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Construction of PLS-SEM Model of Organisational Factors Affecting the Efficiency of Emarati Electronic Government Procurement Platform (EEGPP) Implementation in UAE

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Abstract: The United Arab Emirates (UAE) government paid a lot of attention to enhancing its e-government services, including the e-government procurement platform (E-GPP). Due to lack of study regarding the efficiency of E-GPP implementation, this research aimed to develop a PLS-SEM model of organizational factors affecting the efficiency of Emarati Electronic Government Procurement Platform (EEGPP) of UAE government. This study adopted the quantitative research approach where the survey data from 206 participants were used to develop and analyse the model using SmartPLS software. The model was evaluated and found that it achieved GoF value of 0.690 which indicate having high validating power. Futher analysis on the model, found that planning, policy formulation, change management, and human resource management constructs have significant effect on the efficiency of the EEGPP. Mediating effect of innovation construct also revealed that innovation has a significant mediating effect on the relationship between the four independent variables (planning, policy formulation, change management, and human resource management) and the efficiency of the EGPP of the UAE. This model and the outcomes of this research can contribute significantly to policy and decision-makers during focusing on the planning, policy formulation, change management, and human resource management in the implementation of the EGPP.

Keywords: PLS-SEM, UAE, E-government procurement, public procurement, factors of E-GP

1. Introduction

E-procurement has become one of the most popular applications of electronic commerce (e-commerce) in several industries. Kalakota and Robinson (2000) emphasized the cost savings, greater efficiency, and control as three catalysts for e-procurement expansion. Leveraging e-commerce will benefit the public sector more (Baker, 1999). Today, e-procurement in government is recognized as one of the most important subjects in the government-to-business category, and it has sparked a lot of interest among academics (Turban & King, 2003). Electronic public procurement popularized as E-procurment is another term for it. E-procurement is a technology that allows procurement duties such as sourcing, ordering, commissioning, receipting, and payment across the complete scope of an authority's activities.

Despite the World Bank's emphasize on adopting electronic means for procurement process and the diverse potential offered by e-Government Procurement (e-GP), it remains underappreciated in many countries, particularly in developing countries with low levels of industrialization, poor infrastructure, and other factors. E-procurement is more than just using the internet to do business. E-notification, e-tendering, e-awarding, e-contracting, e-payment, and many

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more elements of the procurement cycle are covered by the system. While some businesses are successful with e-procurement, others are not. Academics have been investigating the advantages of e-procurement in recent years, which include saving money on the entire procurement process by reducing paperwork and printing and photocopying costs, as well as saving time. Furthermore, research shows that emerging countries' e-government infrastructure has been steadily expanding. However, little is known about how governments may employ electronic and internet technologies to enhance sustainable supply chain management, particularly in government procurement (Adjei-Bamfo, 2019). E-government, by combining an e-procurement system with proper monitoring and assessment procedures, provides a larger illustration for market willingness valuation (Adjei-Bamfo, 2019).

Electronic Government Procurement (e-GP) is one of the most pressing challenges in e-government right now, and it surely requires greater attention to assure its success. Previous research has identified a number of organisational concerns that have an impact on the effectiveness of e-GP implementation, including planning, policy formulation, change management, and human resource management. As a result, the focus of this study effort has been on those organisational challenges in order to discover their precise relationship to e-GP adoption. In this regards, several modifications in government purchasing practice have been witnessed globally. Modern public procurement is utilised as a tool to promote public service quality, good governance, and sustainable development, whereas unsuccessful procurement has a negative impact on the usage of such procurements (Preuss, 2009; Osei Kojo, 2017). Public procurement reform can directly help to enhance a country's economic, investment, and social environments. However, concerns related to such procurement may not assist organisations in forecasting demand for public utilities and controlling anomalies, risks, and obstacles associated with the process (United Nations Department of Economic and Social Affairs (UNDESA), 2014). As a result, e-procurement has a favourable effect on an organization's work process, but faults in such e-procurements may lead to the neglect of these portals and applications, rendering them useless to the business.

However, a lack of organisational change and reform in the UAE's public sector underlies a reluctance to accept new methods as old mindsets persist. In the absence of such a transformation, the current structure and procurement process do not meet the standards of the e-procurement process. Also, there is a scarcity of personnel in the UAE with the necessary competence to develop and maintain e-GP. A lack of an effective national e-GP plan that is cascaded down to government ministries and local government departments has a major adverse influence on e-GP adoption. Hence, this study is focusing on studying various independent, dependent, and moderator variables which affect e-GP procurement system in UAE. In this study, independent variables are the E-Government Procurement critical factors, which are E-GP planning, E-GP policies, E-GP change management, HRM training, and service quality. The moderator in this study is E-Government Procurement innovation and the dependent variable is the efficiency of the Emarati Electronic Government Procurement Platform (EEGPP).

2. Literature Review

Supply Chain Management (SCM) has been widely regarded by academia and enterprises since the 1990s (Cheng et al., 2007), and procurement has also been given much attention as the most valuable part of the supply chain system. The complexity of procurement management is on the rise, particularly in the e-commerce era, as customer demands and the market change at a faster pace. E-procurement through modern Information Technology (IT) can reduce transaction costs, increase the efficiency and transparency of the procurement process, and then improve overall operation efficiency, providing a competitive advantage by improving supply chains. As a result, e-procurement has been a significant step forward and one of the SCM hotspots. Most businesses are beginning to embrace electronic procurement (e-procurement) solutions and strategies based on internet technology, as well as simple initiatives designed to automate indirect supply purchasing and streamline basic procurement processes (Cheng et al., 2007).

Electronic procurement, also known as e-procurement, is the electronic or online procurement of goods or services, typically via the internet (Dixit, 2007). E-procurement is the practise of buying goods and services over the internet using electronic methods (the internet, online, e-mail). It includes electronic ordering, bidding, and rendering via portals, extranets, private platforms, markets, and/or E-Data Interchange (EDI). To facilitate the corporate purchasing process, purchase cards, reverse auctions, and/or linked automatic procurement systems may be used. E-commerce is a broad term that refers to an inter-organizational information system that promotes business-to-business electronic communication, information sharing, and transaction support via a network of public or private value-added networks (Min & Galle, 2003). EDI, direct supplier links, the Internet, Intranet, Extranet, electronic catalogue ordering, and e-mail are all examples of how this can be accomplished (Gunasekaran & Kobu, 2007). As a result, while e-procurement and e-commerce are nearly identical, they differ in a variety of ways. E-commerce, for example, frequently works with a large number of individual customers, whereas e-procurement is more likely to include commercial transactions (Johnson & Whang, 2002).

