (ITGI) has over the years provided guidelines for the international business community on issues related to IT governance [5]. The Office of Commerce published information technology infrastructure library (ITIL) to deal with IT services; ITGI developed the control objectives for information and related

technology (COBIT) to address IT controls; International Standards Organization (ISO) published ISO/IEC 27002 to handle information security; whereas National Institute of Standards and Technologies (NIST) provide technical guidelines for day to day IT operations [20]. Universities that employ IT frameworks, standards and best practices would most likely realise their IT goals.

D. IT Governance Relational Mechanisms

A critical factor in aligning IT objectives to business goals is through relational mechanisms. Relational mechanisms include strategic dialogue, sharing of knowledge, training, knowledge sharing, and effective communication [21]. [22] remarked that to avoid anticipated resistance to IT framework implementation, awareness, workshops, and training programs must be instituted and should involve both the IT and operations departments. Similarly, [23] pointed out that implementation of IT programs should involve effective communication between top management, IT executives, information security managers, senior managers, and the end users. After the workshops and seminars, responsibilities and roles should be assigned to all the various departments and regular meetings be put in place in order to ensure consistency in carrying out the processes [22]. Special training for some key personnel to obtain certification in IT framework implementation is necessary to bring excellence into the success of IT governance.

III. METHODOLOGY

This study is a quantitative survey of both IT leaders and non-IT participants in both private and public universities. A total of 61 public and private universities accredited institutions, listed by NAB, took part in the study. These include 9 public universities, 51 private university colleges, and 1 private university with a charter status [24]. Universities that were not accredited by NAB were not included in the study. A total of one hundred and eighty three questionnaires were prepared and mailed (to institutions outside Greater Accra region) and self-delivered (to institutions within Greater Accra region). Each institution received three questionnaires. The participants in the study include the president/chancellor, the vice president/pro-vice chancellor, senior IT leaders, the directors of administration, academic management, and the IT management personnel.

The study employed an instrument developed and used by Educause Centre for Applied Research, [25] to examine IT governance mechanisms in Educause member institutions. ECAR is an institution established to advance higher education by promoting the use of information technology systems. The questionnaire consisted of four sections (1) IT governance structures, (2) IT governance processes, (3) IT governance relational mechanisms, and (4) demography data. IT governance structures has inputs and decision-making section, which is measured using a 5-likert scale: 1 (*never*), 2 (*sometimes*), 3 (*don't know*), 4 (*often*), and 5 (*always*). The participants were asked about their input and decision rights to five main IT domains (IT principles, IT architecture, IT infrastructure, IT application, and IT investment). IT governance processes section used various scales, including 1 (*no*), 2 (*yes*), and 3 (*don't know*). In some cases a 5-likert scale 1 (*strongly disagree*), 2 (*disagree*), 3 (*neutral*), 4 (*agree*), and 5 (*strongly agree*) were used. Similarly, IT governance relational mechanisms section was measured on a scale of 1 (*no*), 2 (*yes*), and 3 (*don't know*). The final section of the questionnaire consisted of demographic data about the functions of the participants and the type of institution (private or public).

A reliability analysis was performed using the Cronbach's alpha (coefficient) to establish internal consistency of the items. Table 1 showed the results of the constructs, which were all above the recommended threshold of .7 or higher [26]. After the reliability testing,

the data were analyzed using frequency analysis and Pearson correlation. [27] used frequency analysis technique to empirical analyze students' computer security practices and perceptions. Also, [28] employed frequency analysis to analyze students' familiarity and practice of information security and safety measures.

Table 1. Reliability Testing

Constructs	No of Items	Cronbach's Alpha
IT Decision Rights/Domains - Input	40	.950
IT Decision Rights/Domains - Decision	40	.960
IT Governance Structures and Processes	21	.964
IT Governance Relational Mechanisms	7	.923

IV. DATA ANALYSIS AND FINDINGS

A. Characteristics of Respondents

A total of 183 respondents were invited to take part in the study (three participants per university) and sixty-six completed the survey were returned, which represent 36% response rate. Overall, 36.4 percent respondents (corresponding to 24 participants) were from the public universities and 63.6 percent (corresponding to 42 participants) were from the private universities. The respondents (15 in total or 22.7 percent) were IT leaders and 14 respondents (representing 21.2 percent) were IT management staff. One President/Chancellor participated in the study (representing 1.5 percent). Seven administrative academic management staff (representing 10.6 percent) and twelve academic management staff (Deans, Heads of Department, etc) representing 18.2 percent and seventeen others (members of the academic board, faculty members, other IT staff) representing 25.8 percent.

