

Factors Influencing Electronic Government Procurement (e-GP) in Bangladesh

Dissertation submitted in partial fulfillment of the requirements for the Degree of
Masters in Procurement and Supply Management

Submitted by
Md Nurul Huda
MPSM, Fall 2014
ID No. 14282017

Masters in Procurement and Supply Management

January 2015



**BRAC Institute of Governance and Development
BRAC University, Dhaka, Bangladesh**

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Masters in Procurement and Supply Management program

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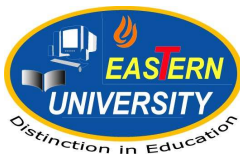
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Dhaka, 24 January 2015

To

Dr. Nazrul Islam

Professor & Dean,
Faculty of Business Administration
Eastern University
House 26, Road 5
Dhanmondi R/A, Dhaka-1205

Subject: Submission of Dissertation Paper for Masters in Procurement and Supply
Management (MPSM) Degree under BRAC University.

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BWDB	Bangladesh Water Development Board
CGFR	Compilation of General Financial Rules
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Dhaka, 24 January 2015

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Abstract

This research work looks for some empirical findings from the survey conducted regarding the factors of influence on e-Procurement system (the e-GP) in Bangladesh from users perspective. Following reform of public sector procurement which was started in Bangladesh in 2003, a transformational change was implemented in 2012 through a step forward from traditional paper-based system to electronic; the users are progressively being capable of benefiting from this. However some concerns were seen in public through experiences and media that the e-GP system has been confronting with some counter-productive factors although there are many supportive elements to take it forward. It was attempted here to understand those factors active in the move and counter-move of e-GP system as relevant to its users.

A questionnaire based online survey was conducted using the 'survey monkey' e-platform aiming the responses from e-GP users or those having substantial experience of procurement in public sector of Bangladesh.

Result reveals that a majority of factors such as Mobile phone based e-GP, Suppliers, Systems support and Top Management role, Efficient systems development, Good governance and Transparency with support from the management and technological provisions do favour the system substantially; while the other factors Red tape regulation and System security, Vested interests, Digital divide, Attitude of individuals, Organisational culture, Ethical values and Energy infrastructure do counter it which could harm the e-GP system seriously if not addressed properly.

Key words: Correlations, e-Procurement, e-Tender, Governance, Transparency.

Chapter One: Introduction

1.1 Background

In Bangladesh, procurement expenditure in Government of Bangladesh (GoB) accounts for about 21% of the national budget which is about 70%-90% of ADP allocation each year (CPTU 2014d). Procurement reform in Bangladesh was initiated in 1999 aiming to introduce governance in utilization of state budget for procurement of all necessary inputs for its operational purpose and thereby to enhance the capacity of public procurement system to achieve openness acceptability, and transparency. The reform is also intended to improve integrity and accountability through a more efficient and effective procurement process in public sector, especially in governmental purchases. There is strong evidence of progressive improvement of procurement regime in Bangladesh.

The legal regime of public procurement in Bangladesh was based on procedures and practices that date back to the British era. For example, the Compilation of General Financial Rules (CGFR), originally issued under the British rule, which broadly outlined the principles governing government contracts, remained the primary legal framework for public contracts and procurements (World Bank 2002). The two contract documents such as Form No. 2908 for supply of goods, and Form No. 2911 for works were instrumental within this legal framework in GoB procurement functions. Building on CGFR principles, government departments and autonomous public bodies and corporations developed

their own rules and codes of practices for public contracts and largesse to follow (Hoque n.d.).

The World Bank initiated a study on status of formal procurement process in 1999 which recommended a reform of procurement process in Bangladesh (World Bank 2002) following this the Public Procurement Regulations (PPR 2003) was introduced. The PPR 2003 was the breakthrough in Bangladesh Public Procurement system which was supported by the *Procedures* for Implementation of The Public Procurement Regulations 2003. In 2006, Public Procurement Act (PPA 2006) came into force and later the Public Procurement Rules (PPR 2008) was formed.

While application of electronic technology and Information and Communication Technology (ICT) in all-round functions of governance in Bangladesh was considered as a vital instrument to establish 'Digital Bangladesh' to enable stronger contacts between the government and its citizens, it was believed that e-Governance could accomplish the mandate of government in formulating a new vision of how government views its citizens, employees and businesses, and building a citizen-centered, service-oriented, public-participative government with efficient, accountable, transparent and performance government system (Al-Hossienie and Barua 2013). As ICT together with the diffusion of the technological advances results in the digital revolution and the emergence of the Information age and created an enormous impact on social, political, and cultural livelihood of the masses - taking the whole world into a different era (Alam, Ahmed and Islam 2008).

The breakthrough in Bangladesh public procurement system came with circulation of 'The e-GP guidelines 2011' which was instrumental to transform the paper-based tendering system to electronic form. Accordingly, the Electronic Government Procurement (e-GP) was introduced in Bangladesh on 2 June, 2011 in pursuant to Section 65 of the PPA 2006. The *strategy for e-Government* states that a sound e-government policy should include a focus on end-users and demand-driven services. Government services will be made available through e-government and the government should prioritize the services that they will initially offer online (GED, Bangladesh Planning Commission 2012).

The e-GP guideline targeted initially four governmental organisations including Bangladesh Water Development Board (BWDB), Local Government Engineering Department (LGED), Roads and Highways Department (RHD) and Rural Electrification Board (REB) for implementing it with the aim to spread over other organisations (CPTU 2011). LGED pioneered the e-GP system implementation and entered into e-Procurement system in January 2012 (LGED 2014). Currently e-GP is under practice by above mentioned public agencies and the use of e-GP is expanding; CPTU is monitoring the progress and achievements made so far. Now the e-GP draws attention of the knowledge community and practitioners to know whether it progresses smoothly. As a part of this interest, this research has been undertaken as a part of academic purpose.

1.2 Concept of Procurement

Procurement encompasses every aspect of the service delivery processes starting from determination of the need for goods, works or services to ensure procurement and delivery on time. Lysons & Farrington defines procurement as the process undertaken by

the organisational unit that, either as a function or as part of an integrated supply chain, is responsible for procuring or assisting users to procure, in the most efficient manner, required supplies at the right time, quality, quantity and price, and the management of suppliers (CIPS D1 Context Module 2012).

The procurement activity starts with the development of needs and requirements which proceeds through sourcing, contracting, receiving the goods or services and consumption by the end users. A typical procurement cycle is shown in Figure-1 below.

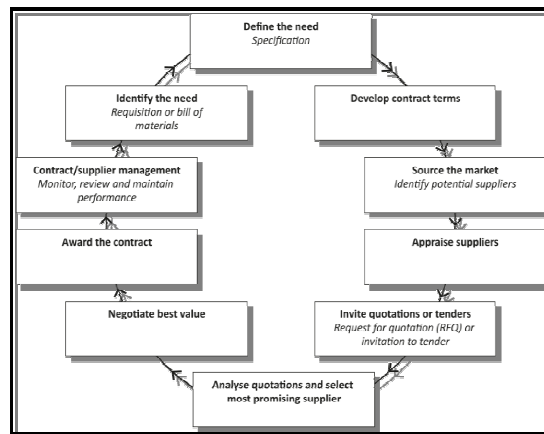


Figure-1: A typical procurement cycle
(Source: CIPS Context module 2014)

1.3 Sectors of Procurement

Procurement happens in public, private or non-profit sectors which is required for their operational purpose. The public sector buyers generally have the overall objective of achieving defined service levels. They are responsible ultimately to the general public for national and community development and to pursue socio-economic goals. They have to satisfy a wider range of stakeholders – the politicians, local vendors, businessmen and suppliers, civil society, media men, etc. They have a wider range of activities to ensure public service and efficient use of resources. These are subject to established

procurement procedures, and legislative directives. They are often subject to budgetary constraints, cash limits and efficiency targets.

