

Review Paper

A Systematic Literature Review on IT Governance Mechanisms and Frameworks

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ABSTRACT

Nowadays, it is not common to come across sectors that can work and succeed without using information technology (IT). IT has now become a part of organizations' management and strategic decision-making mechanisms. Therefore, organizations make serious investments to develop software and system infrastructures and transfer business processes to digital environments such as cloud technologies. So, they get business resilient while they gain opportunities of spreading their business activities to wide stakeholders and customers. Here it is essential to provide assurance that an organization evaluates, develops, implements, maintains, disposes of its IT systems and manages life cycle of all information and information technology systems properly on all physical and logical environments. However, the most important matter is that an organization's objectives are met by the management practices of its information systems. While organizations carry out their digital transformation at a dizzying speed, organizations should be protected from material and moral damages such as loss of money, loss of commercial confidential information, loss of reputation by protecting the confidentiality, integrity and accessibility of the information assets they own and also comply with legal legislations such as the protection of personal data and intellectual property rights. In order to achieve this, organizations benefit from one or more frameworks, standards or directives that are suitable for their own structures and needs, separately or by integrating them. However, the most important point in this transformation process is the transition of organizations from IT management understanding to IT governance. In other words, IT has now become a part of the strategic decision-making mechanism by rising from the level of support tool to carry out business processes in organizations. When we search the academic literature, frameworks and standards, it is seen that the key elements of IT governance are structures, processes and relational mechanisms. If these three components are set up correctly and fit the organization, it can be assured that IT aligns with and supports the objectives of the organizations and that effective IT governance is achieved in every kind of organizations. In this research, databases such as Web of Science, IEEE, and SCOPUS are scanned and found articles are reviewed in order to make a literature review on IT Governance Mechanisms and Frameworks. Results are evaluated and discussed. By the way, suggestions for further studies were made and advanced researches were shed light on.



INTRODUCTION

As information technology (IT) can provide organizations or any enterprises by exploiting opportunities and also realizing and maximizing benefits, IT has become an integral part of every kind of organizations. Although the increased use of IT brings with some security risks, efficient IT Governance (ITG) with responsible useage of IT resources and management of IT risks can overcome these drawbacks. Almeida, Pereira and Silva (2013a) stated that today's widespread useage of IT has increased the dependency on IT seriously and this dependency triggered the importance of ITG especially in large organisations. Unlike large corporations, smaller companies and organisations have hardly ever started and even many top executives are not aware of ITG structures and mechanisms while IT is involved in almost every process in all organizations (Altemimi and Zakariar, 2015).

Although organizations find ways to achieve effective governance by implementing one or more ITG mechanisms separately or together in their enterprise architecture, Almeida et al. (2013a) also explained that there are deficiencies and inconsistencies in ITG mechanism definitions in the literature. So in this article, the most used and referenced ITG mechanisms were decided and also the parameters of the mechanisms were selected with the current terminology revised by the recent regulatory improvements and last technologies. For example, while researchers don't mention about green IT before 2005, we see that it is one of the popular matters which has been mentioned during the last decade. In the article about Green IT 2.0 and responsible digital transformation, Safdie mentions that the estimated carbon footprint linked to digital activities is calculated as approximately 4% of the world's total emissions which represents 2 gigatonnes of CO₂ while the digital carbon footprint is rapidly growing (Safdie, 2022). So new concerns of the last decade like Green IT, artificial intelligence (AI), etc., must be covered by ITG mechanisms in the organizations and enterprises and with this point of view, the literature review was conducted on the components that make up these mechanisms in our research.

Reviewing the literature, most researchers describe that framework of ITG shall be set by three mechanisms as “structures, processes and relational mechanisms” (Bianchi and Sousa 2016; De Haes and Van Grembergen 2015). Implementing all three mechanisms with a holistic approach is the key condition to achieve effective ITG and increase the performance of an organization by this way. So our study has been realized in a concept by using the parameters of these mechanisms.

METHODOLOGY

The literature review constructs the basement of most of the academic and scientific researches (Webster and Watson, 2002). When examined previous studies on literature review are examined, it is seen that researchers generally construct their studies under three main headings. (Tranfield, Denyer and Smart, 2003; Şimşek and Ateş, 2022; Yıldız, 2022) As seen in Figure 1, these headings are planning the research, conducting of research and reporting of data in order.

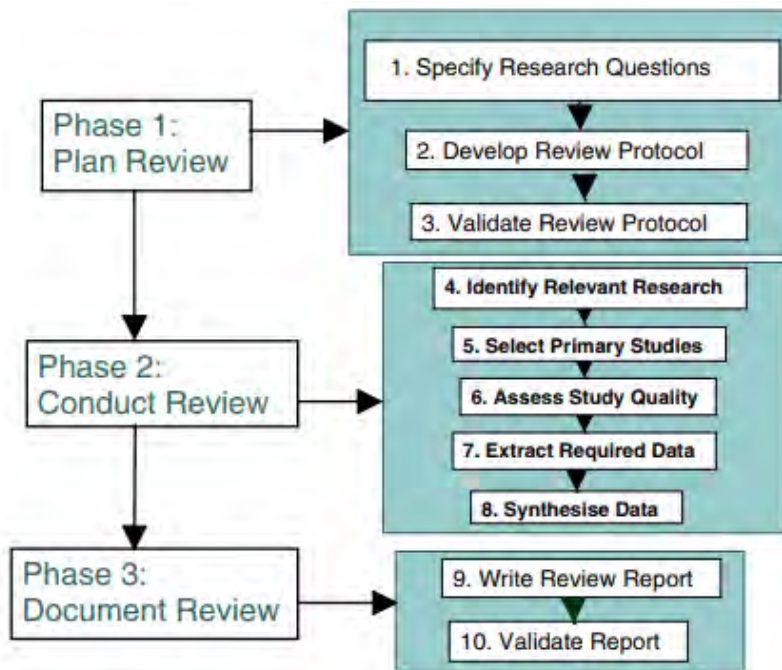


Figure 1. Phases of Systematic Literature Review Process (Brereton et al 2007)