B. IT Governance Structures

This section examined IT governance structures (decisions rights, IT strategic and steering committees) are implemented in Ghanaian universities.

1. Decisions Rights and Domains

Beginning, the study mapped different types of IT decision domains to IT decision rights based on the IT Governance Matrix, a typology developed by [4]. Eight different types of participants were indentified in the university environment. They were categorized into those from whom advice on IT is sought (input right) and those who made the final IT decisions (decision right). Tables 2a and 2b depicted the mapping of IT decision domains to IT decision rights. The mean scores and rankings of each decision domains against the input/decision rights can be observed from the tables. For IT *principles*, only the IT leader has the highest mean input frequency score above 3 while the business monarchy (Board of Directors, Chancellor/President, Vice Chancellor/Rector) ranked the highest in the final decision making.

On the other hand, the business monarchy has the highest input rights (above mean score of 3) with regards to IT *architecture* while IT leader takes the final decision. Moreover, with respect to IT *Infrastructure*, the IT leader ranked the highest both in input and decision making. Similarly, in terms of IT *Application*, the IT leader had the highest input and decision rights. On the other hand, business monarchy has the highest input and decision rights in respect of IT *Investment*. Overall, the IT leader made the most contribution in terms of input and as well decision-making within IT decision domains. It can be observed from Tables 2 and 3 that all IT decisions were made by only the

business monarchy (Board of Directors, Chancellor/President, and Vice Chancellor/Rector) and the IT monarchy (IT leader). This indicated that though university governance is shared and broad-based, IT governance is mainly in the hands of the top executives and IT leaders, thus forming a pattern of the centralized IT governance.

Table 2. IT Governance Input/Decision Rights and Decision Domains

IT Decision Rights (Participants in IT Governance)	IT Decision Domains								
	IT Principles			IT Architecture			IT Infrastructure		
	Input	Decision	Rank	Input	Decision	Rank	Input	Decision	Rank
Board of Directors	2.86	3.34	**1**	3.03	3.23	**2**	3.16	3.08	4
Chancellor/President	2.91	3.11	**3**	3.03	3.22	4	3.23	3.24	2
Vice Chancellor/ Rector	2.76	3.21	**2**	**3.12**	3.23	3	3.10	3.12	3
IT leader/IT Manager	**3.00**	2.86	5	3.06	3.40	**1**	**3.50**	3.27	1
Registry/Academic Registry	2.63	2.46	6	2.50	2.61	6	2.81	2.69	5
Deans/Heads of Department	2.53	3.06	4	2.51	2.75	5	2.84	2.66	6
Faculty Members	2.64	2.24	7	2.45	2.52	7	2.39	2.41	7
Students	2.36	1.97	8	2.03	2.27	8	2.21	2.18	8

Scale: 1 = very rarely or never, 5 = very frequently or always

Table 3. IT Governance Decision Input/Rights and Decision Domains

IT Decision Rights (Participants in IT Governance)	IT Decision Domains								
	IT Application			IT Investment			Overall Totals		
	Input	Decision	Rank	Input	Decision	Rank	Input	Decision	Rank
Board of Directors	3.17	3.03	4	3.21	3.28	2	3.12	3.22	3
Chancellor/President	3.03	3.06	3	3.23	3.24	3	3.18	3.24	2
Vice Chancellor /Rector	3.20	3.11	2	**3.34**	3.31	1	3.13	3.21	4
IT leader/IT Manager	**3.32**	3.20	1	3.27	3.17	4	**3.26**	3.27	1
Registry/Academic Registry	2.69	2.80	6	2.70	2.70	6	2.72	2.64	6
Deans/Heads of Department	2.86	2.91	5	2.58	2.73	5	2.63	2.81	5
Faculty Members	2.55	2.54	7	2.24	2.21	7	2.51	2.45	7
Students	2.17	1.97	8	1.97	1.92	8	2.16	2.11	8

Scale: 1 = very rarely or never, 5 = very frequently or always

2. IT Strategic and Steering Committees

Table 4 showed that 23.8 percent of the respondents' institutions have IT strategic committee and 33.9 percent have IT steering committee. The vast majority of the respondents *do not know* about the existence of IT strategic committee (60.3 percent) at the board level and 39 percent *do not know* of the existence of IT steering at the top management level for oversight of major IT policies and initiatives. For those respondents who indicated having IT steering committees in their institutions identified main roles that the committees played. The respondents noted that IT steering committees plays advisory role, setting policies and priorities.