Private sector purchasing is different from that of public sector in terms of Objectives (primarily to ensure profit margin), Responsibility (buyers are responsible to owners, directors), Stakeholders, Activity/process (organisational capabilities and resources used to produce goods/services), Legal restrictions (company law, employment law, product liability law etc.), Competition between firms, and Value for money that maintains lowest cost for competitive strategy, customer value and profit maximisation. Private sector purchasing also have Diversity of items (specialised stock lists), Publicity (confidentiality applies in dealings between suppliers and buyers), Budgetary limits, Information exchange (do not exchange information with other firms), Procurement policies/procedures (organisation-specific), Supplier relationships (emphasis on long-term partnership development, to support value chain).

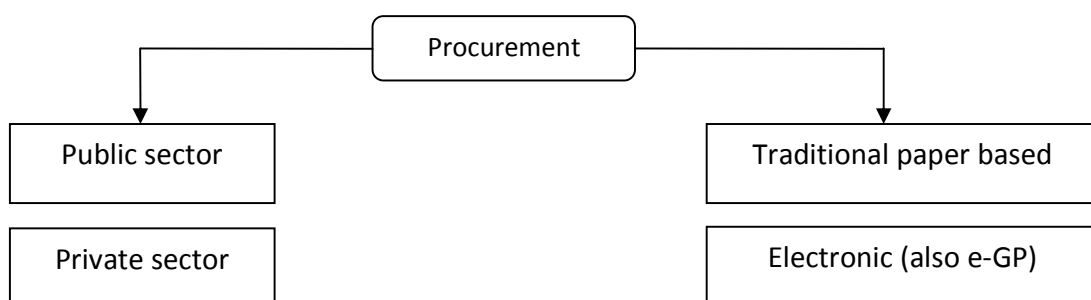


Figure-2: Procurement Contexts and Types

Public Procurement System in Bangladesh is largely decentralized. Ministry of Finance issues instructions on delegation of financial powers from time to time which are exercised by public entities in procuring goods or services. To facilitate an efficient and professionalism in public procurement in Bangladesh the Central Procurement Technical

Unit has been working with different government agencies since 2002, in providing for information and technical know-how as and when required (Hoque n.d.). However, public sector purchasing tends to face a lot of challenges. It is critical for both internal stakeholders and communicating the vendors to ensure they are on-board with the program.

1.4 Electronic Procurement

Electronic procurement is basically a tool that enables procurement activities such as sourcing, ordering, commissioning, receipting and making payment in an electronic way. Industries and government agencies are constantly spectacular to e-Procurement and giving lots of attention on it. Electronic Procurement generally mean web based ERP (Enterprise Resource Planning), e-MRO (Maintenance, Repair and Operating supplies), e-sourcing, e-tendering, e-reverse auctioning, e-informing, e-market sites etc.

Neupane et. al. (n.d.) cites from literature “Public e-procurement has been defined as the use of information and communication technology such as internet/web based system by governments in conducting their procurement relationship with bidders for the acquisition of goods, works, services and other consulting services required by the public sectors (Davila, Gupta & Palmer, 2003; Leipold et al., 2004). It has been defined as an inter-organizational information system, which automatizes any part of the procurement process in order to improve efficiency, quality, and transparency in government procurement (Vaidya, 2007)”

Vaidya et.al. 2004 quotes....the first-level definition of e-Procurement provided by the World Bank (2003) which states that “electronic Government Procurement (e-GP) is the

use of information and communication technology (especially the Internet) by governments in conducting their procurement relationships with suppliers for the acquisition of goods, works, and consultancy services required by the public sector”.

Electronic government procurement (e-GP) is the part of e-governance programme of a country in which paperless office is attempted to establish by leveraging the ICT. It uses Information Technology (especially the internet) by governments in conducting their procurement relationships with suppliers for the procurement of works, goods and consulting services required for the public sector. This e-GP Process contains two phases – the pre-award phase involves e-Notification, e-Access, e-Submission, e-Evaluation and e-Awarding of contracts; and the post-award phase involves e-Ordering, e-Invoicing and e-Payments (Baghdasaryan 2011). The contractual module types are e-Tendering and e-Purchasing and the infrastructure module types are Contract Management, e-Certificates, e-Signatures, Vendor Management, Statistics etc. The e-GP is believed to significantly increase the efficiency, effectiveness and transparency of government procurement process and enhance other governmental objectives. However, e-GP implementation is vulnerable by risks of systems obsolescence, lack of interoperability, higher operating costs, vested interest influences, sub-optimal functionality and reduced innovation (ADB 2004).

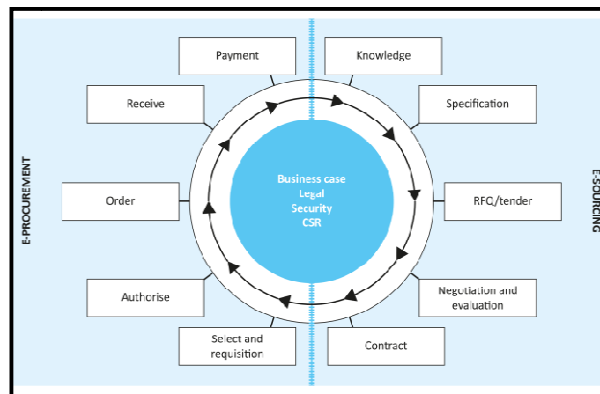


Figure-3: A typical e-Purchasing Process
(Source: CIPS Sourcing module 2014)

In e-Tendering System (Baghdasaryan 2011), there are three types of models are considered in order to meet the specific demands related to implementation of e-GP - the public model (all tasks, including the investment and risks of building the portal, are run by the government), the private model (all tasks are run by private entities that bear the investment risks of the project), and the mixed model (public-private partnership). In public-private partnership model the participants share investment risks and the benefits of the project among themselves.

1.5 Electronic Government Procurement (e-GP)

The e-GP System in Bangladesh has been implemented in two phases (CPTU 2014a) - the e-Tendering System and e-Contract Management System (e-CMS). The first phase of e-Tendering System covers complete e-Tendering processes such as centralized user registration, preparation of Annual Procurement Plan (APP), preparation of Tender document, preparation of Tenders, invitation of Tenders, sale of Tender Documents (e-TD), conducting online pre-bid meeting, collection of Tender security, on-line Tender submission, Bid opening & evaluation, negotiations (where applicable), and contract

awards; while the e-CMS covers complete e-Contract Management processes, such as preparation of work plan and its submission, defining milestone, tracking and monitoring progress, generating reports, performing quality checks, generating running bills, vendor rating and generating completion certificate.

Bangladesh e-GP uses a web portal which is accessible by the users through internet to perform their procurement operations using a web based dashboard (Bangladesh National e-GP Portal 2011).

In the first phase, e-Tendering has been introduced on pilot basis in the CPTU and 16 other Procuring Entities (PEs) under 4 (four) sector agencies – BWDB, LGED, RHD, and REB. The system rolled out to 291 PEs of those 4 sector agencies is now expanding to all the PEs of the government up to Districts and sub-Districts level. In the second phase, e-Contract Management System (e-CMS) has been developed and introduced and implemented. The e-CMS is a complete electronic contract management system which provides platform for preparation of work plan and its submission; defining milestone, tracking and monitoring progress, generating reports, performing quality checks, generation of running bills, vendor rating, generation and issuance of completion certificate (GED, Bangladesh Planning Commission 2012). Total number of PEs enrolled are 1501 including 1036 of four agencies.

The e-GP was developed by the CPTU as a uniform national web portal having centralized registration system that contains a comprehensive system from proc. plan up to final payment (e-Tendering and e-Contract Management), automatic procurement performance monitoring (e-PMIS). It has robust security features & back-up arrangement

with full redundancy to ensure uninterrupted service and harmonized with Multilateral Development Bank (MDB) guidelines. The process was reviewed by an independent consultant for World Bank's use, following which World Bank was accepted the Bangladesh e-GP system for financing. It is believed to be a self sustainable model – system is generating required fund. The security features claimed for e-GP to have tender information encrypted till opening, integrity of submitted tenders, audit log of all activity of all users, no password saving in database, password complexity control and the last login time display.

