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An Exploratory Study of the Key Enabling Factors of IT Projects Governance (ITPG) Implementation in the Public Sector in Oman

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Abstract: Projects are considered as fundamental assets for organizations that strive to promote and empower operational and strategic business decisions. IT project governance (ITPG) refers to the policies and practices that intend to promote the efforts of controlling and managing projects across the entire enterprise effectively. The primary goal of the ITPG practices is to improve the various current efforts of management solutions to offer relevant, timely, and high-quality projects. Despite the increasing numbers of studies about projects, project governance, data governance, and IT governance, an extensive review of the literature indicates that ITPG implementations, in general, are mostly seen as informal practices focusing on specific projects repositories of the organization with deficient structure and lacking systematic support of the organization. Besides, and despite the extensive work on ITPG studies in the private sector, there is little attention and much uncertainty on ITPG implementations in the public sector. This study aims to address this gap by exploring key enabling factors of the ITPG implementation program in the public sector organizations in Oman and the impact of ITPG implementation on organizational performance. The study proposes a conceptual ITPG framework that consists of structural practices, management activities, and relational and assessment factors. A quantitative methodology was used to survey IT professionals working for Oman's government sector. Two studies were conducted using independent samples. An Exploratory Factor Analysis (EFA) was used to assess factor solutions of the enabling factors followed by a Confirmatory Factor Analysis (CFA) and Structural Equation Modelling (SEM) to test substantive hypotheses. The findings revealed that project policies and standards, metadata, IT data backup and recovery, strategic communication, and assessment, were significant enabling constructs of ITPG Implementation. As predicted ITPG implementation significantly and positively influences organizational performance. Furthermore, the results demonstrate that the implementation of PMO positively affected ITPG implementation. This study contributes empirically to the body of ITPG research in the public sector domain and determines the significant enabling factors of the ITPG implementation for Oman's public organizations and its outcome to the organizational performance.

Keywords: IT Project Governance (ITPG), Governance; Public Sector; Sultanate Of Oman; Key Enabling Factors, PMO.

1. INTRODUCTION

Currently, organizations are realizing that interpreting their theoretical strategies into real operations demands projects [1]. Therefore, projects are considered a crucial asset along with other business assets that promote and empower the operational and strategic business decisions for the organizations [2]. To obtain and gain a true value of this critical business asset (i.e. project), corporations need to be attentive about "Doing the right projects" and "Doing the projects right". In other words, organizations should concentrate on assuring that projects' portfolios align with their aims and priorities and that these projects are executed efficiently [3]. Several earlier works indicate that IT project governance approaches provide systematic IT project management solutions through enabling a set of policies and practices to organize the efforts of managing IT assets across all domains of the corporates successfully [3]–[10]. These practices should be consistent with the organization's mission, strategy, and standards as well as its regulations [5]. Many studies also point out that the main purpose of implementing an IT project governance approach is to confirm providing relevant, timely, and high-quality projects or data to the proper people whenever the requirement occurs so those accurate decisions can be made [9], [12]. Project governance provides IT organizations with significant facilities to support their business objectives [4]. ITPG helps to maintain confidentiality, integrity, quality, and availability of organizational data [12]. Moreover, it promotes better decision-making and optimizes operations' efficiency and costs providing the enterprises with the mechanism to have

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true and sufficient information which will lead to real-time knowledge for managers [13], [14]. In general, the main purpose of the ITPG idea is to improve and organize various efforts about IT project management resolutions that are asserted by the organizations to be very costly and not capable to be aligned with business actuality. This can be attributed to the nature of the global organizational transformation and the continuous increase of the need for newly developed projects leading to more data volume as the business's functions are developing more complexity in their usage of data [12], [13], [15].

The aim of this study is to extend the existing project governance contexts by providing new enabling factors (Novel and hybrid framework) as a great step to avoid the obstacles in the way of these frameworks. This new hybrid framework was found to be statistically and significantly contribute to a set of positive predictors for the implementation control of project governance.

This paper is organized as follows; it starts with the motivations that encourages the author to conduct the study. Then, the research methodology, briefly explains the research design, research approach, and instrument. Deep discussion about project governance showing PG's definitions, advantages, issues and challenges, and research conceptual framework and hypothesis respectively in section 4, next the data collection techniques are presented at section 5, then the data analysis and findings are presented in Section 6, moreover, section 7 represents the knowledge contribution of this study, next to the limitations and future research recommendations are shown in section 8, Section 9 is the conclusion of this paper.

2. THE MOTIVATION BEHIND THE APPROACH

As mentioned earlier, this study's domain is the public sector in Oman as it is motivated by Oman's vision in 2040. In his first speech for Oman's vision 2040, His Majesty Sultan Haitham bin Tariq made it clear that this vision will focus on the application of several practices including the "governance of government performance". The second motivation for choosing the context of this study is that the Omani government has already invested in transforming itself and its operations through digital technologies. For instance, it has introduced more than 260 e-government services initiatives to the public resulting in a massive growth in the size of IT projects which may lead to potential complications in the management of government projects[16]. As suggested by the literature, this growing challenge can be overcome by enabling effective procedures and standards for project management of Oman's public institutions by adopting IT project governance policy and investigating the main enabling factors for implementing such policies within the public sector in Oman. The third incentive for this research is that there are few studies about the factors related to IT project governance that is specifically designed for public sector organizations whereas previous studies in this field focused intensively on the private sector's experiences and how companies have promoted and encouraged competitive performance. The final incentive relies on the researcher's work on the literature, which results in identifying a shortage in previous studies that examine the critical enabling factors for IT projects governance programs related to the public sector in Oman. As a result, the two main objectives of this study are to explore the main enabling factors for implementing IT project governance in the public sector in Oman and to investigate the consequences or results of implementing the IT project governance policy within public sector agencies in Oman.

2.1 Problem Statement

A project is a strategic business asset of organizations. Therefore, this critical asset is required to be placed in an effective management procedure to identify the processes and align the decision making with the organizations' strategy towards a successful project performance [17]. Accordingly, much literature was devoted to having a clear insight towards project governance [18][19][17][20]. Furthermore, Without governance procedure, the organization will be under the risk of contradictions which leads to failure in achieving the proposed objectives, and processes and hence the death of the organization[19][18].

Hence, this study focuses on exploring the critical success factors (CFSs) towards a successful project governance framework implementation.

Moreover, the concept of project governance still ambiguous, early-born, and its framework should be aligned with the organizations' strategy to implement it perfectly. In other words, there is no agreed standardized framework to be followed and suitable for all corporations. Also, many studies had been done by researchers to investigate the role of project governance in the methodology – success relationship. They resulted in lots of variations. Some of the results presented the clear role of PG towards success while others showed that PG plays an indeterminable part in project success. This knowledge gap calls for further research[17]. Thus, the project governance concept is a hot and attractive topic to be demonstrated[17][19][18][3][6]. Based on the researcher's work on the literature, there is a lack of studies that had investigated critical implementation factors of the project governance program in the public sector in Oman. Accordingly, this research aims to examine the CSFs of project governance implementation in the public sector in Oman.

3. LITERATURE REVIEW

3.1 Project Governance Definitions

Based on the literature, there is no unified definition of project governance [9]. Instead, several explanations were found which reflect the focused areas addressed by researchers in their studies such as project management [21], project success [19], stakeholders in governance theories [6], project governance and information

relationships [9], and project governance framework [22], etc.

Table I illustrates the definitions of the project governance concept as stated by previous authors. These definitions are generated and developed among the growing studies of the project governance discipline. This table lists different definitions in the literature, and they are distributed among two fields: internal project governance and external project governance studies. The external PG is the governance of all projects related to an organization and in some researches, it is called corporate governance (CG) and others name it as the governance of project management. On the other hand, Internal PG means governing a specific project and it is also called in some researches inner or the internal part of CG [3], [10], [11], [23], [24].

TABLE I. DATA GOVERNANCE DEFINITIONS

Source	Definitions	Aspects	Internal/External PG
[23] [22] [21] [20] [19] [18] [17] [16] [2] [25] [26]	"The appropriate form of contract to govern the relationship between the client and the contractor is determined by both the business challenge, including the level of uncertainty faced by the participating actors, and the prevailing business culture".	-Communication Management	Internal PG
[27][25]	"The process of decision-making and the process by which decisions are implemented".	-Management Process -Decision rights and accountability	Internal PG
[26][25]	"Mechanisms adopted by project-based organizations to manage the interface between project teams and their customers".	-Enterprise-wide -Management Process	External PG

Figures 1 illustrates the meaning of each one.