Several governments have emphasised the adoption of e-procurement, resulting in the development of the E-Government Procurement (e-GP) system. E-GP is defined as the collaborative use of information and communication technologies by government agencies for the procurement of goods, works, and services, as well as contract

management, in order to ensure good governance and value for money in public procurement while also contributing to the country's socioeconomic development.

2.1 E-Procurement Management System

A complete re-processing and optimization for manufacturing enterprise business necessitates determining the materials required. Raw material purchasing departments are divided into two categories: production materials and non-production materials. Different plans are used to guide procurement activities (Cheng et al., 2007).

(1) Non-production materials. In general, non-production supplies are administrative supplies that are not directly involved in production, such as paper and pens. Because non-production supplies purchases are either infrequent or of minor importance, certain types of procurement receive less attention. The potential to eliminate non-production supply costs is limited, but we must maintain a certain inventory level to avoid shortages.

(2) Production materials are materials that are used directly in the manufacturing process, with orders that are repetitive and consistent. The costs of these materials are significant in production and determine the total cost of production as well as a company's competitiveness. As a result, the procurement of production materials must be carefully planned.

First, information on estimated production needs is gathered. A needs-based plan should be developed. The reorder schedule and amount should be included in the plan. In this process, it is critical to consider the continuity of raw material supply and maintain a certain inventory level in different storages to account for unforeseeable circumstances such as a warehouse fire. Because of the volatile market environment, the purchasing plan is subject to change. For example, if there is reliable information that the price of inventories is about to rise, the purchase amount can be higher than usual in order to prepare for the future. Following the creation of a procurement plan, the purchasing department makes purchases in accordance with the procurement plan and sends the relevant procurement information to suppliers, including the procurement date, type, size, and payment methods. The procurement process analysis reveals that the procurement of production materials is quite complicated. To optimise decisions, we must consider internal inventory levels, production needs, current market conditions, future market forecasts, and other information, particularly when making procurement plans. E-procurement system management is distinguished by a wide range of business activities that can be carried out via the internet, such as information dissemination and bidding. Maintaining an online procurement system has advantages over a traditional procurement system.

2.2 Critical Factors Affecting E-Government Procurement

Public procurement officers frequently face structural challenges, as well as efficiency and effectiveness issues, as they assess their capabilities and options across a variety of purchasing options (e.g., resource-based view). As they seek the best value for their stakeholders, public procurement officers, like those in the private sector, are constrained by resource constraints. The best value in public procurement is frequently defined as obtaining the greatest benefit from goods and services at the lowest possible cost. In comparison to procurement officers in the commercial sector, public procurement officers face a broader range and greater number of distinct regulatory, institutional, and normative barriers, which are referred to as critical elements in this study. There are several factors that influence the efficiency of e-government procurement as below:

E-GP Planning: The three primary procurement process steps are procurement strategy and budgeting, procurement solicitation, and contract award & performance (Matechak, 2002). E-GP Planning should be based on a clear assessment of the existing procurement environment because such an assessment helps management define the direction, scope, focus, and phasing required for their plans.

E-GP Policies: A policy on e-procurement could provide valuable guidance to all levels of authority and departments. A clear policy document communicates to readers a commitment to e-procurement. It will, however, reveal why the administration has chosen to modernise its procurement procedures and engage in e-procurement. As a result, the e-procurement policy is applicable in the following scenarios: Guidance, instruction, motivation, and assistance in the change management process can be provided in a variety of ways. Developing an e-procurement strategy requires the organisation to explicitly define its goals for the e-procurement system. Second, the authority can use the policy to communicate the vision of e-procurement within it, thereby starting to prepare employees for the changes that they will face (Hampshire County Council, 2004). An e-procurement policy can outline how an authority's e-procurement strategy will be carried out, as well as the authority's corporate expectations for the initiative's outcomes. For an e-GP policy, it is essential to update the policy on a regular basis. Management and development of a specific policy and strategic framework can provide stakeholders with clear norms and guidelines that can aid in the transformation of socio-technical and socio-political settings (DOFA, 2006).

E-GP Change Management: Another critical organisational issue is change management, which is essential for anticipating and addressing potential psychological, cultural, and technological barriers. If the change process is not thoroughly planned and managed, there can be a significant waste of time and money, as well as a loss of employee morale. As a result, a well-planned change management strategy can provide enormous benefits (Archer, 2005).

Change management in the implementation of an e-GP project may be a large task that takes longer than expected (OGC, 2002). According to the World Bank (2006), the full benefits of e-GP will be realised only through significant changes in the organisation of public procurement activities, requiring extensive change management. It went on to say that without such change management, the end result could be a net loss with technologies coexisting with or simply reproducing traditional operational practises. Change management affects the responsibilities and capacities of various players, shifting the existing power bases (UNDP 2006).

HRM Training: Another critical organisational aspect in achieving successful e-GP deployment is human resource management (HRM). It is critical to pay adequate attention to HRM issues, particularly the selection of appropriate training and education programmes, because any lack of skill required to effectively use e-government systems could be a serious problem, particularly in developing countries, as numerous academics have indicated (e.g. Heeks, 2000). Training is a critical component of implementation, and it may aid other factors such as change management in the process of implementing an e-GP project. According to the World Bank (2006), reaping the full benefits of e-GP will necessitate significant changes in how public procurement processes are organised. "Procurement workers should be educated and trained, have faith in the processes used, and see procurement as a rewarding career that can benefit both them and society." They should also be able to get qualified advice on e-procurement issues.

Service Quality: The goal of electronic government is to improve public-sector information and service delivery. When ICT is used to provide public services, it improves service quality and customer satisfaction (Sharma et al., 2015; Osei Kojo, 2017). Osei Kojo (2017) discovered that e-government has greatly reduced the time and procedures involved in clearing products from the port and aviation, among other sectors, in his examination of interview responses obtained from selected public sector organisations in Ghana. Ahmad et al. (2013) investigate the factors that influence Pakistani citizens' use of e-services. In the public sector, e-procurement increases transparency and openness in public procurement (Basu, 2004; Neupane et al., 2014; Rotchanakitumnuai, 2013). Stakeholders have access to adequate public procurement information, such as tender advertisements, evaluation and selection results, which are all relevant to service quality. Scholars from both developed and developing economies argue that e-governance increases citizen participation in decision-making, makes governments more open, accountable, and effective, and improves service delivery quality" (Boateng, 2013; OseiKojo, 2017)

Innovation: Public procurement (PP) is one of the most direct strategies for fostering innovation (Bleda 2019, Brammer & Walker, 2011; Edler & Georghiou, 2007). PP refers to the purchase of goods and services by the government or a public sector organisation (Rolfstam, 2013; Uyarra & Flanagan, 2010). By demanding and purchasing them, public organisations can encourage private firms to mobilise the creativity and resources required to produce creative solutions to unmet demands and social concerns (Tsipouri et. al., 2015). PP can help innovation markets function properly by addressing information-related market failures, i.e. flaws and asymmetries in the information available to individuals planning to conduct or purchase innovations (Edler & Georghiou, 2007; Georghiou, Edler, Uyarra & Yeow, 2014).