In previous studies, systematic literature review (SLR) is recommended because this methodology is compatible with information systems and it provides more systematic evidence than classical literature review. SLR was chosen for our research because the steps in the SLR were suitable for our research proses. (Brereton et al, 2007; Şimşek and Ateş, 2022; Yıldız, 2022)

First step of the research was initiated by planning. Then, research questions were defined. The general purpose of this study is to form the basis to systematically review the existing literature in the field of information technology governance, to deeply understand the existing knowledge on IT governance mechanisms and frameworks, to evaluate the effects of these mechanisms and frameworks on organizations, to make a comparative analysis of different mechanisms and frameworks, and to provide guidance for future research. This study aims to identify gaps in the literature on information technology governance.

After defining the general purpose in planning phase, the research was set around both questions below which support the main purpose of this study:

- Which components does ITG mechanisms consist of?
- Which differences does exist between ITG mechanisms in the literature?
- What are the key terms used in the literature on IT governance mechanisms and frameworks?
- What criteria can we use to determine how these terms are defined and used in different studies?
- Which articles, books and reports are available on IT governance mechanisms and frameworks?
- What might be the future research topics regarding IT governance mechanisms and frameworks?
- What are the gaps in this field and suggestions for future researches?
- What are the criteria for including or excluding selected studies?

Besides, this study provides a perspective to ITG with the mechanisms “structures, processes and relational in any organizations. Scopus, Web of Science and IEEE databases were searched for studies published in Turkish and English until April 2023 without any time interval. The keyword "IT Governance mechanism" was searched in the title of the articles. As a result of the search, 40 studies were found. In addition, the database of “National Thesis Center” was searched in the website of “Turkish Council of Higher Education”. It is seen that there is no thesis study on this subject in Turkey.

For the phase of conducting review, studies were chosen from thesis, reports, peer-reviewed and academic journals. It was observed that there were 11 repeated studies between SCOPUS and Web of Science and also 3 repeated studies between SCOPUS and IEEE, so totally there were 14 repeated studies. In addition, the full text of 4 studies of SCOPUS and 2 of Web of Science could not be reached. As a result of the evaluation phase, the number of studies reached was 20. During the eligibility phase, full texts of 20 studies were read and evaluated whether they were suitable for the purposes of our study. Findings about these studies were categorized in tables in the following sessions.

Furthermore, it is seen that some studies on ITG mechanisms and their implementations are on specific sectors. For example; Bhattacharjya and Chang (2006) built their study on Australian Higher Education. After De Haes and Grembergen (2005) built their study on financial sector in Belgium, Pereira, Silva and Lapao (2014) built their study on Portuguese healthcare industry. Also Bianchi and Sousa (2016) conducted their studies on ITG mechanisms. The studies of Bianchi and Sousa were built upon the research of De Haes and Grembergen (2005) on the financial sector in Belgium. Even their study focused on Higher education institutions, it also results with similar recommendations.

Besides, the aim of our study is to perform the most up-to-date literature review on ITG mechanisms regardless of the sector, and to build the literature review on the most up-to-date IT concepts, concerns and topics.

IT GOVERNANCE MECHANISM TERMS AND TERMINOLOGY

Information Technology Governance

One of the most well-known description of ITG belongs to According to Information Systems Audit and Control Association (ISACA). According to ISACA, ITG is a combination of the leadership, organizational structures and processes. Executives and the board of directors guarantee the sustainability of the IT and extention of strategies and objectives in organizations with ITG (ITGI, 2003). Looking at the literature, it is seen that researchers try to look at ITG holistically and state that a model that provides an effective ITG architecture consists of ITG structure, process and relational mechanisms. Figure 2 shows the areas that need to be focused in order to achieve an effective ITG in organizations (Altemimi and Zakariar 2015; Robinson 2007)

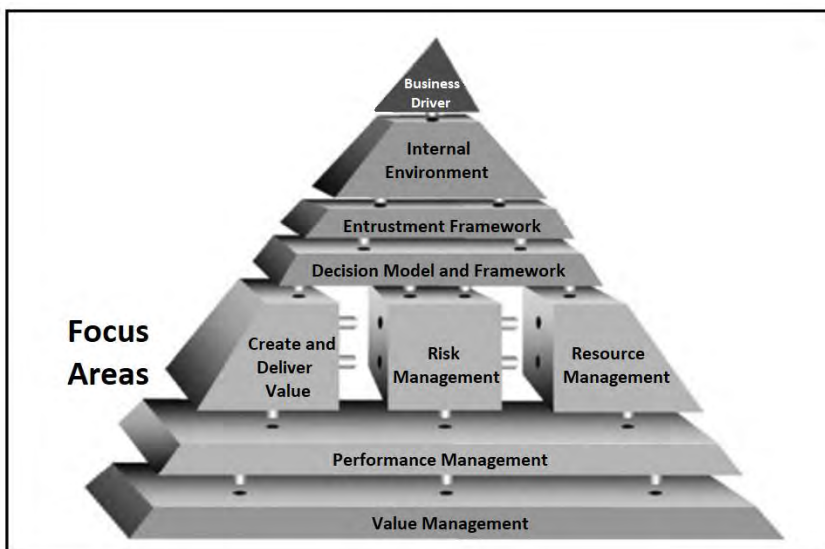


Figure 2. Focus Areas of ITG (Altemimi and Zakariar 2015; Robinson 2007)

Besides, Figure 3 (ISACA, 2009) shows the primarily focused areas of ISACA’s ITG Framework. Evaluating both charts, it can be stated that ITG focuses on five objectives as “strategic alignment, value delivery, risk management, resource management and performance measurement”.