The payment provisions in e-GP allow Tender Security & Performance Security to Online through Banks; and Registration fees, Tender Document fees, Renewal fees to pay through payment gateway. It facilitates a Tender Dropping system to virtual Tender Box. The e-GP has been supported by an 'Online Helpdesk System' on board.

The e-GP System comprises of key Modules/Functionalities such as Centralized Registration System for Contractors/Applicants/Consultants, Procuring Entities and other actors; e-Tendering which includes e-Publishing/e-Advertisement, e-Lodgment, e-Evaluation, e-Contract award System; Procurement Management Information System (PROMIS); Workflow management System; e-Contract Management System (e-CMS); e-Payment System; System and Security Administration; Handling Errors and Exceptions; and Application Usability & Help etc.

The progress of e-GP in Bangladesh as on January 2015, the Registered Tenderers and Consultants are 13060, 1468 Procuring Entity offices, 31 Banks with 1444 users, so the total Registered Users are over 16000 (Source: National e-GP Portal of Bangladesh).

Table-1: Bangladesh e-GP Activity Summary

Period	# Registered Bidders	# Bids invited	Value of bids (US\$ M)
June -2012	294	14	3
December -2012	525	144	18
June -2013	1,067	498	62
December-2013	7,459	4,548	319
March-2014	8,353	6,558	506
January 2015*	13,144	17,398	--

Source: CPTU (2014d) Delivering Procurement Performance: Success Stories Bangladesh, a power point presentation for Second South Asia Region Public Procurement Conference held in Islamabad, Pakistan.

**Bangladesh e-GP Portal @ <http://115.127.40.33/> accessed on 23 January 2015*

All the stakeholders, including Bidders/Tenderers / Applicants / Consultants (National and International), PEs, procurement related Committees, payment service providers, Development Partners (DPs), media, Operation, Maintenance and Management Entity (OMME), e-GP system administrators, auditors and general public have access to e-GP system and information (CPTU 2014a).

Among the public sector agencies, LGED operates e-GP at a great deal in range (48.4% of all PEs) and scale (62.8%) and finalized 62.6%. RHD also shows a great efficiency in operating on e-GP system (20.5%) and already finalized 12.8 tenders per PE (Table-2).

Table-2: e-GP Operation Among Agencies

e-GP Active Agencies	PE	Tenders/Proposals Published		Tenders/Proposals being Processed		Tenders/Proposals Finalized	
		Number	per PE	Number	per PE	Number	per PE
LGED	726	10932	15.1	3034	4.2	6273	8.6
RHD	167	3574	21.4	1089	6.5	2130	12.8
BWDB	124	2218	17.9	677	5.5	1295	10.4
REB	19	189	9.9	97	5.1	91	4.8
PGCB	49	120	2.4	61	1.2	47	1.0
BPDB	204	288	1.4	117	0.6	155	0.8
All Agencies	1501	17398	11.6	5117	3.4	10017	6.7

Source: CPTU (2015) <http://115.127.40.33/RegistrationDetails.jsp>

BWDB (12.7%), BPDB (1.7%) and REB (1.1%) also show a remarkable activity in this field. Among new organisations involved in e-GP, PGCB has been getting momentum in dealing with e-GP. The overall progress of e-GP implementation is encouraging and gaining momentum, however, the ground reality is that actual users are very few as compared to the registered number of users. This impediment might be caused due to many factors including fear of the systems, reliance on someone capable of dealing the system, non-participating in tendering process, also due to competing demand for other responsibilities of the e-GP users. There are concerns over the ability and readiness of its stakeholders that some key stakeholders may fail to come forward to carry out the process due to various reasons which is subject to investigation under this research work.

1.6 Literature Review

Many studies have been conducted since development of the concept of e-commerce around the globe, since 2000's. The flow of digitization touched Bangladesh on time and due to the growing concerns about efficiency in procurement processes in terms of fairness, transparency, better visibility, cost reduction, timeliness, accuracy, competitiveness etc. for private service and provision for level of service for public sector modernization of the procurement system and implement enhanced governance became prominent in this field. As far as governance in public procurement is concerned, along with improvement of efficiency in utilization of public financial resources, their effectiveness could also be enhanced through the reform in procurement systems and now leveraged it through the widespread use of informational and communication

technology (ICT); thus the electronic government procurement (e-GP) is being introduced in many countries.

Al-Hossienie and Barua (2013) recognised that available resources for e-Governance in Bangladesh are inadequate. He noted, however, the rapid growth of information technology development might overcome this barrier.

Alam, SR. (2012) cites at NAPM (2001), the main reasons behind this are the overall ineffectiveness of the business processes, the difficulties of integration with back-office systems and the lack of common standards. He stressed on perceiving ICT by public institutions as the only solution. He highlighted the remarks by Ontology.org that both public institutions and vendors would benefit from a common platform where the former can get the information to make a purchase decision and the later can reach potential customers more than usual.

Bhuiyan (2010) acknowledged lack of proper infrastructure and digital divide were the known major causes behind the failures of e-service implementation, however he noted that e-government applications have been growing in Bangladesh. Again he viewed the prospects of mobile phone based e-service development, and public private partnership (PPP), but also recognised the challenges of frequent power interruption, lack of techno-savvy people in public organizations to look after the systems, etc. He noticed the increased number of e-services reflecting the progress of the country.

Hoque (n.d.) recognized the procurement law in Bangladesh as modern, but he expressed concern about the level of accountability, transparency and efficiency in public

procurements were far from satisfactory. Taking the experience of some Southeast Asian nations, he noted from Jones (2007) some common problems with public procurement systems - fragmented procurement procedures; lack of professional procurement expertise; absence of open, competitive tendering, especially for foreign suppliers; widespread corruption; and the lack of transparency.

Cascapera (2007) recognized e-procurement through which the buyer achieves the target set out during the sourcing project which leads to lower transaction and processing costs and increases efficiency due to increased choice and competition. He pointed out that efficiency is obtained not just via reduced printing and transportation costs, but also via reduced process cycle time in e-procurement. According to him, e-procurement changes the role of buyers in the purchasing function by removing administrative tasks e.g. placing orders and reconciling deliveries and invoices with purchase orders, buyers can spend more time on value-adding activities.

Vanjoki (n.d.) referred the researches he found in the literature (Kalakota and Robinson 2001; Attaran & Attaran 2002; de Boer et al. 2002; Davila et al. 2003; Croom and Brandon-Jones 2005) that the benefits of adopting e-procurement technologies had been widely. The companies primarily adopted e-procurement solutions for cost reductions and process efficiencies. He cites research by Quesada et al. (2010) proposes that e-Procurement technologies affected positively to company's procurement practices and procurement performance. Another research by Davila et al. (2003), he found to identify that companies used e-Procurement gain additional control over maverick spending and can reduce the headcount supporting purchasing transactions. He also quote from Croom

and Johnston (2003) that e-procurement can have a major impact on compliance on many different levels of the procurement process, such as managerial budgetary control; reduced data entry failures; greater transparency and accessibility to corporate level spending; improved system reliability; and improved access to information.