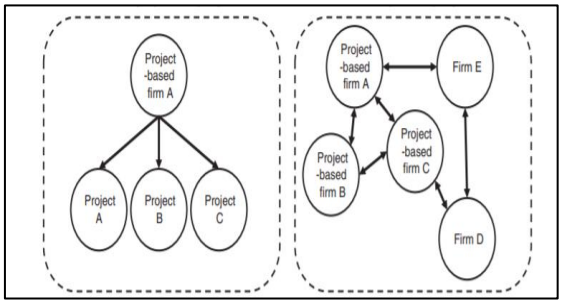

Figure 1. (A) External PG. (B)Internal PG.[25]

However, some confusion may arise regarding governance and management. So, it is necessary to shed light on the main difference between them. Governance specifies the structures employed in an organization, identifies both rights and duties inside these structures, and demands proof that management is functioning efficiently and appropriately along with the specified structures. On the other hand, management aims to assure that the organization is operating within the framework specified by the governance system [10]. Moreover, project governance includes two dimensions as stated by[3]:

- It guarantees that the project's portfolio aligns with the organization's aims and priorities "Doing the right projects".
- It confirms that these projects are executed efficiently "Doing the projects right".

3.2 Advantages of Project Governance

According to Pinto, J. K. [8] study, the significance of project governance is to promote better decision-making and better administrative act through "transparency, accountability, and the defined roles" [28]. The importance of project governance for an organization is to monitor projects to attain business objectives [8].

Altshuler and Luberoff [29] and Crawford et al., [30] also portray project governance as a novel pattern of governance in demand to help to incubate project performance.

Moreover, in their research Sirisomboonsuk, et al., [9] assure that almost all previous studies guarantee that project governance supports to develop of the functioning of the project. They also state that the motivation to implement project governance in an enterprise is because many previous studies confirmed that one reason for a project's poor performance was the loss of operative project governance. Another noteworthy motivation that positively influences a firm's project performance is aligning project governance with its IT governance [9]. Another critical reason for enabling project governance that it administrates the quality assurance scheme in-line with good global performance and it is considered as a functional and effective plan for any state that aims to update and perfect its public investment efficiency [4]. On the other hand, there are some barriers as shown by the literature. Current project governance theories detect that these theories are appropriate to analyse relations among some of the inner stakeholders, but they are not enough for

investigating the implementation of organizational strategies for pleasing outer stakeholders [6].

3.3 The Barriers and Challenges of Project Governance

According to previous studies, there are common explanations for having an unsuccessful implementation of project governance within different organizations. Müller, et al, [31] and Derakhshan, et al, [6] state several inhibitors of deploying project governance. The first reason could be a lack of clear understanding and awareness among the organizations' stakeholders of project governance discipline and its significant value which can negatively affect its implementation across the organizations' projects. Another reason is a scarcity of collaboration between diverse divisions across the organizations, lack of executives' support, and, hence, limited funds and resources being allocated to project governance programs [24]. Besides that, the lack of well-established relationships and communication protocols between different project participants, like project internal and external stakeholders, project owner, project manager, and team, could result in reduced or unsuccessful project governance implementation [6].

Furthermore, the project governance system, like any other new system, faces some challenges and considerations when implemented as a new program in an organization. Reve, et al [32] indicate that although there are needs to initiate project governance programs within enterprises to acquire the perceived benefits of such discipline application, some essential challenges are expected when projecting this system into the organization context. The prime challenge that rises is difficulty in achieving the purposeful manipulation of progress data while applying project governance at large projects [32][25]. As mentioned by Roy et al., [33] governing large projects degrades the performance due to the involvement of a wide range of stakeholders and varied sources of funding, hence complication on local participants and management structure [33]. Political disorder and complicated environments where projects are executed lead to the transformation of organizational relations which can result in substantial modifications in some or all the mechanisms used when governing projects. Another prominent difficulty that leadership may face is confirming that projects go side by side with both strategic requirements and variable contexts of action that might redefine these essentials. Consequently, leaders need to have well-defined project strategies to assure effective project governance[34]. Finally, there is no unified method to the execution of a project governance program in all organizations which is requiring study efforts over a holistic business system[17].

3.4 Framework and Hypotheses

This study presents a hybrid framework combining principles from different frameworks since there is no comprehensive framework among them and all of them face various challenges. This conceptual framework combines the most common factors among the standardized frameworks as well as the literature as shown in Table II [5]. Through this conceptual framework, the researcher adds another aspect of project governance frameworks highlighting the factors associated with saving project's data from a loss such as the factors related to risk management and recovery aligning with the endless growth of large and developed projects.

TABLE II. THE CONCEPTUAL FRAMEWORK'S CSFS AND THEIR CORRESPONDING STANDARDIZED FRAMEWORKS.

Category	ITG Mechanism	CSF	Framework
Strategic alignment	Structure	Project Stewardship	COBIT, VAL IT, ISO 38500.
Strategic alignment	Structure	Project Ownership	COBIT, VAL IT, ISO 38500.
Organizational effect (internal)	Structure	Project Policies and Standards.	COBIT, VAL IT, ISO 38500,
Performance management	Process	IT Data Lifecycle	ISO 38500, COBIT.
Performance management	Process	IT Data Classification	ISO 38500, COBIT.
Performance management	Process	Metadata	ISO 38500, COBIT.
Performance management	Process	IT Data Access and Security	ISO 38500, COBIT.
Performance management	Process	IT Data Backup and Recovery	ISO 38500, COBIT.
Resource Management	People	Strategic Communication	COBIT, ISO 38500.
Resource Management	Process	Assessment	COBIT, ISO 38500.
Performance management	People, Process & Structure	Organizational Performance	ISO 38500, COBIT.
Strategic alignment	People, Process & Structure	Project Management Office Existence	COBIT, VAL IT, ISO 38500, PMBOK, PRINCE2.

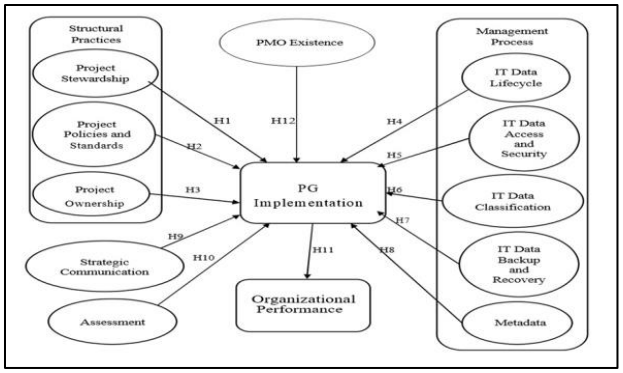

Figure 2. Conceptual Framework.

3.4.1 Structural Factors

The structure of PG associated with the fundamental practices of implementing the project governance program should be available within an enterprise as requisite factors. The PG structure factors are related to the roles and responsibilities addressed throughout the enterprise at the right levels for promoting authority over project

management practices taking into consideration the establishment of the required project principles (policies and standards) for the organization [17], [35].

a) Project Stewardship (P.S) and Project Ownership (P.O):

Too & Weaver, [10] argue that project stewardship and project ownership are defining the essential project governance roles and responsibilities to accomplish project quality. Furthermore, they point out that the primary outputs from the PG system specify the rights and responsibilities of participants in the projects (stakeholders), define (and agreement for) rules and procedures for making decisions, and develop the strategic framework for the selection of the 'right' projects and programs to undertake including a clear understanding of what 'right' means for every organization. Finally, they specify the mechanisms for efficient and effective use of resources [36]. According to Toivonen & Toivonen [15], project stewardship is considerably found to predict how to optimize project quality within a project governance program. This is achieved by emphasizing the requirements needed to empower the project stewardship responsibility of the individuals (i.e. project stewards) to be accountable for the decisions related to the project performance quality. From the perspective of agency and stewardship theories Davis et al. approve that unlike the opportunistic agent, the steward is trustworthy and will make decisions that are in the best interests of the organization, best satisfying his personal needs to meet the organizational demands resulting in the alignment of interests between principals, the organization and the stewards [37]. However as researches have emphasized, stewardship relationships can only arise when the necessary situational factors and structures about the organization are in place and when the individuals involved have appropriate psychological profiles and risk preferences for such developments to occur [35]. In their study about a multifaceted antimicrobial stewardship program deployed at the health sector, Kaufman et al. [38]indicate that the project stewardship duties toward project users and owners are to improve their project efficiency and to resolve project issues in order to preserve project quality [38]. Based on the necessity of project stewardship role to enable implementation of project governance, the following hypothesis is proposed:

H1: Clarity of project Stewardship's role positively affects ITPG implementation.