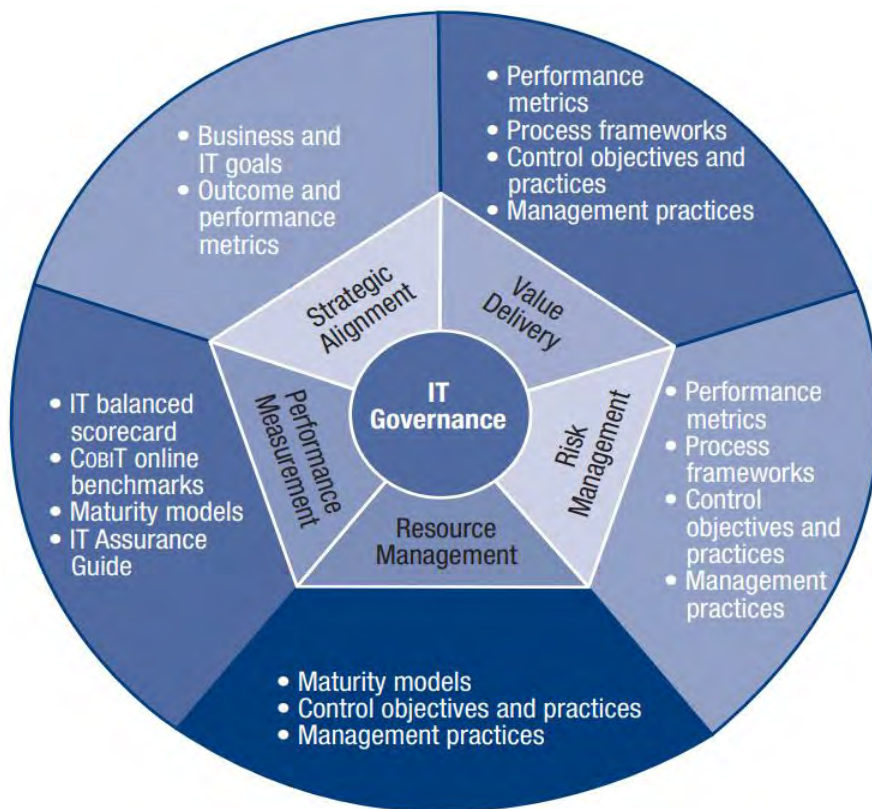


Figure 3. ISACA ITG Framework with Primarily Focus Areas of ITG (ISACA, 2009)

Information Technology Governance Mechanisms

ITG which is a mixture of leadership, organizational structures and processes in order to guarantee the sustainability of IT and extension of the strategy and objectives in an organization, is an integral part of organizations' governance. Thus, it is on and upper level of executive management and board of directors (Grembergen, 2004; ITGI, 2003).

People who are not competent on the subject may not understand the difference between the terms on IT management and IT governance, or they may think that these two concepts in the field of IT are the same. So, this matter can be clarified shortly as below:

While "IT management" focuses on effective internal procurement of IT services and current IT operations, "IT governance" deals with broader matters like creating a vision on transforming and performing IT in order to manage current and future expectations of both external (business' customers) and internal customers (business) (Peterson, 2004). It does not mean that IT management have less importance and complexity than ITG". While outputs of IT Management are evaluated by stakeholders or the products that are subcontracted, ITG is an internal matter in an organization, which is about direction and strategy. So ITG can not be performed and evaluated by outsourced (Grembergen, 2004; Peterson, 2004). This relationship is shown in Figure 4.

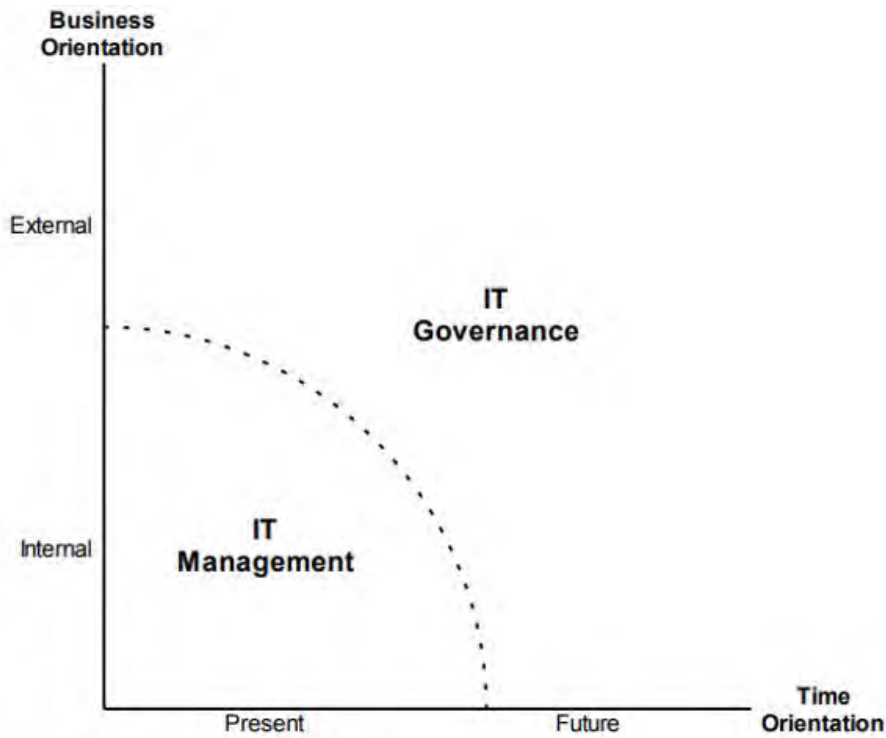


Figure 4. Comparison on IT Management and IT Governance (Burtscher et al., 2009; Peterson, 2004)

An ITG framework can be performed with various combinations of “structures, processes and relational mechanisms” across organizations. According to the literature, most studies are built on this approach (Grembergen, 2004). Because of this reason, our study is conducted with this ITG mechanisms approach as illustrated as Figure 5 below.