Foroughi (n.d.) noted from Reese (2003) that e-Procurement enables companies to make better decisions related to rationalizing their supplier base by providing a broad overview of the market. He cited from Bedell (2002) that e-Procurement provided new levels of visibility about what the company was buying and from whom; but there were problems with integration to backend systems, which might be incompatible platforms, and were a stumbling block to many e-Procurement efforts. The e-Procurement enabled companies to have better control of enterprise spending by aggregating spend of different groups within an organization. From Moore (2007) he highlighted e-Procurement that enabled companies to maintain lean inventory levels. It was recognized that inconsistencies in nomenclature for parts, between companies and even within different departments or sites of the same enterprise, often led to costly delays and errors. Aisbett, Lasch, and Pires (2005) also referred where e-Procurement could reduce material and service costs... .. Since e-Procurement systems are a self-service tool, end users sometimes resist using it and effectiveness depends, ultimately, on its being adopted and regularly used by employees (Bedell, 2002). By Singer (2003) he mentioned that many suppliers, especially smaller ones, do not have the technological capability to integrate with e-Procurement platforms. Also from Foster (2000) he noted that e-Procurement created a new set of responsibilities for purchasing departments.

Jönsson et al. (2010) summarized the key factors as defining an e-procurement strategy, change management and training and education which affect all. And the secondary factors were well defined steering group and communication that would affect some companies which they must take them into their perspective depending on situation. benefits are compliance savings, reduced supplier base and lowered administrative costs. CIPS Knowledge (2014) notes from Preite (2004) '...the data that feeds into the procurement system is accurate'.

Vinter and Papaux (2013) warned that even if potential benefits of e-procurement were obvious, theoretical and practical results clearly indicate that e-procurement for public markets was still the exception rather than the rule. They commented that the aim of a well integrated internal market for public procurement led far behind the EU's stated goals.

Veit, Parasie and Huntgeburth (2011) evaluated that in spite of high potentials and sophisticated goals set by the federal governments, municipalities were reluctant to move procurement to the Internet.

Leipold (2007) appraised that effective e-GP program could offer the opportunity of adding value to the relationship between government buyers and private businesses through delivering a broad range of benefits to taxpayers, the economy and the community generally. And the online technology provided the potential to significantly reform the accountabilities and performance of public procurement systems. An e-GP system could automate the procurement procedures and implement control the processes in which neither purchasing agencies nor bidders to deviate from the public

procurement process. Thus e-GP helped governments to reduce the opportunities for corruptive, fraudulent, collusive, and even coercive practices. Moreover, the bad practices (attacking bidders on their way to the bid submission, manipulating access to procurement notices, submitting overpriced bids, bypassing mandatory public procurement procedures, colluding with competitors, or bribing public procurement officials etc.) could be prevented by using e-GP systems. However, he considered e-GP as not the guarantor for improved governance and reduced corruption. He mentioned the need for strong political will, leadership, and management to design and implement appropriate e-GP systems which would ensure a maximum of transparency and compliance. He also mentioned about the efficiency gains (reduced costs and time) as the key benefits of e-GP; the technologies provide a high level of security through encryption and digital signatures. Further, the introduction of e-GP in a country activates the majority of suppliers to get ready and connected for the web-based government businesses. In doing so, public procurement laws provide support to e-Procurement a basis for policies and procedures as part of legislation up to more comprehensive and prescriptive way.

Arzu (2008) reflected from Pant et al. (2003) that the benefits of forming an e-supply chain were streamlining both internal and external operations; ability to provide real-time response to market conditions; ability to provide real-time response to customer queries; ability to undertake real-time, joint demand planning. He quoted from Rehan (2006), greatest advantages mentioned were to obtain cost savings through integration of the supply chain; overall reduction in the inventory levels throughout the supply chain;

reduction in procurement costs; improved vendor management; cycle time reduction; improved profitability.

Koseva (2012) cited from Eakin (2002), the hard benefits were those that can be directly measured as price savings and process cost reductions, and the soft benefits were those that affect cash flows directly but cannot be quantified easily such as the saving of individuals' time that can be spent more efficiently. Intangibles were all benefits that were not directly measurable in financial terms e.g. cultural change, high visibility of supplier performance, new e-platforms, financial approval for all spending.

He also noted from Cole (2004) who identified that in most of the cases the internal barriers were resulted from of factors such as lack of ownership of the project; diminishing of the quality or prestige of the current role, after the introduction of the new system; lack of knowledge of the subject; political reasons; insufficient time and opportunity for the involvement; personal conflicts; lack of needed knowledge about technology and IT projects; loss of supplier contacts or control. He highlighted that people found electronic payment transactions are still risky, because they are relatively new (Kheng and Al-Hawamdeh 2002). Waarts and Everdingen (2005) consider that culture is affecting the adoption status. Vaidya et al. (2006) defined end users' uptake and training as one of eleven key success factors.

Vaidya et. al. (2004) emphasized that implementing e-Procurement initiatives required the public sector agencies to have the organizational and management ability and flexibility to learn and share the lessons in regards to the new systems and technology and adjust themselves to new procurement practices and processes in a timely fashion.

He also referred S&A (2003) who regarded change management and training as the most important implementation issue and concluded that most other issues are also related to change management.

The problems of implementation and integration of existing infrastructure, according to Parida and Sophonthummapharn (2010), were holding back companies from implementing e-procurement; but benefits were overpowering the risks and companies were moving toward more aggressive strategic approach of implementing e-procurement.

Kaliannan and Awang (2009) pointed out that the suppliers had positive perception about information technology and the use of Internet to do their business transactions; thus they were ready to use the e-Procurement system. They noted that there were many problems and challenges faced by both the buyer community i.e. government, and seller community i.e. suppliers, even a certain level of acceptance and usage show positive development of e-Procurement.

Tonkin (2003) explored that public sector undertook e-procurement initiatives to achieve certain cost reductions and benefits including those related to public policy imperatives.

The role of trust in e-government success using the updated DeLone and McLean IS success model is tested via a survey of 214 Singapore e-government Web site users. Teo, Srivastava and Jiang (2014) found that there were trust in government, but not trust in technology which is positively related to trust in e-government web sites; subsequently to information quality, system quality, and service quality.

Anonymous (2009) research cited that e-procurement led to considerable improvements interaction & communication; also change from standard procurement to e-procurement was not easy to adopt, but beneficial to Kuwait Maastricht Business School (KNPC) and its suppliers.

The findings indicate significant relationships existed between individual factor, organisational factor, environmental factor, technological factor and e-procurement system use. There were also evidences of dynamic capability as a mediator to the organisational factor and system use relationship (Kassim 2011).

Puschmann and Alt (2005) recognized that in the successful practices the redesigning of the procurement process is focused on - reduction or elimination of authorization stages; regulation of exceptions to a limited degree in the beginning; elimination of paper; integration of suppliers in the entire process chain; and consideration of the complete process from searching for goods through to invoicing.

Angeles and Nath (2007) identified three important challenges to e-Procurement implementation - lack of system integration and standardization issues; immaturity of e-procurement-based market services and end user resistance; maverick buying and difficulty in integrating e-procurement with other systems.

Vanjoki (n.d.) observed that lack of system integration and standardization issues were related to the fact that e-Procurement was still relatively new business application and it was not unusual to find a lack of benchmarkable reference models. Other challenges he found to be software immaturity, immaturity of providers of e-procurement services, lack

of supplier preparation, resistance of solutions by end users, difficulty of changing purchasing-related behavior by company's employees.

Mibenge and Okoye (2007) explored that the significance of e-procurement was an important instrument to improve Internal Customer Service and thus external customer satisfaction had also been achieved. They stressed to remember that e-procurement might not be right for all types of organisations depending on their business operations and level of technological development.

Alam (2012) suggested in educating parties for both long-term and short-term benefits that would encourage the application of e-GP. He also mentioned some critical success factors including adequate financial support, availability of interoperability and standards of communication systems, top management support and commitment, understanding the priorities of the company, and having suitable security systems.

Vinter and Papaux (2013) studied e-Government and found the key benefits of fairness and non-discrimination among tenderers that were potential to increase SME and cross-country participation in EU. Savings due to lower price for procurement as well as E-tendering, e-notices etc. administrative burden were also reduced when compared to paper based procurements. They recognized the challenges of persuading stakeholders to embrace new electronic tools and to make sure that the systems put in place facilitate wider access to those valuable markets across the EU. Overcoming structural inertia and fear was also the main reason that companies avoid e-procurement. Moreover language was a barrier to encourage practical participation by foreign companies; and until then e-procurement was not totally developed.