Conversely, the respondents indicated reasons why their institutions do not have IT steering committees (Table 5). These include (a) that the relevant IT decisions were made at the executive levels (25.8 percent), (b) that IT governance processes were not sufficiently formalized (19.7 percent), and (c) that the universities preferred using ad hoc committees as and when needed (18.2 percent). Moreover, only 32.2 percent indicated that their IT leader (CIO) chairs IT steering committees. In addition, about 27.7 percent of the respondents' institutions have their IT leader (CIO) as a member of the chancellor's cabinet, that is, as large as 72.3 percent of the respondents IT leaders were not part of the chancellor's cabinet. Overall, respondents, 10.3 percent, disagreed or strongly disagreed that their institutions' IT steering committee contributed effectively to institutional IT governance; 41.4 percent agreed or strongly agreed; while 48.3 percent remain neutral. Again, fifteen participants (representing 22.7 percent) reported they were not directly involved in IT governance in their institutions, while 17 participants (representing 25.7 percent) reported having been directly involved in IT governance. However, 34 participants remain neutral (representing 51.4 percent).

Moreover, the study established the relationship between the IT leader (CIO) on the chancellor's cabinet and the existence of IT steering committee. The result found negative correlation between IT leader on chancellor's cabinet and the existence of steering committee ($r = -.52$, $p < 0.01$). That is institutions that have IT leaders on the chancellor's cabinet less likely to have IT steering committee put in place. However, the Pearson's correlation suggested that institutions that have IT strategic committee also turn to have IT steering committee ($r = .37$, $p < 0.01$).

Table 4. IT Governance Structure (Steering Committees, Roles, Involvement)

Category	Item Description	No (%)	Yes (%)	Don't Know (%)	Remark
Existence of IT Steering Committees	1. Does your institution's board of trustees/council/governors have a technology subcommittee (IT strategic committee)?	15.9	23.8	60.3	-
	2. Does your institution have a top-level IT steering committee for oversight of major IT policies and initiatives?	27.1	33.9	39.0	-
Role of IT Steering Committees	3. What is the role of the IT steering committee?				

	a. Has advisory role	10.0	53.3	36.7	2
	b. Sets policy	6.2	62.5	31.2	1
	c. Sets priorities	6.7	53.3	40.0	3
	d. Adjudicates conflicts	25.9	22.2	51.9	5
	e. Authorizes funding	28.6	28.6	42.9	4
	f. Other	9.5	14.3	76.2	6
Involvement in IT Governance	4. Does your institution's senior IT leader chair the IT steering committee?	9.0	32.3	58.1	-

Table 5. Reasons for Universities not having IT Steering Committee

Code	Item Description	Option Selected	Percentages (%)	Ranking
1	Prefer distributing function across multiple standing committees	4	6.1	**6**
2	Prefer using ad hoc committees as needed	12	**18.2**	**3**
3	Prefer to preserve IT management freedom of action	3	4.5	8
4	Prefer personal advisory relationships	8	12.1	**4**
5	Relevant decisions are made at executive level	17	**25.8**	**1**
6	Insufficient stakeholder interest/willingness to participate	7	10.6	5
7	IT governance process not sufficiently formalized	13	**19.7**	**2**
8	IT governance needs not complex enough to justify	4	6.1	**6**
9	Other	1	1.5	9

N = 66

B. IT Governance Processes

This section examines the IT governance processes that are put in place in Ghanaian universities. The respondents indicated the use of none, selected or all the elements in the IT frameworks. It is surprising that the large proportion of the respondents did not use any of the three major frameworks; COBIT (54%), ITIL (41.1%), and ISO/IEC 27002 (42.9%). The respondents reported relatively lower usage of all elements and use of selected elements: COBIT 30.2% (mean 1.42), ITIL 47.6% (mean 1.71) and ISO/IEC 27002 46% (mean 1.62). This indicated that ITIL is used relatively much more in Ghanaian universities, followed by ISO/IEC 27002, and COBIT was the least used framework (see Table 6). Moreover, Table 7 shows the percentages and rankings of the institutions that employ measures to measure IT governance processes.