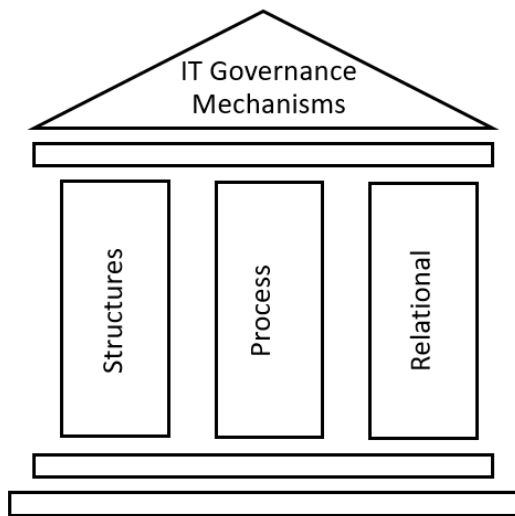


Figure 5. ITG Mechanisms

Weill and Ross (2004) defined another similar approach, given in Table 1. However, it is seen that the approach of Van Grembergen (2004) has been accepted widely.

Table 1. Common mechanisms for ITG (Weill and Ross, 2004)

Decision-making structures	Alignment processes	Communication approaches
“Executive or senior management committee”	“Tracking of IT projects and resources consumed”	“Work with managers who do not follow the rules”
“IT leadership committee comprising IT executives”	“Service-level agreements”	“Senior management Announcements”
“Process teams with IT Members”	“Formally tracking business value of IT”	“Office of CIO or office of IT governance”
“Business/IT relationship Managers”	“Chargeback arrangements”	“Web-based portals and intranets for IT”
“IT council comprising business and IT executives”		
“Architecture committee Capital approval committee”		

Besides, ITG can be applied with 3 basic mechanisms consisted of different components and relationships as shown in Figure 6 below. It is clear that some subcomponents of each mechanism will not be suitable for all organizations and it depends on the structure, type, dynamics of organizations, etc.

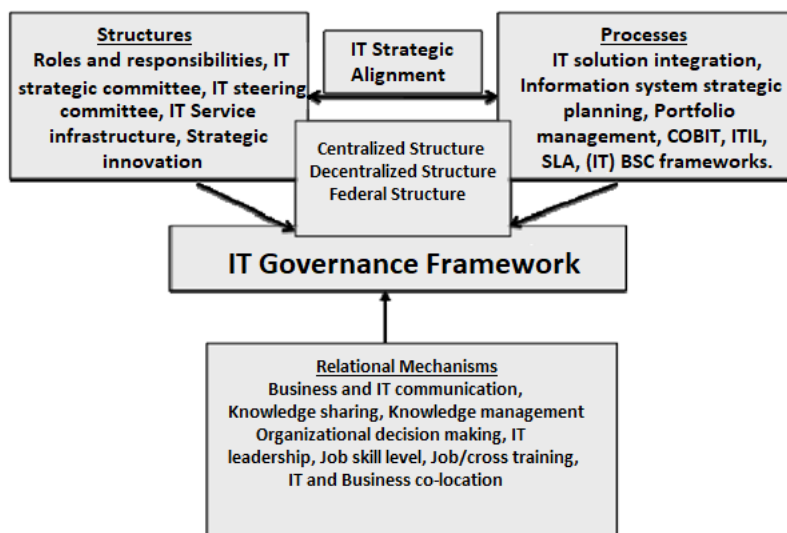


Figure 6. Three Basic Mechanisms (Asante, 2010).

Each type of ITG mechanisms has different effects and importance in organisations, and all must be combined integrally to promote efficient ITG in organizations (Almeida, Pereira and Silva, 2013a). Descriptions of the three types of ITG mechanisms are given with different ways in different sources. Below are some of these definitions.

Structure Mechanisms: They are applied in order to define organizational units, roles and responsibilities in IT decision making such as IT councils, executives like CIOs, committees etc (Levstek, Hovelja and Pucihar, 2018).

Process Mechanisms: They are applied in order to guarantee that behaviors comply with IT strategies and give feedback to decision mechanisms (Almeida et al., 2013a). These include Strategic Information System Planning, chargebacks, frameworks (COBIT, ITIL etc.), Business and IT alignment models etc.

Relational Mechanisms: They are applied in order to spread ITG strategies and results of IT decision processes in organisations with appropriate channels like IT leadership, advocates, trainings, announcements, awareness activities, promotions and etc (Weill and Ross, 2004; Lunardi, Becker and Macada, 2009).

Structure

After reviewing the literature, it is understood that different terminologies are used by different authors while they are mentioning the same concept. Thus, the most significant terms of ITG mechanisms and frameworks in the literature were defined first in this study. Some terminologies and understandings like “IT steering committee”, “IT Strategy committee”, “integration of governance/alignment tasks in roles and responsibilities”, “IT audit committee at level of board of directors”, etc. are described to create common understanding.

IT strategy committee: It is responsible to monitor organisations’ effective governance of IT and activities on strategic alignment of business objectives and IT strategies (ITGI, 2003). The committee operates at board level.

IT steering committee: It is the committee that is responsible to implement the IT policies and positioned on executive management or executive level. There may be more than one “IT steering committee” in an organisation (Grembergen, 2004).