E-Government Procurement Efficiency: Public procurement is a critical method for assisting in the efficient administration of public resources. It aids government projects and services. It can cover all purchases, such as stationery, furniture, and temporary office personnel, as well as more difficult and costly areas, such as building projects, aircraft carriers, and other private finance initiative projects.

3. Conceptual Framework

The conceptual model demonstrates the direction of the research investigation by demonstrating the direct and indirect relationship between the research variables. The research model depicted in Figure 1 embodies the critical organisational factors influencing e-GP implementation. The model also includes six projected hypotheses, with arrows indicating the hypothesised relationships.

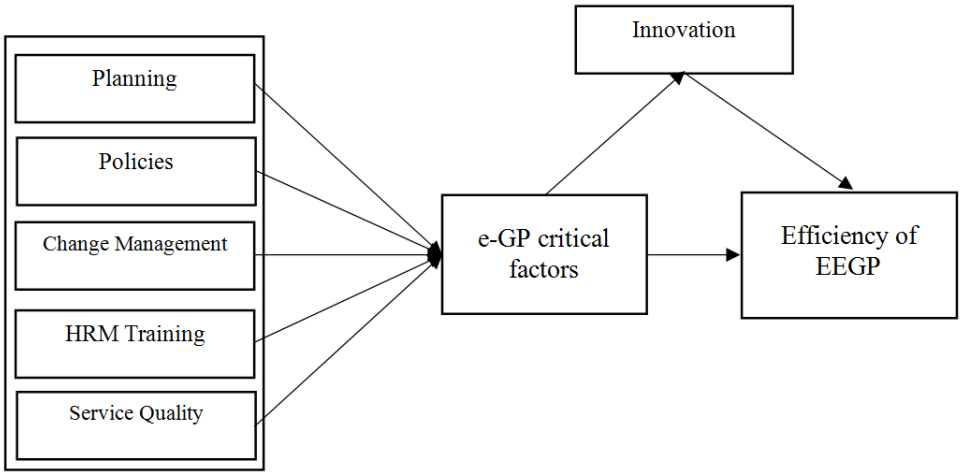

Figure 1: Conceptual Framework

Figure 1 depicts five independent variables that have a significant impact on e-government procurement: planning, policies, change management, HRM training, and service quality. The dependent variable is the Emirati Electronic Government Procurement Platform's (EEGPP) efficiency, and the moderator is the factor innovation. Based on concptural following hypothesis are identified for investigation.

H_1: Planning has significant effect to efficiency of EEGPP implementation.
H_2: Policies has significant effect to efficiency of EEGPP implementation.
H_3: Change management has significant effect to efficiency of EEGPP implementation.
H_4: Human Resource Management (HRM) training has significant effect to efficiency of EEGPP implementation.
H_5: Service quality has significant effect to efficiency of EEGPP implementation.
H_6: Innovation mediates the relationship between e-GP planning and the efficiency of the EEGPP.
H_7: Innovation mediates the relationship between e-GP policies and the efficiency of the EEGPP.
H_8: Innovation mediates the relationship between e-GP change management and the efficiency of the EEGPP.
H_9: Innovation mediates the relationship between e-GP training and the efficiency of the EEGPP.
H_{10}: Innovation mediates the relationship between e-GP services quality and the efficiency of EEGPP.

Planning should be based on a clear assessment of the current procurement environment, as this assessment is useful to management in defining the direction, scope, focus, and phasing required for their plans. An e-GP strategy is included in a Strategic Implementation Plan (SIP), which is linked to other current e-Government and e-Commerce plans. The plans should be created collaboratively, with the participation and support of major stakeholders in government procurement. In order to answer the above hypotheses, a set of the questions was set to collect the data for analysing and answering the hypotheses. The set of questions is as in table 1.

Table 1: Questionnaire items with their sources

No.	Statements	Sources
E-Government Procurement Planning		
1	We make a clear assessment of the existing procurement environment.	Based on World Bank (2006), Adebiyi et al. (2010), Shakya (2012), and Chomchaiya and Esichaikul (2016)
2	We define the direction, scope, and focus during the planning.	
3	We determine the phases required for the plans of creating the e-government procurement.	
4	Our e-government procurement plan is linked to other e-Government and e-Commerce plans.	
5	Our e-government procurement plan is developed collaboratively with the involvement and support of major stakeholders in government procurement.	
E-Government Procurement Policies		
6	Our e-government procurement policy provides instruction to all levels of authority and across all departments.	Based on Hampshire County Council and Makgill (2004), DOFA (2006), Shakya (2012)
7	Our e-government procurement policy gives readers a statement of commitment to e-procurement.	
8	Our e-government procurement policy illustrates the aim of modernizing the procurement functions and investing in e-procurement.	
9	Our e-government procurement policy clearly reflects the aspirations for the e-procurement system clearly.	

10	Our e-government procurement policy shows the communication mechanism in respect of the vision of e-procurement.	
11	Our e-government procurement policy gives the details of e-procurement strategy implementation.	
12	Our e-government procurement policy clarifies the expected outcomes of the e-GP.	
13	Our e-government procurement policy explains the requirements to achieve the objectives behind the e-GP.	
E-Government Procurement Change Management		
14	We carefully designed a change management process for the implementation of e-government procurement.	Based on Archer (2005), World Bank (2006), Al-Moalla and Li (2010), Fridah Kathure (2018)
15	We are aware of managing the psychological obstacles of implementing e-government procurement.	
16	We paid attention to managing the expected cultural issues that might arise when implementing e-government procurement.	
17	We made plans to manage the technological obstacles that can arise with the implementation of e-government procurement.	
18	We take into consideration change management training for the employees when implementing e-government procurement.	
19	We plan to manage any arising implementation risk of e-government procurement.	
20	Our change management plan included managing people's expectations and concerns.	
E-Government Procurement HRM Training		
21	We make training courses for employees in the use of e-government procurement.	Based on Al-Moalla and Li (2010), and Shakya (2012)
22	We prepare our staff to use e-government procurement.	
23	We are careful in the selection of the training and education programs to enhance the implementation of e-government procurement.	
24	We enhance the skills of our staff for the effective implementation of e-government procurement.	
25	Our organization makes sure that the staff are educated and trained in e-government procurement.	
26	Our staff can get the required training to enhance their capabilities in e-government procurement.	
E-Government Procurement Service quality		
27	We focused on improving transparency in e-government procurement.	Based on Basu (2004), Neupane et al. (2014), and Rotchanakitumnuai (2013)
28	We aimed to enhance openness in e-government procurement.	
29	We concentrated on increasing the service speed in e-government procurement.	
30	We paid attention to reducing the costs in e-government procurement.	
31	We give adequate information for the services in the e-government procurement.	
32	We improved the evaluation and selection results in the e-government procurement.	
E-Government Procurement Innovation		
33	We focus on innovative solutions to address unmet needs and social challenges related to e-government procurement.	Based on Edler et al. (2005, Tsipouri et. al. (2015), Mele, Pels and Storbacka (2015), Bleda (2019)
34	We focus on innovation to influence the users by using new technological aspects in our e-government procurement.	
35	We aim to provide services in innovative ways through e-government procurement.	
36	We pay attention to innovative solutions to the barriers that might arise from the use of e-government procurement.	
37	We improve our e-government procurement according to the social, market, and technological changes.	
Efficiency of EEGPP		
38	The use of the Emirati Electronic Government Procurement Platform (EEGPP) has improved the quality of our services.	Based on Al-Moalla and Li (2010), Rotchanakitumnuai