Identically, the definition of project ownership role as well as assigning such responsibility to the project owners, like shareholders (ultimate owners), was suggestively discovered to predict the enhancement of the project's quality within the project governance system. This is done by underlining the requirements of empowering project owners to be accountable for making business decisions about managing the project quality of their context. Governance must be closely connected to ownership. The owner undoubtedly has a key role in a project bearing the ownership rights and responsibilities. Simply, ownership gives control and responsibility. In a project context, this means that a project owner has rights and responsibilities which should be clearly stated and adhered which results in the guarantee of owner satisfaction [39]. These essential responsibilities contribute to enabling the project governance program to manage the organization's projects and therefore the following hypothesis is proposed:

H2: Clarity of project Ownership's role positively affects ITPG implementation.

b) Project Policies and Standards (P.P.S):

Already et al. [5] argue that the aim of the formation of IT project governance policies and standards is to formulate a systematic and standardized set of project processing procedures and usage rules to optimize IT benefits and minimize their risks. In an era of rapidly changing information technology, optimizing the benefits of IT applications and practices while minimizing their risks, is critical. ITG offers solutions to this issue providing guidelines, policies, and procedures to control IT practices and investment [5]. Mkoba & Marnewick [40] examine the areas to be addressed within a project governance framework and find out that the development of project policies and procedures should be related to responsibilities, control of hazards, auditing, transparency, accountability, communication and reporting, and effective involvement of project parties [40]. Muller et al. [41] assert that project governance needs a clearly defined authority to identify and enforce project policies and procedures [41]. Also, Lo [11] investigates the strategic themes of implementing a successful program of project governance and points out that the benchmarking step against the external best practices and standards (like COBIT, ISO, CMMI, PRINCE 2, OMBOK, etc.) for IT project quality should be performed as one of the essential components of the IT project governance framework [42]. Many types of research also confirm that to promote the best practice framework for decision rights and accountabilities of the project governance program, organizations should ensure deploying the requisite enterprise-wide project governance policies and procedures that comply with organizational objectives such as corporate's strategy, values, and mission [6], [18], [36], [43]. Consequently, project policies and standards are substantial factors required when implementing effective project governance for organizations and as a result, the following hypothesis is proposed:

H3: Establishing Project governance policies and standards positively impact ITPG implementation.

3.4.2 Management Process Factors

The procedures of the project management process are associated with the decision tasks of the project management activities to maintain and improve the value of an organization's projects [27], [44]. As per PMBOK Project Management Body of Knowledge (PMBOK) and

PRINCE 2 projects in controlled environments(PRINCE), project management practices are related to the development, execution, and supervision policies that control, protect, deliver and enhance the value of the organization's projects [42], [45], [46]. The project management activities and their represented factors are the compositions of the procedural practice of the project governance model [44].

a) IT Data Lifecycle (D.L):

Since this study focuses on ITPG which is also called corporate governance in some researches and since data is one of the most important assets at IT organizations, this study considers the IT data lifecycle, which includes the project's data, as a critical success factor. Moreover, it is considered a critical success factor in data governance programs. As per the literature, data lifecycle management has been labelled as a substantial mechanism when applying a data governance policy [47][48]. Chamberlain [47] defines data lifecycle management as a policy-based approach to manage the flow of an information system's data throughout its life cycle starting from the creation and initial storage to the time when it becomes obsolete and deleted. Were and Moturi [48] explore the necessity for defining the lifespan policy of the health regulations' data assets to have a data governance system. The procedure of keeping data flowing from one phase to another during the management process of the data lifecycle is based on changing the values of data. Mlangeni [49] suggests that the lifecycle of paper-based data should be controlled by an in-place policy to define how long the paper-based data should be retained. He also affirms the prominence of establishing a department like the Records and Archives department to be accountable for managing the data lifecycle. Furthermore, Mlangeni [49] asserts the need of defining the organization's data assets policies of retention (e.g. time to live) of data as well as an auto-archive of data within the data lifecycle management. Were and Muturi [48] suggest deploying the monitoring procedures starting from the data creation to the disposal within the management process of the data lifecycle. Accordingly, these authors indicate the significance of managing the data lifecycle policy to help to implement the IT project governance program. As a result, the following hypothesis is presented:

H4: Accurately managing a data lifecycle process positively influences ITPG implementation.

b) IT Data Classification (D.C):

Parallel to the IT data lifecycle dimension, IT data classification policy has also been acknowledged as a vital factor associated with IT management practices due to its validity to promote the execution of the IT data governance program. One of the CIOs interviewees in Tallon et al. [50] study claims that classifying data as one of the data management practice allows a better realization of the varying value of data and how this value is required to be consistent with the characteristics of diverse storage systems that will elevate and enhance the organization's data value protection [50]. As per the literature, some examples of valued data underlying this approach of enterprise data management procedure contain sensitive data that should be specified and labelled (e.g. personal, privacy, limited, confidential, etc.). It also comprises core business data that are identified as the most demanded data and business records and they are classified into transaction data (i.e. operational business data) or master data [51][52]. Accordingly, these authors claim the significance of managing the organization's data classification policy to help to deploy an IT project governance program. As a result, the following hypothesis is proposed:

H5: Accurately managing the IT data classification process positively affects ITPG implementation.

c) Metadata (M.D):

In their detailed research, Narayanan et al. [53] argue that the importance of project metadata is due to its use to track project progress. Strong project management and change control capabilities are required to ensure appropriate and consistent versioned packages of metadata to be created across these fragmented metadata silos [53]. From the perspective of the IT organization governance about the importance of overall organizational metadata, there is a consensus among several researchers that the metadata dimension is a crucial enabling element for data governance establishment [54][55][56][49][50][57][48]. The National Information Standards Organizations explain that metadata is organized information that defines, describes, locates, or else to make it easier to query, use, or manage an information resource[47]. Furthermore, metadata describes the anticipated meaning and adequate representation of data for use within a defined context[58]. Examples of metadata include information about data infrastructure, description, and explanation about database model, data processes, physical characteristics of the data, and how the data is utilized[59]. A study by Were and Moturi [48] emphasizes that metadata, as one of the important construct elements for data governance, should be available as a formal data dictionary or description for the organization's data assets. It should be also reachable for the organization's staff when requested. Also, Mlangeni [49] argues that metadata, as an essential factor within that data governance program, should be processed to define the essential data elements of the organization's information systems. It also should be clear and understandable when interacting with such systems and should be also documented. Thus, these authors point out the prominence of managing the metadata dimension to help to implement an organization's governance program. As a result, the following hypothesis is proposed:

H6: Clear and accurate definition of a Metadata management process positively impacts ITPG implementation.

d) Data Access and Security (D.A.S):

Since data is the most important entity at organizations, it is important to secure its content and apply the related authorization levels and rules. Brickson [59] draws attention to the prominence of the data management process associating it with the data access and security dimension to ensure the implementation of data governance within an organization. Brickson [59] demonstrates the functions of this dimension such as the process of planning and executing data security policies and procedures as well as the organization's regulations concerned with data access. As one of the procedural practices in managing data, Tallon et al. [50] point out that CIOs need to work on defining the service-level standards for securing their organizations' data assets and to create and check the data access rights. In other words, this factor concentrates on identifying the data business needs for different types of data that are associated with the role of the individuals in an organization to specify effective safeguarding to ensure confidentiality, integrity, and accessibility of the data and to ensure that unnecessary data access is minimized. Consequently, there should be a clear and well-defined standardized process for data access and security factor within the organization to secure sensitive data from unauthorized changes and to establish data access control for granting or denying specific data access privileges (i.e., select, create, update, or delete). Additionally, this factor enables the tracing procedure of all users' login activities and to track who has accessed what data or has modified what data. As a result, the following hypothesis is presented:

H7: Properly defining and executing data access and security management process positively influences ITPG implementation.

e) IT Data Backup and Recovery (D.B.R):

Another procedure for protecting an organization's data, in general, and a project's data specifically, is through enabling policies for executing backup and recovery activities on the enterprises' data assets based on their usefulness and value criteria. Such policies are crucial practices to maintain the data assets in case of system breakdown, error, or disaster. These practices are also considered as an indicative factor for the state of IT governance policy in the form of preserving the accuracy of the enterprises' data. Mikalef et al. [60] emphasize the necessity to have controlled practices regarding data backup routines that are applied for an organization's data set. Examples of such practices are a full data backup policy and an incremental data backup policy as well as the preparation of a data recovery plan identified for quick recovering of high availability of data during an outage event of the data systems. Accordingly, these authors stress on the importance of defining and executing a data backup and recovery management process to help implementing an ITPG as an essential process for risk management and recovery. As a result, the following hypothesis is proposed:

H8: Clear and accurate definition of a Data backup and recovery management process positively influences ITPG implementation.

4.1.1 Relational and Assessment Factors

This section highlights two substantial factors that contribute to executing a successful ITPG program. The relational practices, which are represented by a strategic communication factor, are purposed to educate users through realigning their awareness on the importance of ITPG practices and policies to increase the quality of the organization's assets such as project, data, and people. Moreover, this factor aims to communicate new ideas and changes in ITPG policies among the stakeholders. The assessment factor concentrates on the activity of the quality assessment of IT assets using some quality criteria matrix to evaluate the ITPG performance in an organization.

a) Strategic Communication (S.C):

To ensure the best practice of ITPG strategy implementation, a communication plan should be developed. This plan aims to distribute and share information, ideas, practices, assignments, scope, and goals among the stakeholders and to share and have a common understanding of the outcomes at each ITPG implementation. The best practice of ITPG requires governance of all IT organization's entities including data and people. The results of Smith's study indicate that enabling a communication plan across the enterprise should be from a bottom-top approach that begins with front-line employees through middle-level management to top and senior management levels as a critical factor in executing the ITPG policy across the entire organization. Thompson et al. [61] claim that the communication process of the governance standards must sufficiently be communicative and well-explained to the users to understand and confirm the fulfilment of the standards and policies across and among the stakeholders. Another critical step to ensure adequate application of the ITPG activities and policies among information systems users is providing training and knowledge transfer sessions and other awareness activities to the organization's staff such as internal-web forums for ideas' exchange and feedback. As a result, the following hypothesis is proposed:

H9: Clear and accurate definition of Strategic communication and sharing practices positively improves ITPG implementation.