Central, Decentral and Federal: Centralized ITG means the central authority on three layers as “project management, IT infrastructure management, IT use management”. Just opposite, departments have responsibilities and authorities on their IT functions in decentralized structure (Brown and Grant, 2005; Denford, Dawson and Desouza, 2015). Besides, federal structure shares the governance of IT across the spheres with the divisional IT staff or line management (Denford et al., 2015; Sambamurthy and Zmud, 1999).

CIO on executive committee: One member in the executive committee is CIO (De Haes and Grembergen, 2009).

Integration of governance/alignment tasks in roles& responsibilities: Responsibilities and role definitions are all documented including alignment of tasks for business/IT staff (De Haes and Grembergen, 2009).

Process

In this stage, it is seen that application methodologies, methods, tools and techniques, frameworks are important for the daily activities of organizations via processes and also the measurement of processes is one of the caring points in IT governance mechanisms. Thus, the most common terminologies are defined according to the literature review in this point of view.

IT performance measurement (BSC) Balanced Score Card: BSC is a performance measurement technique used in IT projects, investments or even entire IT departments. BSC is the method to evaluate the performance of a firm not with only classical financial metrics with also missions, objectives, additional key indicators related to internal and external processes, customer satisfaction, awareness, innovation and continuous improvement. (De Haes and Grembergen, 2015)

Portfolio management: It is the process including selection, prioritisation and control of an organisation’s IT projects and IT investments that business and IT are involved in (De Haes and Grembergen, 2015).

Chargeback: This accounting mechanism is for sharing IT total costs to all projects or departments (Almeida et al., 2013a; Weill and Ross, 2004).

Service level agreement (SLA): A contract between service providers and service customers in order to define acceptable service levels and set of indicators for the quality of service. (Grembergen, 2004)

OCTAVE: This framework is used to identify and manage risks of information security (Alberts, Behrens, Pethia, and Wilson, 1999)

P-CMM: This standard is used to manage and develop capability of IT staff. (Bhattacharya and Chang, 2006)

Green IT: It is an approach of zero or minimal impact on the environment in designing, manufacturing and consuming all IT hardware and systems efficiently and effectively (Murugesan, 2007; Murugesan, 2008).

COBRA: It is a consultative methodology for risk assessment (Pandey and Mustafa, 2012; Secquity, 2023).

Business/IT alignment model: This model is a combination of strategies of IT and business strategy, structures of IT and business, which is used to align IT and business with each other (De Haes and Grembergen, 2015).

Strategic information systems planning: As abbreviated by SISP, it is "the process to decide objectives for organizational computing and to identify potential computer applications which organizations perform" (Lederer and Sethi, 1988; Earl, 1993).

Relational Mechanism

According to the literature, relational mechanisms play dominant role in the effective ITG. Terms about important factors in the relational mechanisms are explained below in accordance with the reviewed literature in order to provide common sense.

Corporate internal communication addressing IT on a regular basis: Internal communication continuously addressed on IT matters in organisations (Almeida et al., 2013a; De Haes and Grembergen, 2015).

Informal meetings between business and IT executive/senior management: Continuous communication of business and IT executive/senior managements for alignment of business and IT objectives.

Cross-training: Sharing knowledge and experience between IT and business people by using different mechanisms like cross trainings (Grembergen, 2004; Luftman and Brier, 1999).

IT Leadership: It is the ability to create and spread a vision for IT across organizations, which is usually achieved by CIO or similar roles in organisations (De Haes and Grembergen, 2015).

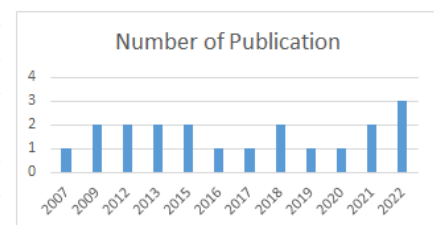
Co-location: Positioning IT and business personnel physically nearby together to communicate well and ensure effective alignment of IT and business objectives.

LITERATURE REVIEW AND RESEARCH RESULTS

For the literature review, the databases of most known and reputable communities like IEEE, Scopus and Web of Science were searched and relevant articles that stated ITG mechanisms clearly and unequivocally were reviewed. The methodologies, conclusions and recommendations for future works were analyzed. Besides, books and other studies of the related authors were searched. So, the identified authors and their articles that were reviewed and analyzed in detail are listed with a historical order in Table 2.

Table 2. List of the identified authors and their articles in a historical order.

Code	Authors	Year	Country
1	Boritz, J., Lim, J.-H.	2007	Canada
2	Lunardi, G. L., Becker, J. L., Macada, A. C. G.	2009	Brazil
3	Spremić, M.	2009	Croatia
4	Ali, S., Green, P.	2012	Australia
5	Herz, T. P., Hamel, F., Uebernickel, F., Brenner, W.	2012	Switzerland
6	Almeida, R., Pereira, R., Silva, MM.	2013	Portugal
7	Almeida, R., Pereira, R., da Silva, MM.	2013	Portugal
8	Schlosser, F., Beimborn, D., Weitzel, T., Wagner, HT.	2015	Germany
9	Altemimi, M.A.H., Zakaria, M.S.	2015	Malaysia
10	Bianchi, IS., Sousa, RD.	2016	Portugal
11	Bianchi, IS., Sousa, RD.,Pereira, R.,	2017	Brazil
12	Levstek, A., Hovelja, T., Pucihar.	2018	Slovenia
13	Wiedemann, A.	2018	Germany
14	Okae, S., Andoh-Baidoo, F.K., Ayaburi, E.	2019	Ghana
15	Zuo, M., Ma, D., Yu, Y.	2020	China
16	Mulyana, R., Rusu, L., Perjons, E.	2021	Sweedden
17	Zhen, J., Xie, ZX., Dong, KX.	2021	Chinese
18	Borja, S., Moon, Y., Yoon, H., Hwang, J.	2022	S.Korea
19	Fajar, A.N., Amri, M.	2022	Indonesia
20	Ilmudeen, A.	2022	Sri Lanka



Structure Mechanisms

In this study, the ITG mechanisms have been examined in 3 stages which are structure, process and relational. The research about structure mechanisms is carried out within a concept as seen in Table 3 and is illustrated that these 17 defined components exist or are not in each article. As can be understood from the study, a concept-based approach is adopted instead of an author-centered approach. With the same approach, other two mechanisms are also analyzed and outputs are given in Table 4 and Table 5 orderly.