C. IT Governance Relational Mechanisms

The section examined the relational mechanisms that have been employed to communicate IT governance processes and decisions. Overall, 16.1% of the respondents disagree or strongly disagree that their institutions' kept all relevant bodies/units well-informed about IT governance processes and decisions; 45.2% remain neutral and 38.7% agreed or strongly agreed. As showed in Table 7, IT governance relational mechanism attributes were ranked in order to identify the methods universities employed to communicate IT governance processes and decisions. The results showed that 53.3% of the respondents' institutions use the academic boards. Less than half of the respondents reported that their institutions communicate IT decision through staff/faculty orientations, while 43.1% use the institutions websites. It is interesting to note that relatively large

proportion (35%) of the respondents *do not know* how their institutions communicate IT strategies.

Table 6. Use of IT Governance Frameworks

Item	COBIT		ITIL		ISO/IEC 27002	
	Frequency	Percentage (%)	Frequency	Percentage (%)	Frequency	Percentage (%)
Do not use	34	54.0	26	41.3	27	42.9
Use selected elements	16	25.4	20	31.7	23	36.5
Use most or all elements	3	4.8	10	15.9	6	9.5
Missing	10	15.9	7	11.1	7	11.1
Mean		1.42		1.71		1.62
SD		.602		.756		.676

N = 63

Table 7: Measurement of IT Processes

Category	Item Description	No (%)	Yes (%)	Don't Know (%)	Ranking (Process Used)
Measurement of IT Processes	Does your institution make use of any of the following as part of its IT governance processes?				
	1. Service level agreements	17.5	22.2	60.3	3
	2. Balanced scorecard	23.4	20.3	56.2	4
	3. External review of the IT function	22.2	30.3	47.6	2
	4. Institution-designed performance measures	12.7	36.5	50.8	1

Table 7. IT Governance Relational Mechanisms

Category	Item Description	No (%)	Yes (%)	Don't Know (%)	Ranking (Methods Used)
Communication of ITG Processes	Which methods does your institution use to communicate about IT governance processes and decisions?				
	1. Periodic newsletters/e-mails	22.0	37.3	40.7	4
	2. Senior leadership announcements	19.0	32.8	48.3	5
	3. Academic boards	10.0	53.3	36.7	1
	4. Staff/faculty orientation	15.3	47.5	37.3	2
	5. Documentation on Web	22.8	42.1	35.1	3
	6. Campus newspaper	38.2	23.6	38.2	6
	7. Other	26.3	21.1	52.6	7

V. DISCUSSION

The existence and implementation of IT governance structures, processes, and relational mechanisms in Ghanaian universities revealed interesting findings. Regarding decision making on IT *principles*, the IT monarchy (IT leaders) had the highest mean input frequency score above 3 while the business monarchy (Board of Directors, Chancellor/President, Vice Chancellor/Rector) ranked the highest in

making the final decision. For IT *architecture* the business monarchy had the highest input rights (above mean score of 3) while the IT leaders made the final decision. For IT *infrastructure*, though the business monarchy contributed immensely in terms of both input and decision, the IT leaders were ranked the highest both in input and decision making. Similarly, in term of IT *application*, the IT leader had the highest input and decision right. On the contrary, business monarchy had the highest input and decision rights in respect of IT *investment*.

Overall, the IT leader made the most contribution in terms of input and decision making within all IT governance domains. The findings are partly in consonance with earlier studies [4], which recommended that decisions about IT *principles* and IT *investment* would be IT effectiveness when taken by business monarchy (institutional leaders). Again, [4] found that decisions regarding IT *architecture* and IT *infrastructure* would be appropriate when taken by IT monarchy (IT leaders); and decisions on business *applications* would be suitable when taken by *federal* archetype (business leaders with IT involvement). However, the findings from this current digressed from the recommended norms as the IT leader made final decisions on IT *application* needs. The IT leaders should make final decisions on IT *architecture* and IT *infrastructure* but not on IT *applications*. This is because, generally, IT leaders better understand technical issues regarding IT *architecture* and IT *infrastructure* and business unit managers should make final decisions on IT application, though may receive input from the IT leaders.