3.4.3 ITPG Implementation (ITPG.IMP) and Organizational Performance (O.P)

As the conceptual framework of this study focuses on governing the most important assets for organizations which is the project as well as its data and the overall organization's data, so it is important to investigate how the quality of project and data which are under the governance program affected and hence their effect on the organizational performance. Zwikael, et al. [62] focus on the importance of project governance as sets of activities

and guidelines that organizations should employ as means to maximize the value of their projects towards advancing their competitive improvement and providing benefits directly to the organization's bottom line. Such gains are acquired by promoting the application of project governance and they contribute to reduce the operating costs and risks of unethical decision-making and minimize high-risk scenarios through control and trust approaches. Moreover, there are positive consequences of employing project governance programs for organizations such as improving client satisfaction rate, reduction of operations costs, improvement in internal business operations, and improvement in employee productivity [43].

Depending on the best practices (as key determinants) to implement effective project governance, Abednego & Ogunlana [27] argue that a good project governance program results in the right decision at the right time, contract fairness, information transparency, a reasonable time for decisions, continuous project control, and monitoring, equality between all involved parties, effectiveness and efficiency, and accountability in the form of user's satisfaction and public community participation [27]. Based on web-based survey responses regarding the results of implementing a project governance program, Musawir et al. [63] state that there are effects that are often reflected in the organization which runs project governance. That is because PG works effectively to improve project success and support organizational strategy as key governance roles such as the role of the project owner adopting a benefits realization mind-set and embedding this mind-set into the project management system [63]. Therefore, the implementation of a project governance program for an organization enhances projects' performance and hence the organizational performance[63][10]. As a result, the following hypothesis is proposed:

H11: ITPG implementation positively improves organizational performance

3.4.4 Project Management Office Existence (P.M.O.E)

Biesenthal & Wilden [17] draw attention to the importance of the projects for organizations as a vehicle to achieve the strategic objectives and beneficial change. To allow projects to be the repeatable, effective, and successful completion of projects and organizational objectives and project-based organizations (PBOs) often use formal organizational governance processes and mechanisms [17]. Weaver [64] finds out that one of the best factors for achieving effective PG is the implementation of a Project/program management office (PMO). He argues that the success of projects of an organization depends on establishing PMO. In other words, this factor acts as a critical success factor as it should transform from the role of simply controlling data gathering to become a conduit that processes and consolidates project, program, and portfolio data to provide the information needed by the board and senior management responsible for the governance of the organization[64]. In their research, Müller et al. [31] demonstrate that one of the mechanisms underlying the discursive abilities includes events for knowledge exchange is the PMO networks that make the governance of projects flexible in structures and interactions which allow effectiveness in project selection and efficiency in project execution [7]. As a result, the following hypothesis is proposed:

H12: Project management office implementation positively improves ITPG implementation.

4 RESEARCH METHODOLOGY

4.1 Research Design

The research design represents the practical operations of how the research will be conducted[65]. Creswell & Creswell, [65]and Maxwell [66] propose the research design illustrated in Figure 3 and it presents that the literature review is an ongoing process that assists to determine significant elements of a study such as research problem, objectives and questions, proposed research model, research instrument and data analysis technique and results. This research strategy applies a quantitative method that is perceived as a proper approach to investigate the factors and test their proposed hypotheses in the research conceptual framework [67]. To execute this investigation, a survey is used to collect the responses as numeric data and then the results of supported and unsupported hypotheses are illustrated in statistical descriptions[68]. The validation steps of the research were employed using various methods. For instance, while preparing the data collection instrument, content validity and pilot study steps were conducted to confirm that the items of each construct fully convey the meaning of this construct. Additionally, expert reviewers and subject-matter experts' recommendations were taken into consideration to improve the performance of the items. Furthermore, examinations of data discriminant and convergent values were done after collecting the data. They were used to validate how the measured items represent their latent constructs and whether each construct discriminates itself from other constructs. The first phase intends to develop measures of the proposed conceptual framework through two steps to develop a research instrument. As shown in Figure 3, as the quantitative method was identified to be the research approach of this study, two steps were involved to design the scales. The first step was carried out to develop the survey questions as the research instrument and it also aimed to validate the integrity of the survey's items applying a content validity procedure. The second step intended to test the survey questions through a pilot study to detect any required modifications or additions to the measures of the proposed conceptual framework. The second phase stipulates the sampling strategy for this study

depending on two multivariate analysis studies executed using independent samples for each study. The final section of this chapter explains in detail the Exploratory Factor Analysis (EFA) and the Confirmatory Factor Analysis (CFA). The EFA is the first data analysis study that is used to assess the underlying factor solutions for the key enabling factors. On the other hand, the CFA is a technique that is deployed to measure and validate the overall model fit and the criteria of the explored factor structure before employing a Structural Equation Modelling (SEM) to test the substantive hypotheses. The third phase illustrates the statistical findings of the data analysis methods (i.e. EFA and CFA with SEM) that were used to explore the key enabling factors for IT project governance implementation within the government agencies in Oman. The next section highlights the research type applied by this thesis along with the research strategy.

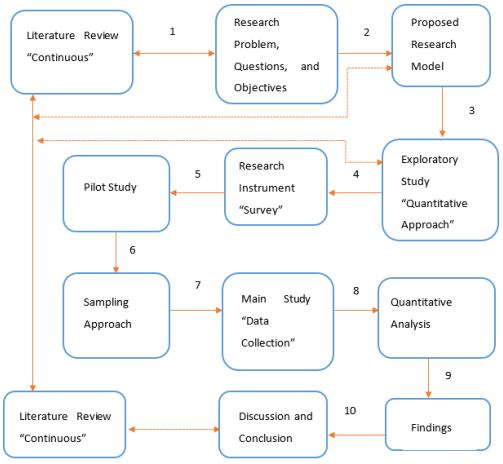

Figure 3. Research design

4.2 Research Type and Approach

This study is exploratory and such a study is usually conducted when there is a lack of knowledge about certain conditions at hand within a specific domain to gain better recognition and increase the understanding of a phenomenon [69]. The phenomenon of this study is the exploration of key enabling factors when implementing IT projects governance within Oman's public sector.

According to McMillan [70], a quantitative approach explores the state of a certain phenomenon. Consequently, the researcher deployed a quantitative approach that embraces a post-positivist pattern that focuses on the falsification of the research hypotheses. This procedure tested each hypothesis through a predefined research instrument for collecting data[67]. The researcher also used this approach to gather numerical data to examine the relationship between variables and test the proposed research hypotheses[68].

As the primary objective of this study is identifying the key enabling factors to implement an IT project governance that influences the organizational performance among Oman's public agencies positively, a quantitative approach is an appropriate method for this research. McMillan [70] emphasize that quantitative research methodology is particularly appropriate to empirically test research hypotheses. Therefore, this study intends to empirically test the proposed hypotheses based on the research conceptual framework.

4.3 Research Instrument

Developing a research tool or instrument is an extremely vital aspect of a research project as everything stated in the findings, discussion, and conclusion is grounded on the information collected using this tool [71]. As this research deploys a quantitative approach, the research instrument used for collecting the empirical information and evidence is a survey or questionnaire. This is because using a survey enables the researcher to obtain an insight into the targeted population by examining its sample, providing a quantitative or numeric description of trends, attitudes, or opinions [67]. Moreover, a survey is a suitable tool to help to answer the research questions that rely on hypotheses developed from the proposed research conceptual framework[72].

Grounded on these facts, the questions of this study's survey are developed according to the literature related to the suggested common factors or practices to employ an effective IT project governance initiative in the private sector organizations.

The survey of the research begins with an introduction page that clarifies the purpose and the aim of the survey, the definition of the IT project governance concept, and the endorsement of the confidentiality of the participants' responses. The questions (items) of the survey are split into four sections as the following:

- The First section comprises demographic information about the participants' profiles. It includes gender, educational level, work experience, and the level of management.
- The second to fourth section presents the proposed items required to measure each construct of the research conceptual framework and test its hypothesized paths. Appendix B highlights a complete list of these items that are characterized as follow:
    - The researcher implemented Hair et al. [68] rule of thumb of having a minimum of 3 or more observed variables (items) under each factor construct to attain the proper model of identification.
    - Each construct was made functional using items as suggested by [68].