For structural mechanisms, it can be stated that “IT steering committee”, “IT organization structure”, “IT strategy committee”, “CIO on executive committee”, “CIO reporting to CEO and/or COO”, “Business/IT relationship managers” are the most mentioned terminologies in the literature as seen in Table 3. So, it can be easily stated that existence of committees is still a must for organizations and top managements. “IT councils”, “IT leadership councils”, “IT audit committee at level of board of directors”, “IT project steering committee” have less privilege. It is also seen that IT structure is one of the most important elements, there is a need for studies focused on the IT Structure of organizations. However, when the organization's working sector, activities, business objectives and IT objectives are evaluated, the organization must decide within which IT organization structure it will work while aligning its IT and business objectives. It will also be beneficial for organizations to investigate which IT organization structures in which sector or in which projects lead organizations to a better ITG. According to the results, committees about security and architecture are mentioned very rarely comparing other committees. Besides, it can be commented that committees are taken account more than the people in the aspects of roles and responsibilities in ITG mechanisms.

Table 3. Analysis Results of Structure Mechanisms

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Practices for Structures		Cross Reference Case Studies																			
IT strategy committee		X	X	0	X	0	X	X	X	X	X	X	X	0	X	0	0	0	X	0	0
IT audit committee at level of board of directors		0	0	0	X	0	X	0	0	0	X	X	X	0	0	0	0	X	0	0	X
CIO on executive committee		X	X	0	X	0	X	0	X	X	X	X	X	0	0	X	X	0	0	0	X
CIO reporting to CEO and/or COO		X	X	X	0	X	X	0	0	0	X	X	X	0	0	0	0	X	X	0	0
IT steering committee		0	X	0	X	X	X	X	0	X	X	X	X	0	0	X	X	0	X	0	X
IT governance function / officer		0	0	0	0	0	X	0	0	0	X	X	X	0	0	0	0	0	0	0	0
Security / compliance / risk officer		0	0	0	0	0	0	0	0	0	X	X	0	0	0	0	0	0	X	0	0
E-business advisory board		0	X	0	0	0	X	0	0	0	0	0	X	0	0	0	0	0	0	0	0
IT project steering committee		0	X	0	X	X	X	0	0	0	X	X	X	0	0	0	0	0	0	0	X
IT security steering committee		0	0	0	0	0	0	0	0	0	X	X	0	0	0	0	0	0	0	0	0
Architecture steering committee		0	0	0	X	0	X	0	0	0	X	X	X	0	0	0	0	0	0	0	0
Integration of governance/alignment tasks in roles& responsibilities		0	X	0	0	0	X	X	0	X	X	X	X	X	0	X	0	X	X	0	X
IT councils		0	X	0	0	0	X	0	0	X	X	X	X	0	0	0	0	X	0	0	0
IT leadership councils		0	0	0	X	0	X	0	0	X	X	X	X	0	0	0	0	0	0	0	0
IT organization structure		X	X	X	X	X	X	X	X	X	X	X	X	X	0	0	0	0	0	X	X
	Centralized	0	0	0	X	0	X	X	X	X	X	X	X	0	0	0	0	0	0	0	0
	Decentralized	0	0	0	0	X	X	X	0	X	X	0	X	X	0	0	0	0	0	0	0
	Federal	0	0	0	0	X	X	X	0	X	X	X	X	0	0	0	0	0	0	0	0
IT investment committee or capital improvement		X	0	X	0	0	X	0	0	X	0	X	X	0	X	0	0	0	0	0	0
Business/IT relationship managers		0	0	0	X	0	X	X	X	X	X	X	X	0	0	0	0	X	0	0	0

Process Mechanisms

For process mechanisms, “risk management”, “IT budget control and reporting”, “benefits management and reporting”, “IT performance measurement (BSC-Balanced Score Card)”, “portfolio management”, “ITG frameworks and standards”, “ITG assurance and self-assessment”, “project governance / management methodologies”, “business/IT alignment model”, “ITG maturity models” are the most used terminology in the articles as seen in Table 4. Among these 26 practices, “strategic alignment for IT and business” is seen as the first concern. Analyzing the most important topics, it can be stated that project management and measurement of the processes and investments are the main aims in the process mechanisms. Therefore, it can be seen that the studies examined in the benefit-cost balance emphasize IT objectives that are compatible with business objectives and project objectives. Service level agreements, tools and techniques are seen the next important concerns. Besides, ITIL and COBIT are mentioned at a lower level after that ITG frameworks and standards. Even, ISO/IEC 38500 is mentioned in the articles about ITG mechanisms as rarely as other frameworks like BS7799, ISO17799 and ISO27001, NIS, HEISC, OCTAVE etc. The last but not the least, there is a scarcity of research for the new concerns of IT sector in the last decade like Green IT.