39	The Emirati Electronic Government Procurement Platform (EEGPP) has made our services to citizens faster.	(2013), Fridah Kathure (2018)
40	The Emirati Electronic Government Procurement Platform (EEGPP) helped us to easily process information.	
41	The Emirati Electronic Government Procurement Platform (EEGPP) has made collaboration with other ministries more effective.	
42	The Emirati Electronic Government Procurement Platform (EEGPP) has made information and document management more effective.	
43	The Emirati Electronic Government Procurement Platform (EEGPP) has made all the services and transactions more trustworthy.	

4. Research Methodology

According to Blumberg, Cooper, and Schindler (2008), there is no clear preference for either qualitative or quantitative methodologies in business and management research, and no evidence that one is more effective than the other. Researchers in need of numerical data, use the quantitative approach to seek facts (Saunders et al., 2009). This strategy can be implemented using a questionnaire survey, a laboratory experiment, or observation. When non-numerical data is required, researchers use a qualitative approach. The researcher is concerned with the breadth of an examination framework in which the identification of people's feelings and experiences takes precedence over, say, the frequency (number) of occurrences of a feeling or experience. In comparison to quantitative research, qualitative research is unstructured. As a result, the researcher is more likely to overlook or misinterpret important aspects of the current event. Quantitative research, on the other hand, is limited by the data it collects, which limits the breadth of its findings. The possibility of missing or misinterpreting something is effectively eliminated (Blumberg, Cooper & Schindler, 2008). In this study, self-administered quantitative research mode is used which implied structured questionnaire survey for collecting the data.Self-administered questionnaires are more advanced than the written word consistency abilities of interviewers. Furthermore, survey questionnaires can help the researcher collect data from a large number of participants, which helps generalise the research findings (Creswell & Creswell, 2017). To evaluate participant responses in questionnaire surveys, Likert point scales are used. Because the anticipated data analysis method is Structural Equation Modeling (SEM), as suggested by Awang et al. (2016), a Likert scale will be used because the majority of the anticipated questions are about people's attitudes and perceptions (unobserved data), which are prone to inaccuracy. For the quantitative portion of the research, a five (5) point Likert scale was used as Strongly Disagree, Disagree, Neutral, Agree, and Strongly Agree, with numbers ranging from 1 to 5. Structured equation modelling (SEM) is a second-generation statistical analytic technique for investigating the interrelationships among various variables in a model (Awang et al. 2015 and Hair et al. 2011). SEM, also known as route analysis, covariance structure analysis, and latent variable analysis, is a statistical tool for data analysis of a structural theory that uses a confirmatory rather than exploratory approach (Kline, 2011). SEM, in other words, is a confirmatory method for thoroughly evaluating and modifying theoretical models (Schreiber et al., 2006). SEM is useful for estimating variance and covariance, testing hypotheses, classical linear regression, and confirmatory factor analysis, in addition to analysing latent constructs. Hence, Partial Least Square approach of SEM i.e. PLS-SEM approach with the help of SmartPLS software was used for the data analysis. The PLS-SEM technique is widely used in model development by researchers in various fields, such as Alshurideh et al. (2019), who used the PLS-SEM approach to investigate the factors influencing social network acceptance. Rahman et al. (2022) investigated the structural relationships between the causes and effects of changes in UAE projects. PLS-SEM was used by Almansoori et al. (2021) to model factors affecting PMO in the UAE. Khahro et al. (2021) created a structural model to evaluate green procurement in Pakistan. Memon and Rahman (2014), Rahme et al. (2013), Memon and Rahman (2013), and Memon et al. (2013) used PLS-SEM to investigate the factors that contribute to cost overruns in large and small Malaysian projects, as well as the effect of resources on the project budget. Jasimuddin et al. (2017) developed a model of the factors influencing digital technology acceptance in e-government services in the UAE. Al-Skaf et al. (2021) used the PLS-SEM approach to investigate the acceptance of social media sites.

5. Results and Discussion

With the help of the questionnaire, 206 questionnaire forms were collected which were used for statistical analysis. The respondents participating in the survey had several level of academics background and experience level as summarized in Table 2.

Table 2: Characteristics of the respondents

Age	Frequency	Percentage %
20- 30	26	12.6
31-40	73	35.4

41-50	56	27.2
51-60	33	16
Over 50 years	18	8.7
Educational Level		
High school	1	0.5
Certificate/Diploma	1	0.5
Bachelor's	58	28.2
Master's	105	15
Ph.D.	41	19.9
Working experiences		
1-5 Years	61	29.6
6-10 years	56	27.2
11-15 years	40	19.4
More than 15 years	49	23.8

Table 2 reveals that 26 respondents are of ages between 20 and 30 years, asignifincant number of respondents i.e. 73 are 31 and 40 years old, respondent of age between 41 and 50 are 56 participants while 51 respondents are older than 50 years. Among these participants, majority of participants (i.e. 105) have completed masters degree, 58 and 41 participants have bachelor and PhD degree respectively while 1 respondent has attained high school and diploma certification each. Further, 61 respondents have experience from 1-5 years, 56 respondents have experience from 6-10 years, respondents with 11 to 15 years are 40 participants, and 49 participants have above 15 years experience