- All the 11 IT project governance determinants with their items were independent variables type and they were distributed into four groups that signify the IT project governance practices: structural practices, management process, communication and assessment procedures except the IT project governance implementation (PG.IMP) is considered as an intermediate variable (dependent and independent). PG.IMP variable is independent in the situation of effecting organization performance (OP) as PG.IMP tending towards OP and affects it.
- Other items intended to measure two dependent variables type including PG.IMP, when all the 11 factors enter and affect it, and the organization performance variable when PG.IMP tending towards OP and effect it.
- All the items of 13 governance determinants as well as the observed variables (items) of organizational performance were made functional employing a five-point Likert-scale, ranging from 1 (Strongly Disagree) to 5 (Strongly Agree), to measure the agreement level of each IT project governance facet.
- Unlike other constructs, the intermediate construct, IT project governance implementation factor, which is used to investigate the frequency of implementation level adopted a seven-point Likert-scale ranging from 1 (far below implementation) to 7 (far above implementation).

5 Data Collection and Preparation

5.1 Pilot Study

This research's pilot study was implemented to apprehend response patterns and to get feedback from participants whether the items were comprehensible or not. Moreover, this study intends to specify the correlations between the items to provide a preliminary indication of convergent validity. As a result, the statistical analysis of the pilot study's collected data is useful to investigate if the set of items for a single factor is interrelated rationally among themselves using an initial indication of convergent validity.

The survey was developed and distributed to the participants who meet the inclusion criteria (e.g., must be IT professionals working in public organizations). The participants were recruited to participate in a pilot study, and they were asked to fill in an online survey using the Google Forms website.

The sample of the pilot study included 30 participants (N = 30) who are IT professionals working in the public sector in Oman. The size of this sample is determined according to the guidelines suggested by[73] as they state that (N = 30) is enough for a pilot study that intends to develop an instrument. All 30 participants respond to all the questions. Accordingly, there was no missing data concerning items.

Participants' responses to the question concerning suggesting an improvement to the survey questions demonstrated that almost all the items were clear and comprehensible. As illustrated by Appendix A, the results of the descriptive statistics for the 5-point Likert-scale indicated a mean ranging between 3.5 and 4.367. The standard deviation for the items with a 5-point Likert scale ranged from SD = 0.596 to SD = 1.1847 and the items of a 7-point Likert scale displayed a minimum SD = 0.9965 and maximum SD = 1.5669. The analysis of the level of the inter-item correlation among the set of items measuring one factor demonstrated to have high significance for the sets of the constructs' items of the survey. In this pilot study, the significant inter-item correlations level exhibited high statistical significance (i.e. * = $p < 0.05$; ** = $p < 0.01$) for most of the constructs' items. This indicates that the preliminary test concluded with high consistency between the indicator scales of each factor showing a good convergent validity among that factor's items. According to the feedback and the correlational analysis outcomes of the collected preliminary data, as shown in Appendix B, the final survey was developed for the large sample size determined by a sampling approach to execute the real study.

5.2 Sampling Approach

5.2.1 Sample Size

In accordance to studies done by Jorgensen, Pornprasertmanit, Schoemann, and Rosseel[74] and MacCallum, Browne, and Sugawara[75], the researcher deployed an online calculator tool as a mean to specify the sample size (N) of the targeted participants. This online tool calculation process (www.surveysystem.com) pointed out that the required minimum size was 371 participants in this research. In determining the sample size, it has been accepted 5% margin of error, 95% confidence level, and the total size of IT sector employees is 11000 according to thumb of rules. In addition, the study employed 50% response distribution. To ensure accurate results the study uses a sample size larger than the minimum required sample size, which is 380 participants.

5.2.2 Participants

Presented earlier in the research design section, the third phase of the research includes applying multivariate analyses using EFA and SEM to answer the research questions. Hair et al (2014) state that the best approach to

validate the results of the EFA study is to transfer it to a confirmatory assessment and assess the validity of the results by dividing the original sample randomly into two independent subsets. In other words, as stated in the literature, it is impossible to have desired results by exploring the factor structure through factor analysis (EFA) and assure the validity of the produced factor structure through CFA utilizing the same self-sample[68]. Thus, the initial sample size of N = 380 participants was divided into two independent samples for EFA and SEM. The first study (EFA) had a sample size of 100 participants, so it fit the minimum required size for such a study as suggested by [68]. The second study (SEM) sample size is N = 280 and it also complies with the required sample size to gain satisfying statistical results.

The gender profile for the EFA sample showed that the percentage of female participants is almost the same percentage for both genders. On the other hand, the SEM sample showed that the percentage of female participants more five times bigger than the male percentage. The educational qualifications for most respondents were Bachelor's and master's degrees. Moreover, the experience level of participants ranged from less than 5 years to 15 years and a small number of the participants had a work experience that is above 20 years.

Table III shows the demographic characteristics of the two samples.

TABLE III. DEMOGRAPHIC PROFILES

		EFA Study (N = 100)		SEM Study (N = 280)	
Profiles	**Options**	**Frequency**	**(%)**	**Frequency**	**(%)**
Gender	Male	40	40.0	41	14.6
	Female	60	60.0	239	85.4
Education-Level	Diploma	10	10.0	30	10.7
	Bachelor	72	72.0	195	69.6
	Masters	12	12.0	46	16.4
	PhD	6	6.0	9	3.2
Experience	Less than 5 years	66	66.0	92	32.9
	5 and 10 years	15	15.0	100	35.7
	11 and 15 years	12	12.0	42	15.0
	16 and 20 years	2	2.0	23	8.2
	Above 20 years	5	5.0	23	8.2
The Level of Management	Higher Management	12	12.0	37	13.2
	Middle Management	28	28.0	100	35.7
	Operational Management	60	60.0	143	51.1

5.2.3 *Data Screening*

Before executing the data, analysis steps, an IBM SPSS program was deployed to examine the 67 items for all the 13 factors of the two studies' samples (EFA, N = 100; SEM, N = 280) for missing values, normality, and outliers. The screening of the missing values of the data was conducted by running an analysis pattern function of SPSS and none of the variables had any missing value in both samples.

To assess the normality of data distribution for both samples, the researcher conducted the process of calculating the ratio of skewness and kurtosis values to their standard errors to yield a computed t-test as a basic portion of the descriptive statistics using IBM SPSS as shown in table IV. The findings indicate the normal distribution of most of the collected data among both samples [76].

TABLE IV. DESCRIPTIVE STATISTICS OF NORMAL DISTRIBUTION.

Variables	**EFA Study (100 Sample)**				**SEM Study (280 Sample)**			
	Skew.	***Std. Error***	***Kurt.***	***Std. Error***	***Skew.***	***Std. Error***	***Kurt.***	***Std. Error***
PS1	-.715-	.241	.092	.478	-.896-	.146	.762	.290
PS2	-.435-	.241	-.164-	.478	-.681-	.146	-.091-	.290
PS3	-.425-	.241	-.197-	.478	-.318-	.146	-.322-	.290
PS4	-.706-	.241	.095	.478	-.440-	.146	-.378-	.290
PO1	-.777-	.241	.687	.478	-.644-	.146	.136	.290
PO2	-.813-	.241	.425	.478	-.743-	.146	.133	.290
PO3	-.398-	.241	-.019-	.478	-.589-	.146	-.277-	.290
PPS1	-.690-	.241	.230	.478	-.597-	.146	-.033-	.290
PPS2	-.436-	.241	-.360-	.478	-.519-	.146	-.064-	.290
PPS3	-.333-	.241	-.395-	.478	-.655-	.146	.170	.290
PPS4	-.623-	.241	-.096-	.478	-.545-	.146	-.139-	.290
PPS5	-.568-	.241	-.111-	.478	-.786-	.146	.481	.290
PPS6	-.595-	.241	.091	.478	-.833-	.146	.865	.290
DL1	-.518-	.241	-.238-	.478	-.866-	.146	.727	.290
DL2	-.145-	.241	-.889-	.478	-.488-	.146	-.135-	.290
DL3	-.188-	.241	-1.039-	.478	-.708-	.146	-.004-	.290
DL4	-.698-	.241	-.004-	.478	-.906-	.146	.690	.290
DL5	-.615-	.241	-.574-	.478	-.700-	.146	-.028-	.290
DL6	-.437-	.241	-.517-	.478	-.540-	.146	-.016-	.290