Table 4. Analyze Results for Process Mechanisms

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Practices for Processes	Cross Reference Case Studies																			
Strategic information systems planning	0	X	X	X	0	X	X	0	X	X	X	0	0	0	0	0	0	0	0	0
IT performance measurement (BSC-balanced scorecard)	0	X	X	X	X	X	X	X	X	X	X	X	0	0	0	X	0	X	X	0
Portfolio management (ROI, VALIT)	X	0	X	X	X	X	0	X	X	X	X	X	0	0	0	X	0	X	0	0
Charge back	0	X	0	X	0	X	X	0	X	X	X	X	0	0	0	0	0	X	0	0
Service level agreements	0	X	0	0	0	X	0	0	X	X	X	X	X	0	0	0	0	X	X	0
IT governance Frameworks /Standards	0	X	X	0	X	X	0	X	X	X	X	X	0	X	0	X	X	X	X	0
ITIL	0	X	X	0	0	X	0	0	X	X	X	X	0	0	0	0	0	X	0	0
COBIT	0	X	X	0	0	X	0	0	X	X	X	X	0	0	0	0	0	X	0	0
ISO/38500	0	0	0	0	0	0	0	0	0	X	0	X	0	0	0	0	0	0	0	0
BS7799, ISO17799 and ISO27001	0	0	X	0	0	0	0	0	0	X	0	X	0	0	0	0	0	0	0	0
COSO/ERM	0	0	0	0	0	X	0	0	0	0	X	0	0	0	0	0	0	0	0	0
People Capability Maturity Model (P-CMM)	0	0	0	0	0	0	0	0	X	X	0	X	0	0	0	0	0	0	0	0
NIS	0	0	0	0	0	0	0	0	0	X	0	0	0	0	0	0	0	0	0	0
HEISC	0	0	0	0	0	0	0	0	0	X	0	0	0	0	0	0	0	0	0	0
OCTAVE	0	0	0	0	0	0	0	0	0	X	0	0	0	0	0	0	0	0	0	0
MoR: Management of Risk (International)	X	X	X	0	X	X	0	0	X	X	X	0	0	X	X	X	0	X	0	0
IT governance assurance and self-assessment	0	X	X	0	0	X	0	0	X	X	X	X	0	0	0	X	X	0	X	0
Project governance / management methodologies	X	X	X	0	X	X	0	0	X	X	X	X	0	0	0	0	0	X	X	0
IT budget control and reporting	0	X	X	X	X	X	0	0	X	X	X	0	0	X	0	X	X	X	X	X
Demand Management	0	0	0	0	0	X	0	0	X	0	X	X	0	0	X	0	0	0	0	X
Benefits management and reporting	X	X	X	X	X	0	0	0	X	X	X	0	0	X	0	0	0	X	X	X
Business/IT alignment model	X	X	X	X	X	X	X	X	X	X	X	X	X	0	0	X	X	X	X	X
ITG Maturity Models CMM	0	X	X	X	X	X	0	X	0	X	X	X	0	X	0	X	0	0	X	0
Green IT	0	0	0	0	0	0	X	0	0	X	0	0	0	0	0	0	0	0	0	0
Tools and techniques, software	0	X	X	0	0	0	0	0	0	X	X	0	X	X	0	0	X	0	0	X
Risk Analysis (COBRA)	0	0	X	0	0	0	0	0	0	X	0	X	0	0	0	0	0	0	0	0

Relational Mechanisms

For relational mechanisms, it can be reported that “collaboration between principle stakeholders”, “management of knowledge”, “corporate internal communication addressing IT on a regular basis”, “IT leadership”, “shared understanding of business and IT objectives” are common issues in the given 14 practices in Table 5 below. So it can be stated that good communication is a must in the relational mechanism in order to set efficient ITG. A robust and continuous communication between the organizations and its all internal and external stakeholders provides a proper relationship management for the organization and this will support the good governance of IT.

Table 5. Analyze Results for Relational Mechanisms

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Practices for Relational Mechanisms	Cross Reference Case Studies																			
Co-location Business/IT collocation	0	X	0	X	0	X	X	0	X	X	X	X	X	0	0	0	0	X	0	0
Cross-training	0	X	0	0	0	X	0	X	X	X	X	X	0	0	0	X	X	X	0	0
Cross-functional business/IT job rotation	0	X	0	0	0	X	0	X	X	0	X	X	0	0	0	X	0	0	0	0
ITG awareness campaigns	0	0	0	X	0	X	X	0	0	0	X	X	X	0	0	0	0	0	0	0
Knowledge management (On IT governance)	X	0	0	0	X	X	0	X	0	X	X	X	X	0	X	X	X	X	X	X
Executive / senior management giving the good example	0	0	0	0	0	X	0	0	0	X	X	X	0	0	0	0	0	0	0	0
IT leadership	0	0	X	X	X	X	0	X	X	X	X	X	X	X	0	X	0	0	X	0
Corporate internal communication- Addressing IT on a regular basis	0	0	0	X	0	X	X	X	X	X	X	X	X	0	0	X	X	X	X	0
Active participation by principle stakeholders	0	X	0	0	X	X	0	X	X	X	0	X	X	0	X	X	0	0	0	0
Collaboration between principle stakeholders	0	X	X	0	X	X	0	X	X	X	0	X	X	0	X	X	X	0	X	0
Partnership rewards and incentives	0	X	0	0	0	X	0	X	X	X	X	X	0	0	0	0	X	X	0	0
Shared understanding of business/IT objectives	0	X	0	X	X	X	X	X	X	X	X	X	0	0	0	0	X	X	0	0
Senior management announcements	X	0	0	0	0	X	0	0	0	X	X	X	0	0	0	0	0	0	0	0
Office of CIO or ITG	X	0	0	0	X	X	0	X	X	X	X	X	0	0	0	0	X	0	0	0

DISCUSSIONS AND RECOMMENDATIONS FOR FURTHER STUDIES

Contributions

Looking at the literature, it can be stated that there are some inconsistencies, gaps and lack of connection among studies on ITG mechanisms. For this reason, this study aims to identify these gaps. Unlike the studies carried out so far, in our study we tried to create a common concept through the most frequently used terminologies and at the same time it was aimed to ensure that ITG mechanisms can be spoken in the same language. Similarly, unlike the older studies, our study aims to perform the most up-to-date literature review on ITG mechanisms regardless of the sector, and to build the literature review on the most up-to-date IT concepts, concerns and topics.