Neupane et. al. (n.d.) noted from Gupta, Jha and Gupta (2009) that e-Procurement centralize data in order to improve audit and analysis. He also referred Ndou (2004) that e-Procurement eliminated the direct human interaction on bidding and other work and services, corruption was decreased significantly, and internal efficiency was increased in government departments. The other benefits they mentioned that from an e-procurement system, government could monitor all the works and services more easily and efficiently (Aman & Kasimin 2011; Kaliannan & Awang 2009); e-Procurement system provided better status monitoring and tracking of applications; increased transparency in works and services and improves better interaction between supplier, vendors and citizens through online system (Adebiyi, Ayo & Adebiyi Marion, 2010); online bidding system automatically reduces the cartel, collusion and riggings among the bidders (Pathak et al., 2006); and also improved transparency and efficiency, reduce cost, better decision-making, supplier performance monitoring, quality of service and so on.

GeBIZ (2005) reported that e-Procurement technology performance of countries like Bahrain, Norway, Italy, Singapore, Turkey, India, and Malaysia indicate it helped them to increase competition among bidders in public work and services evidenced by eighteen countries' governments were obtaining best quality and price ratio after implementing public e-procurement technology. Peru, Pakistan, New Zealand, Italy, Fiji, and Hong Kong (China) also obtained best quality of governance by implementing e-procurement in government level. Singapore government using GeBIZ on-stop e-procurement portal which enhance transparency in government procurement, easy access to information, increase procurement efficiency, global reach among the bidders and suppliers, and

increase more competition among bidders. The main implementation benefits of this system were to make more consistency in procurement process, more visibility into procurement process, and secure document transmission (Guadamuz and Jiménez 2009). Fifteen countries' focus on e-Procurement helped increase efficiency in document transmission and reduce more chances of corruption. Nine countries' government e-procurement implementation benefits result indicated that e-procurement helped to reduce human interference in bidding process and avoided unnecessary physical threat to the other bidders in tendering process (Neupane, Soar, Vaidya and Yong 2004).

Somasundaram wrote for ADB (2011), government departments in India those implement e-GP system reported the key benefits such as average number of bidders per tender were increased; tender premium had decreased by about 15%; and the cycle time taken to evaluate tenders was decreased.

Smart (2010) recorded the potential benefits of e-procurement mechanisms as increased order accuracy, transaction efficiency and greater integration between trading partners; ...it acted as an enabler to more effective management of the function; ... e-Procurement led to improvement in process and price for buying firms; e-Procurement was used by buyers and suppliers as a means to channel dominance; e-Procurement led to automation of process, not supply chain integration....however, procurement managers pursued functional targets rather than supply chain-level objectives. Furthermore, buying firms could use e-Procurement mechanisms inter alia to exploit market competition, improve processes, support supplier rationalisation programmes, enforce compliance and support a segmented approach to supply markets. Although e-procurement was an enabler of the

purchasing firm's supply strategy;integration with suppliers was not greatly enhanced by e-procurement deployment.

1.7 Rationale of the Study

The CPTU adopted a well managed strategy which is critical to the successful implementation of e-GP. However, the best practice e-procurement implementation should identify its barriers and opportunities so that they can be addressed in proactive manner, CPTU also to consider the same. The potential barriers might be specific to the procurement process, the organisation itself or existing communication channels and their elimination is important – to neutralize them is at threshold. For example, some government officials were unwilling to use e-GP as published in Bangladesh media such as the Daily Jugantor dated: 23 September 2014. On the other hand, it is required to exploit the potential favours of factors of e-GP and to enhance their utilization. A World Bank evaluation showed e-Tendering was seen effective to restrict coercive and collusive practices which was also published in Bangladesh media such as the Daily Janakantha, dated: 17 December 2014.

This a novel research and possibly the first of its kind in Bangladesh and it is expected that the results of the study would help a range of stakeholders, especially the e-GP users, it's planners, policy-makers and researchers to address the challenges of e-government applications in Bangladesh. Any future research could benefit by the outcomes of this study in quantifying the contribution of e-GP to the national account and gain through waste minimization and process efficiency.

1.8 Research Objectives

The research objectives of the study are to identify the factors of influence on electronic government procurement in Bangladesh that could affect it either positively or negatively. In this respect two counter acting sets of factors of e-GP would result from the study which would require considering some measures to minimise the effects of those counterproductive factors.

1.8.1 Broad Objectives

The broad objectives relate to the 'scope' of the research study which is suitable for its time horizon and considering the available resources. Thus the desired future of this research is to attempting to understand the factors influencing e-GP and identifying their core directions; grouping them into two counter acting sets those may act as key barriers and enablers by grading their influence in ranks to high, medium or low.

1.8.2 Specific Objectives

Stretching the above general objectives, the specific objectives of this research would look into the outcomes – they are:

- I. To give an overview of procurement system in Bangladesh;
- II. To identify the factors affecting procurement system in Bangladesh;
- III. To identify the relationship of the factors influencing procurement system in Bangladesh with e-GP; and
- IV. To suggest some measures to increase the efficiency of e-GP in Bangladesh.

1.9 Research Questions

The research questions (what is to study) and research strategy (how to conduct the study) are very important as they influence the strategy that is employed in order to either provide answers to the questions or verify them. The research strategy to be used depends on the nature of the problem and formulation of research questions.

In present case, the research poses to look for responses to questions those are based on e-government procurement depending upon the level of understanding and capacity to react on proper course by the users, thus the questions are as follows:

- a) What are the elements of e-government procurement in Bangladesh and what does it would like to do?
- b) What are the factors of e-government procurement that influence it?
- c) What are the factors of e-government procurement favours the e-GP and what others challenge it?
- d) How to overcome those challenges?

1.10 Structure of the Document

The structure has a sequence with an introduction followed by methodology, a brief of related theories, data analysis, discussion on results highlighting the factors of influence and identifying those factors as supportive or offensive to e-GP; and finally a concluding chapter.

The first chapter gives an introduction of the study focusing the rationale of the research and review of literature. It provides objectives of the study and formulates the research questions based on those objectives.

The second chapter discusses about the methodology covering data, sampling the population, discussion on target population, data analysis covering descriptive and inferential statistics, model concept and appropriateness, goodness of fit, correlation issues etc.

The third chapter includes data organisation, analysis and interpretation of results. The fourth chapter highlights both empirical and statistical results of factors of e-GP those influence it, ranks and summarize them.

The final chapter covers the conclusions of the work and put few recommendations; then admits some limitations of the study.

Chapter Two: Methodology

2.1 Main Methodologies

The history of e-governance study reveals that there are various methods of analysis adopted by the researchers such as Case Study, Comparative Analysis, Content Analysis, Correlation Analysis, Factorial Analysis, Life History Method, Variance Analysis etc. Keeping these approaches in mind, efforts were made in this research work to utilize appropriate methods in understanding of issues as expected and meet the objectives.

Since 2012 e-GP has been operational in Bangladesh and the level of its use has been spreading in both dimensions of concentrations and wider aspects of users. The number of users is increasing with the increase of implementing agencies, from four target agencies to 22 agencies at present. Not only e-Tendering, e-management of contracts is also gaining momentum, the use of e-CMS for example.

In these courses of practicing e-GP, experiences show some adverse factors from both external and internal to the organisations, the public agencies, challenging the proper functioning of the system. Literatures also show evidences of the difficulties to implement e-GP worldwide including Bangladesh. Attempts have been made to explore the potential factors of influences on e-GP on the basis of experience, discussion and dialogue with its users to be termed here as primary source; also by searching the current literatures to be termed as secondary sources.