Variables	EFA Study (100 Sample)				SEM Study (280 Sample)			
	Skew.	*Std. Error*	*Kurt.*	*Std. Error*	*Skew.*	*Std. Error*	*Kurt.*	*Std. Error*
DC1	-.548-	.241	-.237-	.478	-.745-	.146	.250	.290
DC2	-.637-	.241	-.505-	.478	-.887-	.146	.025	.290
DC3	-.535-	.241	-.069-	.478	-.785-	.146	.260	.290
MD1	-.666-	.241	.072	.478	-.625-	.146	.199	.290
MD2	-.562-	.241	.060	.478	-.601-	.146	.599	.290
MD3	-.524-	.241	.463	.478	-.722-	.146	.462	.290
MD4	-.771-	.241	.874	.478	-.519-	.146	.203	.290
DAS1	-.857-	.241	.059	.478	-1.156-	.146	1.214	.290
DAS2	-1.379-	.241	1.902	.478	-1.174-	.146	1.178	.290
DAS3	-.639-	.241	-.137-	.478	-.574-	.146	-.396-	.290
DAS4	-.538-	.241	-.066-	.478	-.704-	.146	.132	.290
DAS5	-.703-	.241	.684	.478	-.764-	.146	.312	.290
DBR1	-.662-	.241	.100	.478	-1.021-	.146	.544	.290
DBR2	-.828-	.241	.833	.478	-.908-	.146	.308	.290
DBR3	-.658-	.241	-.039-	.478	-.952-	.146	.497	.290
DBR4	-.410-	.241	-.369-	.478	-.799-	.146	.128	.290
SC1	-.586-	.241	.178	.478	-.364-	.146	-.605-	.290
SC2	-.581-	.241	-.068-	.478	-.755-	.146	-.066-	.290
SC3	-.669-	.241	.602	.478	-.553-	.146	-.061-	.290
SC4	-.793-	.241	.497	.478	-.709-	.146	.050	.290
SC5	-.515-	.241	.041	.478	-.635-	.146	-.425-	.290
ASS1	-1.025-	.241	2.150	.478	-.730-	.146	.408	.290
ASS2	-.312-	.241	-.773-	.478	-.606-	.146	.161	.290
ASS3	-.234-	.241	-.511-	.478	-.654-	.146	.255	.290
ASS4	-.606-	.241	.237	.478	-.788-	.146	.424	.290
ASS5	-1.036-	.241	1.905	.478	-.788-	.146	.685	.290
ASS6	-1.036-	.241	2.777	.478	-.931-	.146	1.203	.290
PMO1	-.808-	.241	.268	.478	-.625-	.146	.013	.290
PMO2	-.577-	.241	.018	.478	-.645-	.146	.230	.290
PMO3	-.491-	.241	.134	.478	-.496-	.146	-.362-	.290
PMO4	-.527-	.241	.052	.478	-.498-	.146	-.122-	.290
OP1	-.554-	.241	.826	.478	-1.043-	.146	1.570	.290
OP2	-.398-	.241	.068	.478	-.761-	.146	.413	.290
OP3	-.521-	.241	.093	.478	-.870-	.146	.852	.290
OP4	-.736-	.241	1.190	.478	-.756-	.146	.693	.290
OP5	-.234-	.241	-.511-	.478	-.885-	.146	1.309	.290
OP6	-.616-	.241	-.074-	.478	-1.064-	.146	1.651	.290
PG.IMP1	-1.240-	.241	1.326	.478	-.781-	.146	-.201-	.290
PG.IMP2	-.946-	.241	.633	.478	-.718-	.146	-.230-	.290
PG.IMP3	-.954-	.241	.695	.478	-.714-	.146	.065	.290
PG.IMP4	-1.037-	.241	.834	.478	-.803-	.146	.084	.290
PG.IMP5	-.948-	.241	.546	.478	-.636-	.146	-.099-	.290
PG.IMP6	-1.051-	.241	.777	.478	-.940-	.146	.097	.290
PG.IMP7	-1.354-	.241	1.983	.478	-.940-	.146	.414	.290
PG.IMP8	-.998-	.241	.666	.478	-1.155-	.146	.791	.290
PG.IMP9	-1.001-	.241	.538	.478	-.764-	.146	-.066-	.290
PG.IMP10	-.954-	.241	.732	.478	-.864-	.146	.189	.290
PG.IMP11	-.782-	.241	.469	.478	-1.147-	.146	1.126	.290

6 Data Analysis and Findings

6.1 Exploratory Factor Analysis (EFA)

A series of EFAs is performed using IBM SPSS with Principal Axis Factoring (PAF) as an extraction tool and Promax rotation with Kaiser standardization system to evaluate the basic structure of the IT project governance factors through the item deducting of 67 indicators. PAF is one of the most widespread factor extraction methods used to discover the interrelationships between many variables and to explain those variables in terms of their dependent dimensions (factors) patterns[75].

The boundary point used to evaluate the factor structure solution is defined as proposed by [68] through determining the factor loads to be at or above .30 that are assumed to meet the minimum factor structure explanation standards. Moreover, this factor-loading criterion was chosen to ensure that adequate items would be preserved during this implicit factor structure exploration. The suggested number of the assessed items listed (i.e., three or more) was used as guidance. Hair et al., [68] clarified the recommendation as a method of identification of the assessed items to just be only identified (i.e. three items) or over-identified (i.e. more than three items) for classifying a factor solution with appropriate information to be tested for SEM. The defined limit of the factor loading for each variable was thus stated to be bad when the loading factor becomes close to.30, and good if it reaches more than 30.

TABLE V. PATTERN MATRIX EXPLORATORY FACTOR ANALYSIS (EFA).

VARIABLE	Factor												
	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*
PS													
PO													
PO1								0.554					
PPS													
PPS1			0.510										
PPS5			0.421										
PPS6			0.409										
DL													
DL2							0.615						
DL1							0.581						
DL3							0.523						
DC													
MD													
MD2					0.769								
MD4					0.718								
MD3					0.624								
MD1					0.622								
DAS													
DAS3												0.694	
DAS4												0.526	
DBR													
DBR1	0.766												
DBR2	0.575												
DBR3	0.414												
SC													
SC4											0.650		
SC2											0.539		
SC3											0.498		
SC1											0.416		
ASS													
ASS4						0.616							
ASS6						0.578							
ASS1						0.567							
ASS3						0.494							
ASS5						0.437							
PMO													
PMO1									0.707				
PMO3									0.576				
PMO2									0.369				
OP													
OP6		0.775											
OP4		0.747											
OP5		0.583											
OP1		0.457											
OP2		0.445											
PG.IMP													
PG.IMP2				0.809									
PG.IMP1				0.648									
PG.IMP8				0.630									
PG.IMP9				0.586									
PG.IMP3				0.560									
PG.IMP4				0.462									
PG.IMP10				0.416									
PG.IMP5				0.384									

The technique of extraction: Factoring of the principal axis.
The technique of Rotation: standardization Oblimin with Kaiser
Rotation converged into 35 variations.

A series of iterative measures were used during all of the EFA experiments. An element that did not meet the boundary points for consideration as explained above has been excluded. Such a series of measures were carried out until the solution to the satisfying factor structure was reached, as outlined in Table V. The number of factors, in the final factor solution during those exploratory experiments, produced 10 factors. The final factor approach in the conceptual project governance model was equivalent to the suggested latent constructs in the analysis. By focusing on the current stage of factor analysis, exploring the basic structure of the solution factor for project governance is implemented. Furthermore, Fulfilling the appropriate factor solution was indicative of moving forward with CFA and structural model success as discussed in the next section.

6.2 Structural Equation Modeling (SEM)

The results illustrated from the analysed data of the second variable sample (N = 280) of the initial variable size (N = 380) were centred on the SEM methodology by applying the two-method approach. The first stage was aimed at analysing a measuring model (CFA). The analysis was performed in this method to evaluate the overall determining model fit, as well as to develop reliability of data and approximate and distinctive reliability to ensure that the measurement model supports the observations of the EFA effectively. The second stage is planned to investigate a structural model that defines the relationships between the latent constructs in estimating the value of the path coefficient (test hypotheses). In general, SEM helps researchers to test theoretical hypotheses on how variables are theoretically related (Schreiber, Stage, King, Nora, & Barlow, 2006). The SEM system that used AMOS 24 to manage the two separate Liker-Scales (i.e. five-point and seven-point) for data collection for estimating CFA measurements and assessing structural model.

6.2.1 Outcomes of Confirmatory Factor Analysis (CFA)

The CFA is the most varied analysis tool for evaluating whether the latent constructs calculated observed variables are compatible with the outcome of the latent constructs basic structure of the EFA [68]. In this process of data analysis, as stated above, the researcher concentrated on evaluating the overall model fit and the construct validity and reliability of the calculated model resulting from the factor solution of the EFA, based on the number of boundary criteria.

6.2.1.1 Model Fit

The researcher used a variety of parameters to determine the overall fit of the CFA model as thresholds defined by Hu & Bentler, [77] such as CMIN / DF, CFI, SRMR, and RMSEA. The CMIN / DF should be between 1 and 3 for goodness match scales, the CFI should be appropriate if it exceeds 0.90 and outstanding if it exceeds 0.95, the SRMR should not exceed 0.08, and the RMSEA should not increase more than 0.06 (for more information see Table V).