5.1 PLS-SEM Model Analysis: Convergent Validity and Reliability of Items

Measurement model is assessed for validating the relationships between the Reliability refers to the degree to which a scale delivers consistent and stable measures across time, and it is related to reflective aspects in the measurement model (Hair et al., 2014). The measure of how free the scale is from random error is reliability, which is defined as the degree to which measurement scale answers are consistent across constructs (Pallant, 2011; Creswell, 2014). Although Cronbach's alpha is the most generally used measure of reliability, when working with PLS-SEM, composite reliability is favoured over Cronbach's alpha (Hair et al., 2011; Wong, 2016). Examination of the factor loadings of indicators and computing the Average Variance Extracted (AVE) yields convergent validity (Hair et al., 2014). The measures illustrate the indicators' variance measurement models' capability (Wong, 2016). A measurement model must have composite reliability of at least 0.7 to be considered reliable (Wong, 2013). For newly constructed scales, however, composite reliability of 0.6 is also regarded as sufficient for establishing reliability (Chin, 1998, Hair et al., 2011, Bagozzi & Yi, 1988). The average of the intercorrelations between the items that measure the concept is calculated using the Cronbach's alpha. Cronbach's alpha values should be 0.7 or higher for any construct. Table 3 shows the results of the developed model's convergent validity while The AVE should be 0.50 or higher (Hair et al., 2016). Convergent validity results obtained from Smart PLS for the test model are presented in Table 3.

Table 3: Convergent validity and Item Reliability Parameters

Exogenous Constructs	Items	Loadings	C.R.	AVE	C. Alpha
Change Management-CM	CM1	0.695	0.91	0.592	0.884
	CM2	0.758			
	CM3	0.791			
	CM4	0.833			
	CM5	0.772			
	CM6	0.799			
	CM7	0.728			
Efficiency of EGP-EFF	EFF1	0.715	0.891	0.576	0.853
	EFF2	0.750			
	EFF3	0.816			
	EFF4	0.804			
	EFF5	0.710			
	EFF6	0.754			
Innovation- IN	IN1	0.851	0.908	0.664	0.873
	IN2	0.855			
	IN3	0.839			
	IN4	0.791			
	IN5	0.730			

Planning- PL	PL1	0.832	0.876	0.586	0.822
	PL2	0.762			
	PL3	0.754			
	PL4	0.819			
	PL5	0.648			
Policies- POL	POL1	0.602	0.927	0.615	0.909
	POL2	0.821			
	POL3	0.824			
	POL4	0.764			
	POL5	0.833			
	POL6	0.864			
	POL7	0.818			
	POL8	0.714			
Service Quality-SERV	SERV1	0.852	0.925	0.712	0.899
	SERV2	0.789			
	SERV3	0.862			
	SERV4	0.856			
	SERV5	0.857			
Training-TR	TR1	0.850	0.919	0.653	0.894
	TR2	0.864			
	TR3	0.782			
	TR4	0.809			
	TR5	0.799			
	TR6	0.740			

Table 3 shows that Change Management (CM), EGP Efficiency (EFF), Innovation (IN), Planning (PL), Policies (POL), Service Quality (SERV), and Training (TR) have AVE values of 0.592, 0.576, 0.664, 0.586, 0.615, 0.712, and 0.653, respectively, which are higher than the suggested values of 0.5. Furthermore, all Cronbach's Alpha values are greater than 0.7, which is the ideal value. As a result, all of the measurement models met the convergent validity requirements. The developed model is depicted graphically in Figure 2.

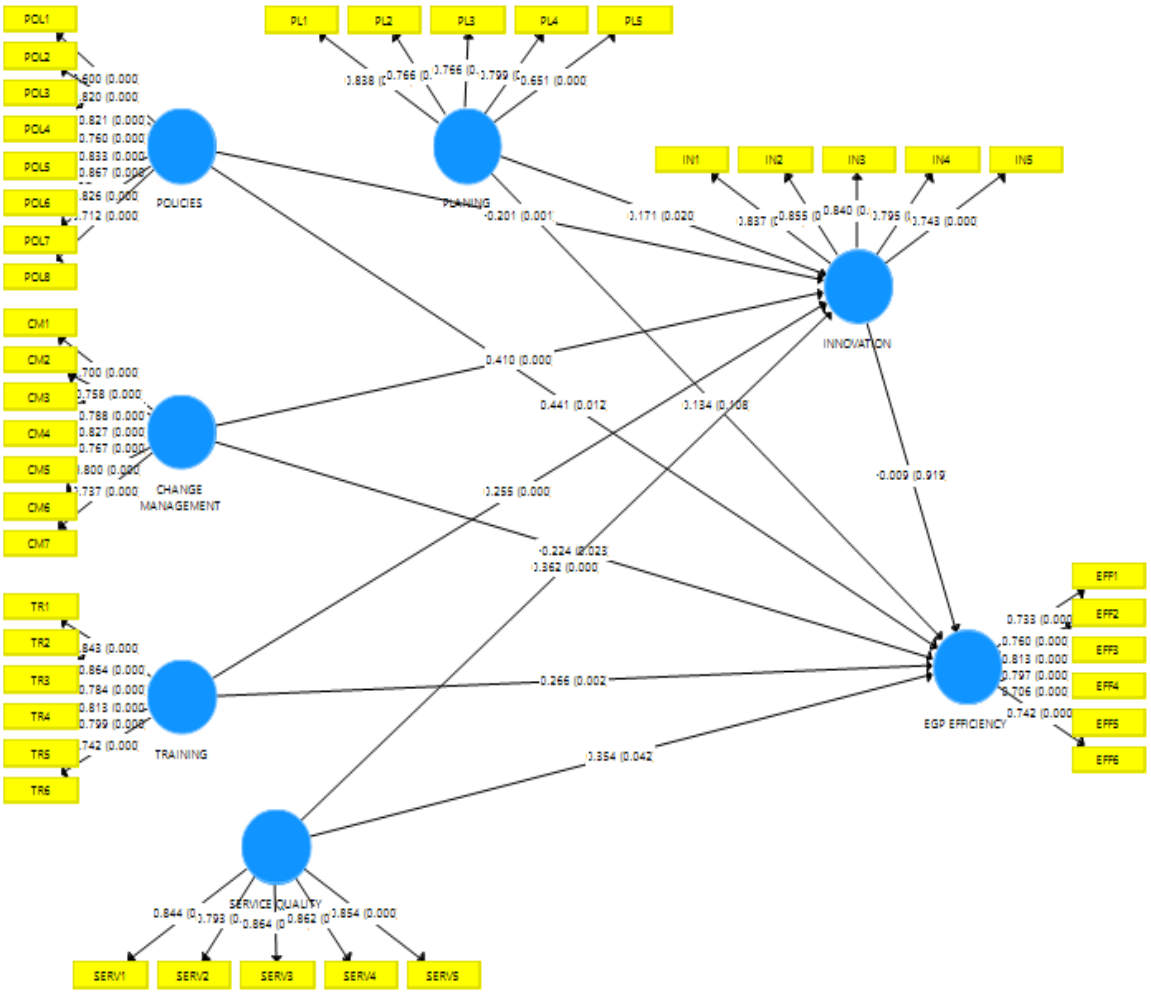

Figure 2: Results of Measurement Model

5.2 PLS-SEM Model Analysis: Discriminant Validity

Discriminant validity assesses the degree to which measurement models differ from other research constructs. It evaluates how one measurement model differs from the other models in the structural model. Discriminant validity has typically been assessed using the Fornell and Larker criterion, as well as the Cross-loading criterion. According to Fornell & Larcker's (1981) criterion for proving discriminant validity, the square root of each measurement model's AVE must be greater than the correlation of the model with any other model in the structural model. As a result, in the current study's Fornell and Larker's test, the square root of each outer model's AVE should be bigger than its correlation with any other construct (Hair et al., 2014). Table 4 shows the discriminant validity test developed by Fornell and Larker.