Looking at the results, some conclusions on ITG mechanisms performed in organizations are obtained, and so some inferences can be made accordingly which can help the organizations who would like to run ITG mechanisms properly. To establish an effective ITG, organizations should adapt the structural, process and relational mechanisms in a tailor-made manner by blending them in the most appropriate way. It is seen that committees with different duties and responsibilities and at different levels are formed for effective ITG performance in organizations. In particular, it is observed that there is a great consensus that the strategy committee is necessary for many executive managers on the road to success. Senior executives appear to appreciate the great benefit of this committee in strategic alignment of business objectives with IT policies. In the study of Bianchi, Sousa, Pereira, and Souza (2019), CEOs declare that IT strategy committee has the most importance in IT Governance mechanisms (Bianchi et al, 2019).

Besides, some other lower level committees under strategy committee have different duties. For example, while IT steering committee is responsible to oversee a major project or projects and to manage IT objectives, the IT project committee manages IT projects and their returns on the organizations (ROIs). For this reason, it is understood from the results that the committees benefit us in providing effective ITG and that the existence of these committees is still trusted by the executive managers, CEOs and CIOs. It is understood that the ITG structuring focuses on establishing official bodies such as committees rather than focusing on individual roles and responsibilities.

As expected in accordance of the basement of ITG, nearly all articles declare that the strategic alignment of IT and business objectives is the first priority in processes mechanisms. Project management and measurement of the processes are the next important issues. It is seen that balanced score cards and measurement of investments (return of investments) are the next considerations in the process mechanisms according to the articles. Besides, service level agreements (SLAs), tools and techniques used in processes are other matters of interest.

In the articles, it has been seen that the IT organizational structure is one of the topics mentioned definitely when examining the ITG structural mechanisms of the organizations, but it is less focused on the IT structure of the organization even it is centralized, decentralized or federal and their effects. From some studies, it is understood that organizations are tend to a central IT management from a distributed structure for the effective ITG and appropriate risk managements in the cyber space. However, there is a lack of studies on this topic despite researches shows that they have not have a negligible effect on effective ITG in the organizations.

From the articles and related literature, ITG frameworks and standards play an important role for organizations in order to set the efficient ITG. Among these frameworks and standards, ITIL and COBIT are the most popular ones according to the articles while the other frameworks and standards NIS, ISO/IEC 27001, ISO/IEC 38500, HEISC, OCTAVE are mentioned very little. For this reason, more study results are needed to increase the quality of findings in this field. We see that the other rare topic in process mechanism is that Green IT.

The last but not the least, good communication between all parties, internal and external stakeholders is essential for building a common understanding at ITG. And as expected, the leadership accelerates and furthers the ITG processes.

Scope and Restrictions

This study was conducted to form the basis to systematically review the existing literature in the field of ITG, to deeply understand the existing knowledge on ITG mechanisms and frameworks, to evaluate the effects of these mechanisms and frameworks on organizations, to make a comparative analysis of different mechanisms and frameworks. While this study identifies gaps and lack of important points on the studies about ITG mechanisms and frameworks, it is not aimed to fill in all these gaps. Similarly, although this study can guide the organizations about how to built and run ITG, it cannot give all the best practices about ITG.

This study has some limitations. As the first limitation, the data was collected from 20 articles. Because using the SLR methodology, studies were chosen from thesis, reports, peer-reviewed and academic journals. As there were repeated studies in search databases, the study was limited to 20 studies from 40 found articles in the evaluation phase. Secondly, most common used ITG mechanisms and frameworks were taken into account, the study may be extended to other ITG mechanisms and frameworks. Besides, there is not any ranking among the mechanisms and frameworks either in the study.

Although our study contributes to increase the awareness of ITG mechanisms, more researches are needed to analyze the effects of ITG mechanisms as independent from the sectors and countries and studies should be spread over a wider area.

Recommendations for Further Studies

First of all, it can be easily seen that there are so many sector and country specific researches during the literature review. As there is a scarcity of research on human factors or organizational and cultural aspects in ITG mechanisms, we recommend that future researches may explore IT governance taking into account probabilistic factors on region, culture, private sector or public sector.

From a different approach, more researches are needed to analyze the effects of ITG mechanisms as independent from the sectors and countries and studies should be spread over a wider area. In this way, common language and terminology on ITG mechanisms can be standardized. Common language and understanding will contribute to the better communication of companies with their external and also internal stakeholders. Besides, the alignment of IT strategy and business objectives will be guaranteed. It will even have an impact on benchmarking activities between organizations. So it is recommended for the researchers to spread their studies on wider population or different sectors that haven't been searched on with the common ITG mechanisms aspects.

Besides, the lack of studies on the common language and understanding that will be formed by blending ITG concepts such as COBIT, ITIL and ISO/IEC 38500 with their good practice examples has been noticed. More studies about ISO/IEC 38500 in ITG mechanism may help to enrich the relevant literature.

Another recommendation for further studies is to focus on the effects of IT structure on effective ITG. It is remarkable that more researches are needed on the effectiveness and performance of ITG when the IT structure is centralized, decentralized or federal.

As there is a scarcity of research for the new concerns of IT sector in the last decade like Green IT, more studies should be conducted in new up-to-date concepts. Further studies may be expanded with the popular concerns of IT sector like artificial intelligence, machine learning and cyber resilience.

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