Both types of factors were screened through mirroring the broad factors underlying in the theories of environmental scanning and conflicting situations, using the frameworks such

as PESTLE, Porter's five forces, Force-Field analysis etc. A consolidated set of influencing factors were drawn and attempted to test them with the e-GP users either in public sector or of general public. They are basically the Bidders/Tenderers/Applicants /Consultants (National and International), Procuring Entities, Procurement related Committee members, Payment service providers at banks, Development Partners (DPs), media, Operation, Maintenance and Management Entity (OMME), e-GP System Administrators, Auditors and the general public. It was emphasized to have reflection of regular users, such as the Tenderers/Consultants, Procuring Entities, Approving Authorities, Procurement related Committee members, Payment service providers at banks etc. during the survey.

2.2 Scope of the Work

The scope of research work with e-GP is very wide that could account to the quantifying its overall impacts on economy as a whole. However, the prevalent factors, such as available time, finance resources, human factor and requirement of the university for Masters Study governs the boundary of the work. The scope of the work was kept limited to determination of 'for' and 'against' metrics around e-GP in Bangladesh based on their level of influence from user perspectives so that it becomes attainable. This work could contribute to some extent for further research in this field.

The available time also limits access to academic resources and interact professional personnel about the subject matter. Also there are very few research works in Bangladesh context and so advances yet to make in this field.

2.3 Data Source

The findings of the previous studies are important sources for the research. As this study aims to work on factors influencing e-GP existing literature have already identified many of those factors. However, the context and environment of the e-GP system are obviously different, it also varies in course of time; so these elements needs to be checked to recommend in present context. A number of factors of influence as identified in the previous literature were considered for this research.

Experience study is another source of information where skillful users of the public procurement personnel can point out some distinctive information. This valuable resource was also attempted to utilize in contextualizing the related aspects that available studies may not cover.

The flow chart below depicts the ways how above factors of influence was organized and tested under this research.

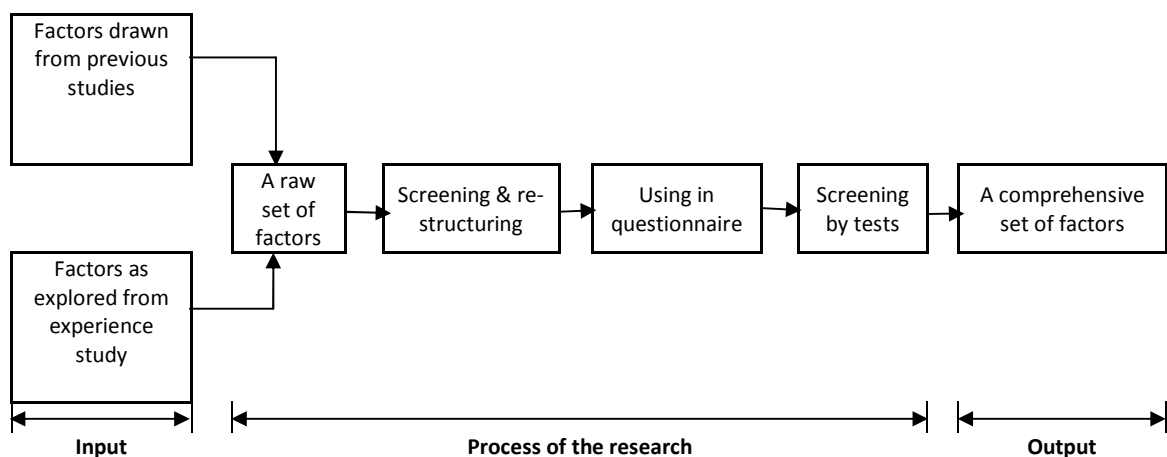


Figure-4: Process of Determining the Factors of Influence of e-GP

2.4 Tools and Frameworks

The variant factors of electronic procurement can be identified through the use of various techniques including direct understanding based on the facts of and the use of previous literature. Frameworks like PESTLE, SWOT analysis, the force-field analysis, the Porter's five forces, etc. could help to understand the environmental factors and simulate the situations around a project or function such as e-GP. As a public sector business, e-GP contributes to enhanced governance to its service environment which is susceptible to be effected by many environmental factors and thus above frameworks are much useful.

2.4.1 PESTLE Factors

The PESTLE factors are useful to understand environmental drivers and constraints which are very relevant to this study. There are variant macro-environmental aspects that impact the operation of electronic procurement can be judged in terms of PESTLE framework that stands for Political, Economic, Social and Technological analysis. It describes a framework of macro-environmental factors used in the environmental scanning component of strategic management. Some analysts added the Legal factor and rearranged the mnemonic to SLEPT; inserting Environmental factors it was expanded to PESTEL or PESTLE. The model has been further extended to STEEPLE and STEEPLED, by adding Ethics and Demographic factors. It is also a useful strategic tool for understanding market growth or decline, business position, potential and direction for operations. Another similar framework STEER analysis systematically considers Socio-cultural, Technological, Economic, Ecological, and Regulatory factors.

In particular to Bangladesh e-GP, the range of social factors including psychographic nature of human; technological innovations along with shorter lifecycle equipments and techniques; economic issues of cost matters, availability and speed of service; governmental legislations, fast changing market conditions (i.e. public demand for better and better services) and political preferences can largely affect.

2.4.2 SWOT of e-GP

A SWOT analysis includes analyzing a business's strengths, flaws, possibilities, and risks. It can help to uncover the opportunities that are beneficial to exploit. And by understanding the weaknesses, one can manage and eliminate threats that would otherwise affect unawares.

The PESTLE factors, combined with external micro-environmental factors and internal drivers when applied to e-GP systems, can be classified as opportunities and threats in a SWOT analysis. Moreover, by looking at competitive environment using the SWOT framework, a strategy can be developed based on the influencing factors of e-GP which could help to distinguish it from traditional paper based system and be able to sustain.

A thematic diagram of SWOT of e-GP has been developed as below:

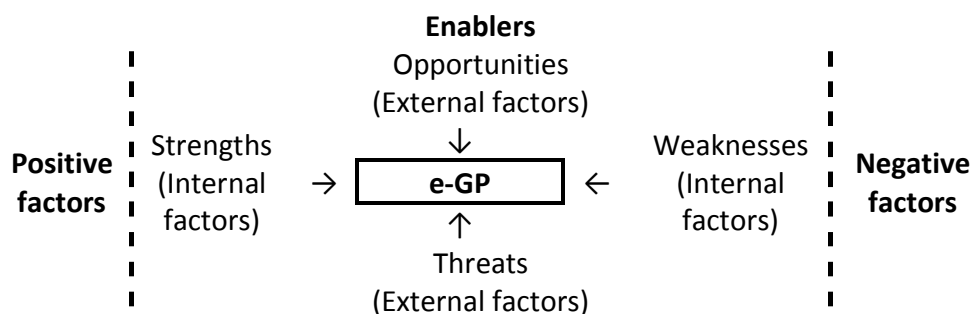


Figure-5: SWOT of e-GP

For this study SWOT, as a tool, is quite relevant and the factors available in the literature as well as judged by the experience and learning could be framed by it. In fact the objectives of this study demand identifying proactive and counter-active factors. The positive factors might include supportive elements that can boost strengths and opportunities of e-GP while the negative factors could include offensive elements that can restrain it and damage the benefits.

2.4.3 Force-Field Analysis

The force-field analysis model was developed by Kurt Lewin. This model is based on the idea that in a given organisational situation there is an interplay of restraining and driving forces which keeps things in equilibrium such an equilibrium may vary over time and depending on situations. It aims to chart the forces that are pushing in the desired direction and those that push in other directions to maintain status quo. Once this has been done, it is possible to focus on the resisting forces and either to overcome or at least to reduce them.