Table 4: Discriminant Validity - Fornell-Larcker Criteria

Constructs	CM	EFF	INN	PLAN	POLI	SERV	TR
CM	**0.769**						
EFF	0.641	**0.759**					
INN	0.842	0.69	**0.815**				
PLAN	0.692	0.666	0.788	**0.766**			
POLI	0.715	0.801	0.643	0.565	**0.784**		
SERV	0.739	0.817	0.785	0.703	0.837	**0.844**	
TR	0.766	0.679	0.81	0.741	0.59	0.649	**0.808**

Table 4 depicts that the diagonal values of AVE are greater than non-diagonal value which confirms the discriminant validity of the model. In addition to that, the cross-loading test was also performed. The cross-loading criterion is advocated by Chin (1998) which defineds that the items must load higher on their underlying constructs than their cross-loading on other constructs (Hair et al., 2014; Wong, 2016). Table 5 shows the results of the cross loading test for the developed model.

Table 5: Results of Cross Loading

Factors	CM	EFF	INN	PLAN	POLI	SERV	TR
CM1	**0.795**	0.560	0.630	0.505	0.551	0.565	0.628
CM2	**0.758**	0.409	0.586	0.424	0.516	0.532	0.493
CM3	**0.791**	0.487	0.648	0.497	0.565	0.569	0.575
CM4	**0.833**	0.492	0.657	0.511	0.613	0.618	0.579
CM5	**0.772**	0.440	0.646	0.543	0.523	0.521	0.587
CM6	**0.799**	0.489	0.685	0.568	0.558	0.591	0.613
CM7	**0.728**	0.564	0.671	0.665	0.513	0.574	0.635
EFF1	0.622	**0.731**	0.660	0.586	0.737	0.684	0.604
EFF2	0.437	**0.715**	0.436	0.493	0.602	0.590	0.388
EFF3	0.525	**0.750**	0.473	0.440	0.674	0.613	0.524
EFF4	0.438	**0.816**	0.593	0.542	0.618	0.678	0.559
EFF5	0.586	**0.804**	0.599	0.536	0.676	0.702	0.578
EFF6	0.416	**0.710**	0.465	0.457	0.494	0.525	0.482
IN1	0.503	0.754	**0.845**	0.557	0.581	0.594	0.531
IN2	0.667	0.665	**0.851**	0.675	0.610	0.755	0.603
IN3	0.668	0.554	**0.855**	0.712	0.503	0.613	0.738
IN4	0.654	0.587	**0.839**	0.705	0.441	0.586	0.827
IN5	0.717	0.528	**0.791**	0.583	0.532	0.609	0.615
PL1	0.768	0.442	0.730	**0.808**	0.536	0.623	0.501
PL2	0.610	0.558	0.674	**0.832**	0.430	0.527	0.634
PL3	0.503	0.405	0.562	**0.762**	0.384	0.488	0.500
PL4	0.486	0.426	0.568	**0.754**	0.344	0.473	0.487
PL5	0.562	0.509	0.657	**0.819**	0.437	0.536	0.677
POL1	0.469	0.624	0.532	0.648	**0.849**	0.652	0.492
POL2	0.488	0.452	0.417	0.379	**0.802**	0.530	0.382
POL3	0.595	0.625	0.551	0.409	**0.821**	0.683	0.450
POL4	0.623	0.630	0.526	0.396	**0.824**	0.661	0.431
POL5	0.513	0.554	0.454	0.400	**0.764**	0.650	0.326
POL6	0.577	0.655	0.509	0.446	**0.833**	0.666	0.495
POL7	0.606	0.726	0.541	0.517	**0.864**	0.726	0.564
POL8	0.609	0.734	0.609	0.553	**0.818**	0.717	0.577
SERV1	0.454	0.607	0.402	0.435	0.714	**0.801**	0.449
SERV2	0.579	0.670	0.630	0.581	0.691	**0.852**	0.602
SERV3	0.640	0.515	0.634	0.507	0.700	**0.789**	0.441
SERV4	0.686	0.681	0.656	0.546	0.730	**0.862**	0.552
SERV5	0.588	0.772	0.647	0.632	0.695	**0.856**	0.526
TR1	0.636	0.773	0.735	0.677	0.637	0.657	**0.593**
TR2	0.704	0.637	0.696	0.643	0.625	0.633	**0.850**
TR3	0.658	0.636	0.740	0.677	0.529	0.639	**0.864**
TR4	0.611	0.436	0.627	0.566	0.351	0.425	**0.782**
TR5	0.614	0.571	0.653	0.631	0.478	0.516	**0.809**
TR6	0.515	0.462	0.578	0.533	0.324	0.388	**0.799**

Table 5 depicts that the loading values of the items in their relative construct is higher than the other constructs which confirms the discriminant validity of the developed model.

5.3 PLS-SEM Model Analysis: Structural Model Assessment

The second stage of the PLS-SEM evaluation is assessment of the structural (inner) model (Hair et al., 2014). The purpose of the structural model evaluation is to determine the model's quality and rate its capacity to predict endogenous constructs. The endogenous construct's coefficients of determination (R2); the exogenous measurement model's effect sizes using Cohen's f2; the model's predictive relevance using cross-validated redundancy (Q2); and the model's global goodness of fit (GoF) are used to assess structural model (Hair et al., 2011; Hair et al., 2014; Wong, 2016).

Coefficient of determination (R2) assessment is a measure of the structural model's quality. It measures the degree of variation explained by the model. R2 depicts the whole contribution of the exogenous constructs in explaining or predicting the variance of the endogenous construct in the structural model. The higher the model's quality, the more variance is explained/predicted, and vice versa (Hair et al., 2011; Hair et al., 2014; Wong, 2016). R2 value of 0.25 is considered low; 0.50 is moderate and 0.75 value of R2 is considered noteworthy (Hair et al., 2014; Wong, 2016).