Again, universities generally have a tradition of inclusiveness; therefore, the IT leaders' dominance in the entire decision domains could hinder inclusiveness. A possible explanation might be that there was limited technical experience among the board-level executives and top management level, thus the major IT decisions are deferred to IT leaders [8]. Similarly, all IT decisions were made by the business monarchy and IT monarchy. The federal, feudal, and anarchy made no IT decision. This implies that IT decisions from the deans, students, and registry was limited. That is, IT governance is mainly in the hands of the top executives and IT leaders, which forms a pattern of the centralized IT governance. The centralized IT governance, though has its merits of increased profitability as a result efficient operations and high degree of standardization, leading to low business costs [30], universities must involve other stakeholders (such as the deans, heads of departments in its IT governance) in other to reap the benefits of both centralized and decentralized IT governance approaches. Moreover, as a result of changing trends towards deployment and implementation of modern IT systems, including enterprise resource planning (ERP) systems, cloud computing, data center, and data warehousing systems, IT governance seems to be more geared towards centralized and shared governance models rather than strictly decentralized model.

Regarding IT governance structures, less than one-quarter of the respondents' institutions have IT strategic committee. About one third have IT steering committee and the same proportion indicated that their IT leader (CIO) chairs the steering committees. A little over one-quarter of the respondents institutions have their IT leader (CIO) being a member of the chancellor's cabinet. Overall, 41.4 percent agreed or strongly agreed that their institutions' IT steering committee contributes effectively to institutional IT governance. It is recommended that universities institute IT strategic and steering committees for effective IT governance [17] [19]. It is interesting to note that the universities that have IT leaders on the chancellor's cabinet turn not to have IT steering committee put in place. Rather, many universities prefer to use ad hoc committees to handle their IT issues.Perhaps, the informal nature of IT governance practices and the IT leader serving directly on the chancellor's cabinet; resulted in the universities having no

need for IT steering committee. Yet, those that have IT strategic committee also turned to have IT steering committee.

With regards to the use of IT governance processes as contained in IT governance standards and frameworks, the majority of the participating universities do not use any of the governance frameworks. In order to improve IT governance, universities should use IT governance frameworks such as the control objectives for information and related technology (COBIT) to address IT controls, information technology infrastructure library (ITIL) to deal with IT services, ISO/IEC 27002 to handle information security, and National Institute of Standards and Technologies (NIST) to provide technical guidelines for day to day IT operations [20].

In addition, the results showed that majority of the respondents' institutions use the academic boards (53.3 percent) to communicate IT decisions and processes. Less than one-half of the respondents reported that their institutions communicate IT decision through staff/faculty orientations, and through the use of the institutions websites. Effective communication of IT governance processes and decisions are important to IT governance effectiveness. Therefore, universities should improve IT governance communications and further expand it via mobile computing platforms in order to reach all the stakeholders.

VI. CONCLUSIONS

The current study examined information technology governance mechanisms (structures, processes, relational) that are put in place in Ghanaian universities. The overall results showed that the use of IT governance structures was ad hoc. The vast majority of Ghanaian universities do not have permanent IT strategic/steering committees. Therefore, IT decisions are made at the executive level or by employing ad hoc committees. It is suggested that the boards of directors and senior executives should constitute IT strategic and IT steering committees for effective IT governance. Moreover, IT governance decisions making forms a pattern of the centralized IT governance with only top management and IT leaders make IT decisions with regard to all IT decision domains. To communicate IT decisions, the universities mainly use the academic boards. The study also found that IT governance processes were not sufficiently formalized as the majority of universities do not use IT governance standards, frameworks, and best practices.

Based on these findings, it is highly recommended that the NAB step up efforts to make sure universities institute formal IT governance in order to maintain high educational quality as the survival of universities depends on their IT systems. The board of directors, academic boards, IT leaders, and the executive management teams of universities seeking to improve and make changes to their institutions' IT governance can use the findings of this study. This study recommends that senior executives should involve all relevant stakeholders in making IT decisions, improve communications of IT governance issues to all the stakeholders through various means rather than primarily via the academic boards. This study is however limited with regards to the small sample size. As a result of limited participants' involvement in IT governance in these institutions, future research will include an in-depth study combining both quantitative and qualitative research to further understand how IT governance is practiced.

VII. REFERENCES

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