The e-GP system also faces the pressure by its competing environment. The system is still to implement in many government entities although it has been spreading steadily. By this time only 22 agencies have come under e-GP implementation; but the four target organisations practice it widely.

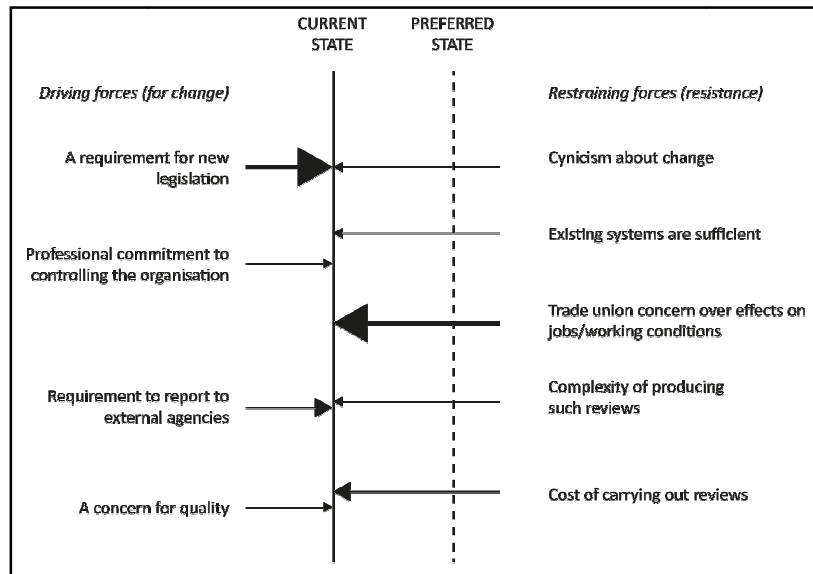


Figure-6: A Typical of Force-Field Method

2.4.4 Porter's Five Forces

The Porter's five forces framework is another tool that helps to understand industry attractiveness and competitive forces. It could be useful to understand the influencing factors of competitive environment around the e-GP. The five forces are competitors; the power of buyers; the power of suppliers; the threat of new entrants; and the threat of substitute products. In research context of e-GP, the external stakeholders are media, development partners, and general public. The factors such as benefits of e-GP service delivery i.e. efficiency, timeliness, shorter procurement cycle, transparency etc. could be considered as buyers and the organisational users such as procuring entities, committee members could be considered as suppliers side. However, this technique applies for a particular point of time and in a specific context.

2.5 Sample Design

In statistics, sampling is the selection of a subset of individuals from within a statistical population to estimate characteristics of the whole population. The sampling process in any research work comprises several stages – defining the population, specifying a set of items to measure, specifying a sampling method for selecting items, determining the sample size, implementing the sampling plan, and data collection. This study followed the same principle in designing the sample.

2.5.1 Sample Size Criteria

Main aspects of determining the size of a sample are the purpose of the study, population size, sampling error (the level of precision), the confidence level, and the degree of variability in the main measured attributes (Polonia 2013). However, later three criteria usually needs to be specified to determine the appropriate sample size – these are reviewed below (Glenn 2013):

The Level of Precision

The *level of precision* (also *sampling error*) is the range in which the true value of the population is to be estimated. This range is often expressed in percentages (say, ± 10 percent). Thus, if 60% of the population in the sample has adopted a recommended practice with a precision rate of $\pm 10\%$, then conclusion results between 50% and 70% of the population have adopted the practice.

The level of Confidence

The *confidence or risk level* is based on ideas encompassed under the Central Limit Theorem. The basic concept of the Central Limit Theorem is that when a population is repeatedly sampled, the average value of the attribute obtained by those samples is equal to the true population value. Also the values obtained by these samples are distributed normally about the true value, with some samples having a higher value and some obtaining a lower score than the true population value. In a normal distribution, approximately 85-95% of the sample values are found within two standard deviations of the true population value such as mean.

The Degree of Variability

The third criterion, the *degree of variability* in the attributes being measured, refers to the distribution of attributes in the population. The more heterogeneous a population, the larger the sample size required to obtain a given level of precision. The less variable (more homogeneous) a population, the smaller the sample size will be. For example, a proportion of 50% indicates a greater level of variability than either 20% or 80%. This is because 20% and 80% indicate that a large majority do not or do, respectively, have the attribute of interest. Because a proportion of 0.5 indicates the maximum variability in a population, it is often used in determining a more conservative sample size, that is, the sample size may be larger than if the true variability of the population attribute were used.

The common ways of determining the sample size are:

- by using or conducting a census survey;

- transfer a sample size from a similar study;
- using published tables; and
- applying of formulas to calculate a sample size.

2.5.2 Sample Bias

When a sample is collected in such a way that some members of the intended population are less likely to be included than others, this is termed as sample bias in statistics (Wikipedia 2014 online). It is a non-random sample that a biased sample of a population results in which all individuals were not equally likely to have been selected. If this is not taken into account, the analysis can result erroneously attributed under study rather than to the method of sampling.

2.5.3 Sample Size Determination

For populations that are large, Cochran (1963) developed the Equation 1 to yield a representative sample for proportions.

$$n_0 = \frac{Z^2 pq}{e^2} \dots\dots\dots \text{Equation 1}$$

which is valid where n_0 is the sample size, Z^2 is the abscissa of the normal curve that cuts off an area α at the tails ($1 - \alpha$ equals the desired confidence level, e.g., 95%), e is the desired level of precision, p is the estimated proportion of an attribute that is present in the population, and q is $1-p$. The value for Z is found in statistical tables which contain the area under the normal curve.

Finite population correction for proportions is given in Equation 2:

$$n = \frac{n_0}{1 + \frac{(n_0 - 1)}{N}} \dots\dots\dots\text{Equation 2}$$

where n_0 - the initial sample size, n - adjusted sample size, N - the population size.

A simplified formula for proportions, developed by Taro Yamane (1967):

$$n = \frac{N}{1 + N * (e)^2} \dots\dots\dots\text{Equation 3}$$

where n - the sample size, N - the population size, e - the acceptable sampling error. (Say 95% confidence level and $p = 0.5$ are assumed)

According to Yamane formula (1967), Potential error limit

$$e^2 = [z^2 p (1- p)/ n_0] - [z^2 p (1- p)/N] \dots\dots\dots \text{Equation 4}$$

2.5.4 Sample Size for the Survey Work

The e-GP user in Bangladesh includes government users as the system allows – Heads of the Procuring Entities, Approving Authorities, Procuring Entities, Tender/Proposal Opening Committee, Tender/Proposal Evaluation Committee, System administrators (at CPTU and at organisation level), Tenderer/Consultants, Bank users, Development Partners, Media personnel etc. Considering the e-GP users in Bangladesh as registered by 2012, the total number was 13,609 in 2012. The registration details page of the e-GP web portal supports this statistics. As there were potential to rise in number of registered users, current figure may be assumed to be around 15,000.

As the sample size and effective sample size have moderate impact on quality measures, it is necessary to consider the possibility of increasing sample size. Present work would

use the simpler form of estimating the sample size using Taro Yamane's formula which is based on the level of precision.

Table-4: Estimating Sample Size

Population (N)	level of precision (e)	Sample size, $n = \frac{N}{1 + N * (e)^2}$	Response rate	Critical value (z)	Potential error limit, $e^2 = [z^2 p (1- p)/ n_0] - [z^2 p (1- p)/N]$
15,000	20%	25	0.166%	1.28	1.04%
15,000	15%	44	0.295%	1.44	1.17%
15,000	63	0.420%
15,000	10%	99	0.662%	1.64	1.33%
15,000	5%	390	2.597%	1.96	1.54%
15,000	2%	2,143	14.286%	2.33	1.38%
15,000	1%	6,000	40%	2.58	-

According to Table-4, given a response rate of 0.295% (derived from 44 responses out of 15,000) the e-GP survey therefore has an 85% confidence level with 1.17% of potential error. Similarly, 0.662% (99 responses) gives a 90% confidence level with 1.33% of error. Hussey and Hussey (1997) noted that no survey can ever be deemed to be free from error or provide 100% surety; so error limits having below 10% with confidence levels of 85 ~90% is acceptable. For the purpose of this research work, a sample size of 99 was targeted, but the responses received were 63 (0.42% of the population).