According to Hair et al. (2014), an R2 value of 0.2 is considered high in the field of consumer behaviour. These rules of thumb were used to determine the study's R2 levels. For the developed modem, the R2 value is obtained as 0.761 Which implies that the value of R2 is higher than average, implying that the models are highly accurate in their predictions (Hair et al., 2014).

R2 shows the total contribution of all exogenous constructs to variance prediction, and route coefficients show the individual impact of each path in the structural model, they do not provide the relative contribution of each exogenous construct to R2. The individual contribution of each exogenous component to the R2 is calculated using effect size (f2) (Hair et al., 2011). Effect size is computed by estimating changes in the R-squared, represents the relative effect of specific exogenous constructions on the endogenous construct(s). The effect size of each construct in the structural model is calculated using Cohen's f2. The formula works by eliminating a specific construct from the model and observing the results (Hair et al., 2014).

$$\text{Effect Size: } f^2 = \frac{R^2 incl - R^2 excl}{1 - R^2 incl}$$

Where:

f^2 = effect sizes

R^2 incl = R^2 inclusive (R^2 with a particular construct included in the model)

R^2 excl = R^2 excluded (R^2 with a particular construct excluded from the model)

1= Constant

A small effect size is defined as $f^2 = 0.02$, a medium effect size is defined as $f^2 = 0.15$, and a high effect size is defined as $f^2 = 0.35$ (Cohen 1988). The effect sizes of various research constructs were examined using the criteria listed above. Smart-PLS result for F^2 of the model shows that effective size value is 0.489 which means that effect size is large for the efficiency of E-government procurement. After assessing the effect size, predictive relevance of the model is assessed. The structural model's predictive importance is assessed using cross-validated redundancy. The data points of all indicators in the outer model of endogenous constructs were tested using stone-predictive Geisser's relevance (Q^2) to see if they could be effectively predicted (Wong, 2016). The sample re-use methodology is used in this method, in which a piece of the data matrix is omitted, model parameters are calculated, and the omitted portion is forecasted using the estimated model parameters (Hair et al., 2011; Hair et al., 2014). This quality evaluation criterion requires the cross-validated redundancy (Q^2) value to be a positive integer greater than 0 in order to have effective predictive relevance (Chin, 1998).

The study's final models are evaluated using the blindfolding approach and Smart-PLS software to calculate cross-validated redundancy (Q^2) based on the aforementioned submission (Ringle, Wende & Becker, 2015). Table 6 shows the results of the blindfolding approach.

Table 6: Predictive relevance

	SSO	SSE	Q^2 (=1-SSE/SSO)
Efficiency of E-Government Procurement	1230	704.918	0.427
Innovation	1025	461.616	0.55

Table 6 shows the structural model's cross-validated redundancy. The endogenous constructions' Q^2 values are greater than 0. This indicated that the study model was really useful in terms of forecasting (Chin, 1998). In contrast to covariance-based structural equation modelling, PLS-SEM does not have a commonly acknowledged global goodness of fit statistic (Vinzi et al., 2010). On the otherhand, Tenenhaus et al. (2004) proposed the "GoF" index, a global goodness of fit criterion, as a solution to this problem. The index is made up of the geometric mean of the average communality (AVE) index and the average coefficient of determination (R^2). The following formula can be used to compute it:

$$GoF = \sqrt{\overline{AVE} \times \overline{R^2}}$$

The GoF index aims to explain the PLS model's performance at both the measurement and structural levels, with a particular focus on the model's overall prediction performance. The structural model is represented by the R^2 in the formula, whilst the quality of the index's measurement models is addressed by the AVE^2. The GoF index of 0.1, 0.25, or 0.36 denotes tiny, medium, or big, respectively (Akter et al., 2011). The GoF index for the model is displayed below.

$$GoF = \sqrt{0.628 \; x \; 0.761}$$

$$GoF = \sqrt{0.477}$$

$$GoF = 0.690$$

Above is a formula for calculating the goodness of fit index. The GoF of the model was 0.690. According to Akter et al. (2011), the GoF of the research models is regarded high, indicating that the research model is of high quality

5.4 PLS-SEM Model Analysis: Hypothesis Testing

The bootstrapping procedure was used to test hypithesis by assessing the path coefficients and their significance. Bootstrapping procedure was run for 5000 samples with the help of SMartPLS software and the evaluation model is presented in Figure 3.

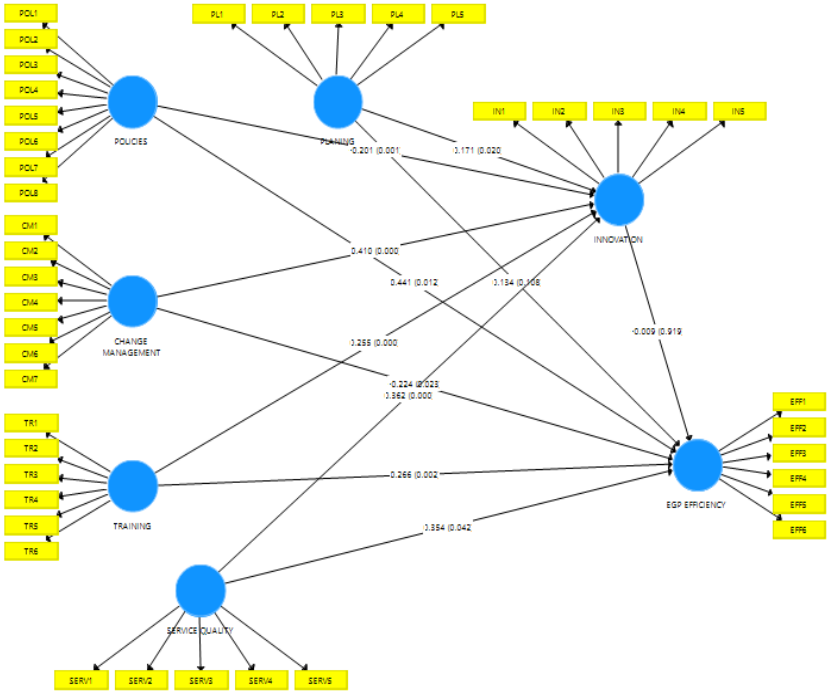

Figure 3: Evaluation of structural model through PLS bootstrapping

Based on Figure 3, the bootstrapping results were assessed for direct and indirect relationship of the factors with efficiency of Emirati Electronic Government Procurement Platform (EEGPP). Table 7 shows the bootstapping results for the direct effect of the independent variables, which are Change Management (CM), Planning (PL), Policies (POL), Service Quality (SERV), and Training (TR) on the dependent variable EGP Efficiency (EFF).