TABLE VI. MODEL FIT CRITERIA

Criteria	Thresholds		
	Poor	***Acceptable***	***Excellent***
CMIN/DF	> 5	Between 3 and 5	Between 1 and 3
CFI	< .90	Between .90 and .95	> .95
SRMR	> .10	Between .08 and .10	< .08
RMSEA	> .08	Between .06 and .08	< .06

Note: [77] were focused on the criterion thresholds and their interpretations.

Iterative changes to the CFA model were made to get a better fit for the model. The results of the overall model fit are shown and told in Table VII based on a study of the Goodness-of-Fit (GOF) index thresholds. Factor loading is said to be optimal if it is equal to or greater than 0.70 as per Hair et al.[68], By observing the loading factor of the initial CFA model, two items (DL1, DL3) were found, among several other three items, related to the DL factor with a loading range of less than 0.60, which was less than the recommended cutting off a good item loading its potential construction. Furthermore, among the other two items, there was one item (DAS4) relevant to the DAS factor with a loading range of less than 0.60, plus one item (PO1) initially of one item from the PO factor with a loading of less than 0.60, which demonstrated to be less than the recommended cut off good item loading. After that, there are already two items (PG. IMP10, PG. IMP5), and 8 items linked to the factor PG.IMP with a loading range of less than 0.60. According to what was stated above, the researcher removed the DL, DAS, PO factors for breaching the prescribed minimum number (3). Moreover, the factors DC, PS have been omitted, as they are unidentified factors, that is, there is no similarity in the items that are loaded to the factor.

The comparison of nested models was done by measuring the calculation of the difference (Δ) of both the Chi-Square difference (ΔX2) and the degree of the difference in freedom (Δdf) of the alternative calculated model (with 9 factors) from the main scaled model (with 13 factors). For the nested 9-factor model, the chi-square difference between the restricted and unconstrained model was substantial ($p<.001$) compared to the initial 13-factor model, as shown in Table VII. Additionally, the overall model fit values in the alternative CFA model had improved GOF indexes related to the first CFA model, as shown in Table VII. Several iterative attempted to maximize the overall fit performance of the model on the alternative (i.e. 9-factors) calculated model by removing the lowest loaded factors from some of the latent factors over-identified particularly, the results improved in the GOF indications as shown in Table VII.

6.2.1.2 Construct Validity

After making sure that the 8-factor model outcome substantially outperformed the original 13-factor model, the following stage was to check that the 8-factor measurements were representative of construct validity. Accomplishing this goal, the researcher used boundary points identified by Hair et al., [68] to determine connecting and discriminating validity.

The definition of construct validity shows to what degree the measured objects reflect their latent constructs. While Convergent validity means that items of a particular construct converge a common proportion of variance as proof that the items test the same construct precisely.

TABLE VII. MODEL FIT MEASURES FOR CFA AND STRUCTURAL MODELS

Criteria	Initial	Alternative	Modified	SEM Model	Thresholds
	CFA	*CFA*	*Alternative CFA*		
	Model	*Model1*	*Model2*		
CMIN	1041.047	871.856	868.892	1304.422	--
DF	629	532	532	505	--
CMIN/DF	1.655	1.639	1.633	2.583	Between 1
					and 3
P-Value	***	***	***	***	Between
					.05 and
					.000
CFI	0.799C	0.822C	0.814C	0.892	>0.95
SRMR	0.064a	0.062a	0.065a	0.062	<0.08
RMSEA	0.081p	0.080p	0.080p	0.075	<0.06

Notes: 1) After removing PMO Factor; 2) After removing DRB factor; a) Excellent; b) Acceptable; C) Poor * = p < .05, ** = p < .01, *** = p < .001

For calculated things, the convergent validity was evaluated by performing three boundary points recommended by Hair et al., [68].Large loading of things on a factor would imply sharing on a common point that's on a particular factor. All indicator factor loading will ideally surpass 0.70 to be regarded as having a high converging validity. The loadings of the items shown in the adjusted 9-factor CFA measurement model (Figure 4), as shown in Table VIII, fulfilled the first convergent validity requirement. Furthermore, Hair et al., [68] proposed the convergent validity of a factor as a second limit, the Average Variance Extracted (AVE), which ought to be 50 or higher. The AVE threshold demonstrates that a factor's average loading of items implies a variance at or above 50 percent to surpass the variance induced by the measurement error for that construct. The findings of the adjusted alternative calculated model AVEs crossed the defined threshold as shown in Table IX. According to Hair et al., [68], the third criterion for evaluating convergent validity is that the Construct Reliability (CR) threshold should be .70 or higher, moreover, it would be acceptable if the CR range between.60 and.70 were acceptable. The resulting findings of the updated 8-factor model's CR values surpassed the suggested boundary limits of (.70) to show the high reliability existing of calculated items for their associated latent constructs. Therefore, the results of the three standards to indicate the degree of convergent validity of the alternative calculated model of CFA have been satisfied; thus, the convergent validity for the model has been achieved.

By fulfilling the requirements of the convergent validity test, the researcher proceeded to execute a discriminant validity assessment. The discriminant validity reflects the degree to which a construct describes a specific phenomenon from other calculated constructs. To assess the discriminating validity, a comparative step was performed between the squared root of an AVE (Average Variance Extracted) value of a construct and its estimations of inter-correlation with other constructs [68]. The test outcomes, shown in Table IX, indicate that the squared root of AVE values of all constructs is greater than their estimates of correlation with other constructs, and therefore the boundary point for discriminant validity has been fulfilled. In that event, this analysis proves that the measurements of the alternative CFA model assessed distinguishing phenomena and thus obtained a meaningful statistical method of the validity of the construct.

TABLE VIII. FACTORS LOADINGS OF THE CFA MODEL.

ITEMS		FACTORS	ESTIMATE
PPS1	<---	PPS	0.735
PPS5	<---		0.698
PPS6	<---		0.758
PG.IMP2	<---	PG.IMP	0.831
PG.IMP1	<---		0.736
PG.IMP8	<---		0.715
PG.IMP9	<---		0.718
PG.IMP3	<---		0.787
PG.IMP4	<---		0.793
PG.IMP10	<---		0.619
PG.IMP5	<---		0.563
MD2	<---	MD	0.764
MD4	<---		0.775
MD3	<---		0.845
MD1	<---		0.716
SC4	<---	SC	0.604
SC2	<---		0.823
SC3	<---		0.690
SC1	<---		0.730
ASS4	<---	ASS	0.542
ASS6	<---		0.802
ASS1	<---		0.719
ASS3	<---		0.801
ASS5	<---		0.824
DL2	<---	DL	0.498
DL1	<---		0.714
DL3	<---		0.651
OP6	<---	OP	0.794
OP4	<---		0.774
OP5	<---		0.624
OP1	<---		0.593
OP2	<---		0.544
PMO1	<---	PMO	0.680
PMO3	<---		0.729
PMO2	<---		0.779
DBR1	<---	DRB	0.636
DBR2	<---		0.893
DBR3	<---		0.771

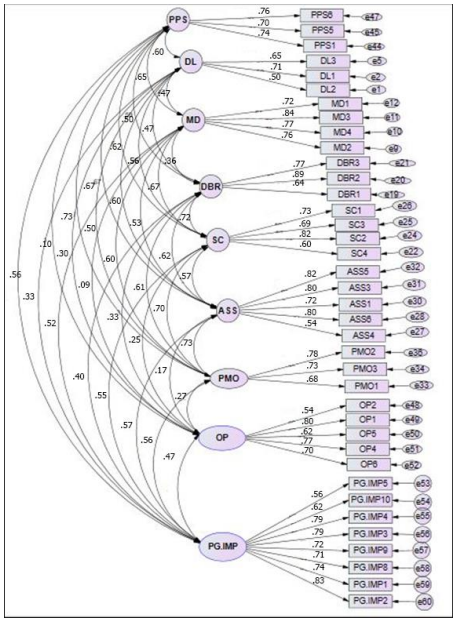

Figure 4. CFA Measurement Model 1.

TABLE IX. CORRELATIONAL MATRIX

Factors	PPS	MD	DBR	SC	ASS	PMO	OP	PG.IMP
PPS	0.632							
MD	0.649***	0.586						
DBR	0.590**	0.560***	0.680					
SC	0.618***	0.671***	0.723***	0.541				
ASS	0.673***	0.635***	0.617***	0.665***	0.573			
PMO	0.729***	0.599***	0.609***	0.704***	0.727***	0.595		
OP	0.101	0.089***	0.333*	0.246*	0.171	0.266*	0.784	
PG.IMP	0.562**	0.521**	0.552**	0.552**	0.571**	0.559**	0.475**	0.583***
CR	0.774	0.858	0.815	0.806	0.859	0.774	0.802	0.897
AVE	0.534	0.603	0.599	0.513	0.694	0.534	0.453	0.526

Note: CR = Construct Reliability; AVE = Average Variance Extracted. Diagonal measurements are the square root of AVEs and measurements below diagonal are correlation values between constructs.
* = p < 0.05. * * = < 0.01 p. * * * = p < 0.