Table 7: Results of hypotheses testing (direct effect)

Hypotheses	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	*P Values*	*Findings*
PLAN -> EFF	0.332	0.226	0.184	2.579	0.015	Supported
POLI -> EFF	0.443	0.378	0.176	2.519	0.012	Supported
CM -> EFF	0.228	0.200	0.094	2.417	0.016	Supported
TR -> EFF	0.263	0.253	0.075	3.500	0.001	Supported
SERV -> EFF	0.350	0.403	0.172	2.036	0.042	Supported

From table 7, it can be seen that the direct effect of E-GP critical factors on the efficiency of the E-Government Procurement i.e. EEGPP is tested through five hypotheses. The findings of these hypotheses are given below.

H_1: Planning is positively associated with the efficiency of Emirati Electronic Government Procurement Platform (EEGPP). The p-value of the factor E-GP planning is 0.015, which significant at the level of 0.5. This result shows that this factor has a positive effect on the efficiency of Emirati Electronic Government Procurement Platform (EEGPP).

H_2: Policies is positively associated with the efficiency of the Emirati Electronic Government Procurement Platform (EEGPP). The p-value of the factor E-GP policies is 0.012, which is significant at the level of 0.5. This result shows that this factor has a positive effect on the efficiency of the Emirati Electronic Government Procurement Platform (EEGPP).

H_3: Change management is positively associated with the efficiency of the Emirati Electronic Government Procurement Platform (EEGPP). The p-value of the factor E-GP change management is 0.016, which is significant at the level of 0.5. This result shows that this factor has a positive effect on the efficiency of the Emirati Electronic Government Procurement Platform (EEGPP).

H_4: Human Resource Management (HRM) training is positively associated with the efficiency of Emirati Electronic Government Procurement Platform (EEGPP). The p-value of the factor HRM training is 0.001, which is significant at the level of 0.01. This result shows that this factor has a positive effect on the efficiency of the Emirati Electronic Government Procurement Platform (EEGPP).

H_5: Service quality is positively associated with the efficiency of the Emirati Electronic Government Procurement Platform (EEGPP). The p-value of the factor service quality is 0.042, which is significant at the level of 0.5. This result shows that this factor has a positive effect on the efficiency of the Emirati Electronic Government Procurement Platform (EEGPP).

Based on the results of the hypotheses, all the critical factors of E-GP have a positive effect on the efficiency of the Emirati Electronic Government Procurement Platform (EEGPP). Hence, these factors can be utilised to support the effective use and implementation of the national platform of the UAE, known as the Emirati Electronic Government Procurement Platform (EEGPP). Besides these, the P-Values of the indirect effect of Innovations (INN) on the relationship between the independent variables - Change Management (CM), Planning (PL), Policies (POL), Service Quality (SERV), and Training (TR) and the the efficiency of Emirati Electronic Government Procurement Platform (EEGPP).

The indirect effect of Innovation between the independent variables (Change Management (CM), Planning (PL), Policies (POL), Service Quality (SERV), and Training (TR) and the dependent variable (the efficiency of the Emirati Electronic Government Procurement Platform (EEGPP) is tested through five hypotheses. The findings of these hypotheses testing are in the table 8.

Table 8: Results of hypothese testing (indirect effect)

Hypotheses	T Statistics (|O/STDEV|)	*P Values*	*Findings*
PLAN -> INN -> EFF	0.102	0.019	Supported
POLI -> INN -> EFF	0.095	0.024	Supported
CM -> INN -> EFF	0.099	0.021	Supported
TR -> INN -> EFF	0.092	0.027	Supported
SERV -> INN -> EFF	0.102	0.019	Supported

H_6: Innovation positively mediates the relationship between E-GP Planning and the efficiency of Emirati Electronic Government Procurement Platform (EEGPP). The p-value of this hypothesis is 0.019, which is significant at the level of 0.5. This result shows that innovation has a positive mediating effect on the relationship between E-GP Planning and the efficiency of Emirati Electronic Government Procurement Platform (EEGPP).

H_7: Innovation positively mediates the relationship between E-GP Policies and the efficiency of Emirati Electronic Government Procurement Platform (EEGPP). The p-value of this hypothesis is 0.021, which is significant at the level of 0.5. This result shows that innovation has a positive mediating effect on the relationship between E-GP Policies and the efficiency of the Emirati Electronic Government Procurement Platform (EEGPP).

H_8: Innovation positively mediates the relationship between E-GP change management and the efficiency of Emirati Electronic Government Procurement Platform (EEGPP). The p-value of this hypothesis is 0.021, which is significant at the level of 0.5. This result shows that innovation has a positive mediating effect on the relationship between E-GP change management and the efficiency of the Emirati Electronic Government Procurement Platform (EEGPP).

H_9: Innovation positively mediates the relationship between E-GP Human Resource Management (HRM) training and the efficiency of Emirati Electronic Government Procurement Platform (EEGPP). The p-value of this hypothesis is 0.027, which is significant at the level of 0.5. This result shows that innovation has a positive mediating effect on the relationship between E-GP Human Resource Management (HRM) training and the efficiency of Emirati Electronic Government Procurement Platform (EEGPP).

H_{10}: Innovation positively mediates the relationship between E-GP Service quality and the efficiency of Emirati Electronic Government Procurement Platform (EEGPP). The p-value of this hypothesis is 0.019, which is significant at the level of 0.5. This result shows that innovation has a positive mediating effect on the relationship between E-GP Service quality and the efficiency of the Emirati Electronic Government Procurement Platform (EEGPP).

Based on the findings of the indirect effect of innovation as a mediator between E-GP factors and the efficiency of the Emirati Electronic Government Procurement Platform (EEGPP), it is clear that the factor innovation has a high explanatory level that supports the role of the E-GP critical factors in enhancing the efficiency of the Emirati Electronic Government Procurement Platform (EEGPP).

6. Conclusion

This paper reported about various factors which affect efficiency of the E-government procurement system in UAE. The study was carried out by developing structural relationships between the factors affecting E-procurement. Data collection was carried out through questionnaire survey where 206 data samples were collected and analyzed with SmartPLS software. Assessment of the developed model for studying critical factors of E-GP in relation with efficiency of the Emirati Electronic Government Procurement Platform (EEGPP) revealed that the critical factors of E-

Government Procurement (i.e. E-GP Planning, E-GP Policies, E-GP Change Management, E-GP HRM Training, and E-GP Service Quality) have a direct positive effect on the efficiency of the Emirati Electronic Government Procurement Platform (EEGPP). Also, the indirect mediating effect of Innovation showed that it has a positive mediation effect on the relationship between the E-GP critical factors and the Emirati Electronic Government Procurement Platform (EEGPP). This research will help the academic and practitioners to understand the nature of aspects distressing the efficiency of E-GP in general and, in particular, the UAE context.

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