6.2.2 Structural Model

The researcher checked the structural model, after achieving a good CFA model fit, indicating strong convergent and discriminant validity. The Structural Equation Model (SEM) was performed to determine the relationships of the resulting calculated (CFA) model between the independent and dependent constructs. According to what has stated in Table VII, The SEM structural model fit indices (Figure 4) fulfill the minimum threshold defined. As a decision rule, a degree of significance of alpha.05 was used to determine whether the hypothesis is accepted or not. For instance, if the p-value is less than .05, it supports the hypothesis and implies a significant result. On the other side, if p is greater than the value of .05 then the hypotheses have been ruled as unsupported ones.

The results stated in Table X and both Figures 5, and 6, show that seven out of thirteen regression paths were statistically significant in favor of their respective hypotheses. Such significant predictors illustrate 76.5% of variation in execution of IT project governance (R2 = .480, p < .005). The implementation of project governance, in particular, plans for achieving the organizational performance (R2 = .303, p < .005) where the implementation of project governance accounts for 56.5 percent of the variation in organizational efficiency.

TABLE X. STRUCTURAL EQUATION MODELING (SEM) RESULTS.

Path Relations		Factors	Estimate	S.E.	C.R.	P	Significant	Supported
PG.IMP	<---	PPS	0.503	0.07	7.209	***	S***	Yes
PG.IMP	<---	MD	0.494	0.063	7.846	***	S***	Yes
PG.IMP	<---	DBR	0.744	0.085	8.796	***	S***	Yes
PG.IMP	<---	SC	0.71	0.098	7.258	***	S***	Yes
PG.IMP	<---	ASS	0.65	0.071	9.214	***	S***	Yes
PG.IMP	<---	PMO	0.707	0.09	7.884	***	S***	Yes
OP	<---	PG.IMP	0.357	0.04	8.976	***	S***	Yes

Note: * = p < .05, ** = p < .01, *** = p < .001; S = Significant, NS = Not significant.

The results of the SEM analysis, shown in Table X and both Figures 5 and 6, on the relevant path rates (hypotheses), showed that seven important factors affect positively the organizational performance were found as follows: PPS, MD, DBR, SC, ASS, PMO, ITPG.IMP was statistically significant supporting their respective hypotheses. In contrary to the business-centered studies, according to the SEM sample, no impact of project stewardship, project ownership, IT data lifecycle, and IT data access and security, were detected on the discipline of IT project governance implementation. This might be explained because Omani public entities do not employ formal titles for employees in charge of the project stewardship role. Accordingly, there is not any sufficient concentration on specific role assignments and responsibilities like project stewardship roles that indicated to be a significant factor for the project governance implementation according to the literature confirmations.

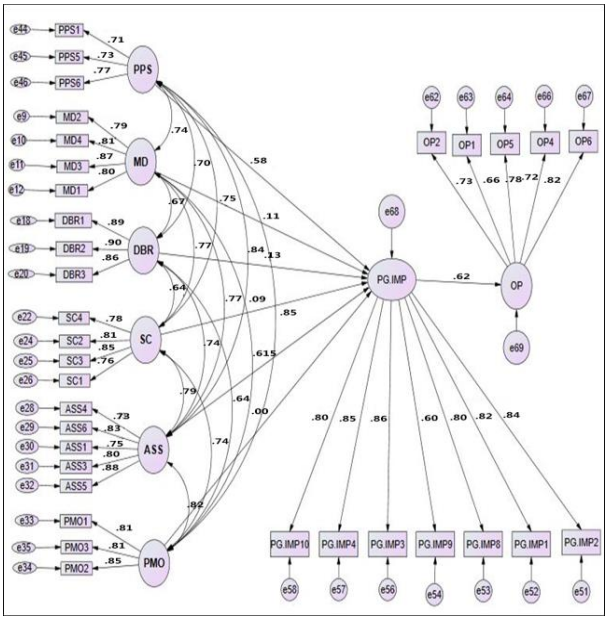

Figure 5. SEM Structural Model.

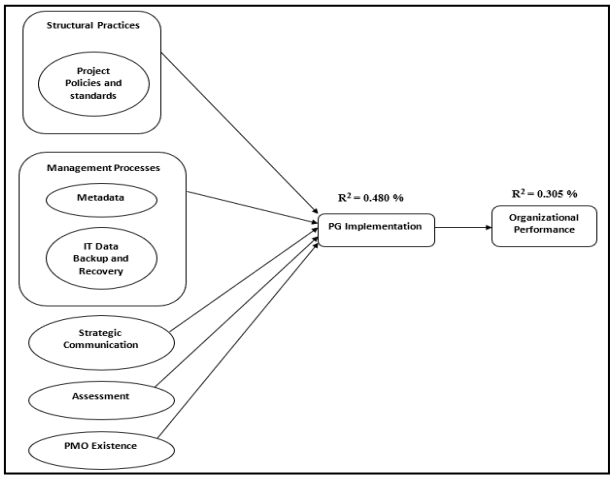

Figure 6. Hypothesized Conceptual Framework (After Removal of Non-Significant Factors)

7 KNOWLEDGE CONTRIBUTIONS OF THIS STUDY

This study added to the previous literature in different aspects. In terms of methodology, most studies in this context used the qualitative analysis or case studies to understand the implementation of project governance, but this study provided an important attempt to comprehensively develop and validate a measurement scale for assessing the enabling factors of the project governance and its results in the public sector. Concerning the theoretical contribution, this study extended the existing project governance contexts by providing new enabling factors (hybrid framework) as a great step to avoid the obstacles in the way of these frameworks. This new hybrid framework was found to be statistically and significantly contribute to a set of positive predictors for the implementation control of project governance. This conclusion indicated that entities aiming at a formal implementation of project governance should not concentrate only on having a project repository but the continuous assessment for the project is vital for project quality to develop an effective business value. This study provides another statistical evidence of organizational performance as a result of the implementation of project governance in the public entities in Oman, and the statistics results showed that it was a very high-significant determinant. Moreover, this research offered beneficial addressing to the current implementation of standardized frameworks that were tested in a new comprehensive and mixed frame in a public sector context. The results show that the most enabling factors are relevant, and very few were seen irrelevant, as clarified in Table X.

Besides, this study offers practical perspectives for public sector entities and significant research contributions in the same context. It could help the decision-makers and policy-makers in evaluating and assessing project governance processes' status by using the developed tool to conduct a self-assessment before using the project governance strategy. Moreover, it helps the decision-makers and policy-makers in the Omani public sector to make use of the ITPG implementation framework in Oman to prioritize the significant factors for implementing the ITPG program. Since these results may be valid within the Oman public sector context, it should also be important and relevant to similar contexts sharing the same fundamental features.

It is worth mentioning that the public sector is the most-suited for ITPG programs because it was proven that it enhances their overall performance.

8 LIMITATIONS AND FUTURE RESEARCH RECOMMENDATIONS

This study provides promising perspectives, but it has some limitations. Firstly, this research was made within Omani contexts, therefore results are mainly relevant to it. Another limitation of this study is that non-IT professionals were not within the targeted audience, which could have enhanced the research's conclusions if they were considered. An additional limitation could be that some participants may not have enough grasp of some factors' concept definitions such as the project stewardship factor. Therefore, this lack of awareness and understanding may affect their given answers. Furthermore, some participants may think that some questions are confidential for their organization, therefore they could not provide their responses. Finally, the findings suggest that the suggested factors with statistical significance have higher variability in the implementation of project governance, but more factors might clarify the remaining portion of the variability in the implementation of project governance that needs to be addressed. Despite the existence of the limitations mentioned above, this study was exploratory. Futures studies could further address the enabling factors and inhibiting factors of the formal implementation of

project governance and could validate other research tools that include a holistic list of enabling factors. Additional researches are also needed to test mediating and moderating factors that might increase the relationships between the enabling factors and the implementation of project governance. A qualitative approach could be used integrated with a quantitative method (i.e. mixed method) through performing semi-structured interviews to refine, elaborate, and complement the quantitative conclusions.

9 CONCLUSION

The purpose of this study is to investigate the main enabling factors considering them as vital determinants of the implementation of IT projects' governance in the Omani Public Sector. The investigated factors, that showed positive impacts on the implementation of the IT project's governance were:

- Structural practices (one factor).
- Strategic communication (relational factor).
- The process of IT data management (two factors).
- Assessment of the project governance practices (extended factor).
- The factor of PMO existence.
- The implementation of the project's governance was considered as another significant factor because it was positively affecting the organizational performance, as a result, for the agencies of the Omani.

In contrary to the business-centered studies, according to the SEM sample, no impact of project stewardship, project ownership, IT data lifecycle, and IT data access and security, were detected on the discipline of IT project governance implementation. This might be explained because there is no precise understanding of the measures to be utilized for dealing effectively with such a process of project management in Omani public entities.

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