The experience shows wide variations in level of use of e-GP by the registered users. As there are legal requirements for e-GP user registration, and the number of users are about 15,000; but the ground scenario reveals the number of actual users is far below than that. For example, a Procuring Entity may require at least 10/15 users to participate in a tender processing cycle that includes committee members to open and evaluate the

tenders, participating tenders, bank users, an administrator, the approving authority or HOPE. But the active users are only a few where someone works for the others; for example, the study shows over 10% of registered users do not use e-GP in their own where as another 10% non-registered people use e-GP by themselves. It is revealed from experience study that some alternate people work for the users of e-GP to complete the tendering process. Private users were seen to depend on public sector users for support in operating e-GP. This practice is worse among tenderers whose share accounts to 61% of total registered users (Table-6). Thus ultimate populations for e-GP users are far less than estimated (or assumed); in fact, determination of a reliable population size is a complex matter.

2.5.5 Description of the Sampled Population

The respondents were targeted from the government organisations and their related players of the e-GP systems such as the Head of the Procuring Entity, approving authority, Procuring Entity, opening and evaluation Committee members, Tenderers, Applicants, Bank users, System administrators etc.

The four governmental organisations – Bangladesh Water Development Board (BWDB), Local Government Engineering Department (LGED), Roads and Highways Department (RHD) and Rural Electrification Board (REB) mainly were targeted for the survey. The contact persons of these organisations (www.eprocure.gov.bd/contactUs.jsp; date: 11 October 2014) were contacted through e-mail requesting them to communicate it to respective officials so that they consider it authentic and respond accordingly. The responses show that the respondents were from approving authority, Procuring Entity,

opening and evaluation Committee members, Tenderers, Applicants, Trainers, and System administrators.

2.6 Design of the Questionnaire

The initial point of research is to look for the questions to be answered. The questionnaire is to focus the experience and feeling of users with e-GP with respect to how far they are 'friendly' with the system to use and to know if they feel difficulties to deal with it.

Surveys often contain questions with a set of possible responses. For example, Likert-type scales use fixed choice response formats that are designed to measure attitudes or opinions (Bowling 1997; Burns & Grove 1997). These ordinal scales measure levels of agreement/disagreement. This survey also used similar set of given responses in five point scale such as 1 = oppose strongly, 2 = oppose, 3 = neutral, 4 = supports, and 5 = supports strongly. The questionnaire also covered the user's personal attributes; their personal settings of procurement orientation; their personal involvement with e-GP system.

The factors of influences of e-GP were identified based on available literature as well as experience study. Most of them were short listed and re-structured such that the respondents find easy to understand the issue and react accordingly. The dialogue with e-GP users i.e. experienced people, and having feedback on a draft questionnaire contributed to develop the survey. At the outset a draft questionnaire was distributed to few experienced practitioners of e-GP, and their feedback were utilized to finalize its size.

The relationship between number of questions in a survey and the time required for answering them is not linear. The more questions to respond, the less time the respondents wish to spend in answering each question. If the respondents begin satisficing (aiming to achieve only satisfactory results) or speeding through a survey then the quality and reliability of data may suffer. The respondents take just over a minute to answer the first question in a survey (including the time to reading any survey introductions) and spend about 5 minutes in total, answering a 10 question survey. However, respondents take more time per question when responding to shorter surveys compared to longer surveys (Brent 2011).

Considering above, the length of the questionnaire was maintained such that the users do not get exhausted while answering it and the time would require about 10 to 15 minutes, thus achieve expected level of response.

While the questionnaire contains the potential factors of influences on electronic government procurement (e-GP), it also have some personal attributes of the respondents covering their age, experience, registration status to the e-GP system and respective role, and background knowledge on procurement and the e-GP (Appendix-1). The reliability statistics having alpha value 0.893 confirms that the questionnaire (Table-5) can reliably explain the prediction which seems quite reasonable. It is noteworthy that Nunnally (1978) suggested the alpha value as a rule of thumb to be 0.70; however, recent expectations of alpha value are a minimum 0.80.

Table-5: Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	No. of Items
0.877	0.893	38

2.7 Data Collection Technique

Various instruments are available for facilitating the data collection process. These include interviews, questionnaires, document analysis, observations, Focus Group Discussions (FGD), etc. (Lancaster 2005). However, the choice of data collection instruments is determined by the nature of the information needs intended to achieve the objective of the study and data sources (ibid.). In other words, each instrument is known to best facilitate the collection a particular kind of data (Yonazi 2010). The questionnaire survey could be face to face interview or remote; video based; web based; and predesigned cards of alternative sets of choice, photographs or a stated scenario may also be used.

In this study, an internet based survey techniques were used based on a structured questionnaire, lodged on 'surveymonkey' platform (<https://www.surveymonkey.com/NQHMQ8Q>). The respondents were contacted via e-mail by giving them this web link to take the survey. The responses were logged to the 'surveymonkey' system and individual responses were extracted for analysis.

2.8 Data Analysis Tool and Outcomes

Statistical Package for the Social Sciences (SPSS) was used for data analysis. This tool is a widely used program for data analysis in social sciences. It is also used by market researchers, health researchers, survey companies, government, education researchers, marketing organizations, data miners, and others. The original SPSS manual (Nie, Bent and Hull, 1970) has been described as one of "sociology's most influential books" for

allowing ordinary researchers to do their own statistical analysis. In addition to statistical analysis, data management (case selection, creating derived data) and data documentation are the features of the base software. SPSS datasets have a two-dimensional table structure, where the rows typically represent cases (such as individuals) and the columns represent measurements (such as age, sex etc.). Only two data types are defined: numeric and text (or "string"). All data processing occurs sequentially case-by-case through the file. Files can be matched one-to-one and one-to-many, but not many-to-many (Wikipedia 2014 online).

2.8.1 Descriptive Statistics

Descriptive statistics are useful to understand the features of a set of data. These are numerical measures which do not allow reaching conclusions regarding any hypotheses made. Descriptive statistics enables to present the data in a meaningful way and allows interpretation such as the distribution and pattern of data and their spread. These are the summarizing of data using measure of the center (average, mean, median, mode or mid range), spread of a dataset (range or standard deviation), skewness and kurtosis, correlations between data, and presentation of statistical results using a combination of tables, graphs and charts and discussion of the results. SPSS is quite useful in this respect; its 19th version was used for analysis.

2.8.2 Inferential Statistics

Inferential statistics use samples representing its populations and help to come to a conclusion about the population from which the sample was drawn. As it is not feasible to study each member of the population individually, a representative subset of the

population (i.e. sample) is chosen. Inferential statistics examines the statistical sample, and thus can say something about the population. There are two main divisions of inferential statistics – a confidence interval that gives a range of values for an unknown parameter of the population (the level of significance due to some uncertainty); and the tests of significance by analyzing the sample.

2.9 Model Form and Appropriateness

It was aimed to identify and rank the factors affecting Electronic Government Procurement (e-GP) in this research. A model covering these factors could result an overall impact which may take the form as a model relationship (Equation 5).

$$y = f(p, q, r, s, \dots + c) \dots \dots \dots \text{Equation 5}$$

Where, y represents overall impacts on e-GP; and p, q, r, s represent factors affecting i.e. benefits and enablers, challenges and barriers of e-GP and c is a constant representing unobserved elements and errors.

Above relationship represents that an overall impact on e-GP as a dependent variable which is influenced by a number of independent variables of its attractions having perceived benefits due to the presence of several enablers; also influenced by the threats of challenges and due to numerous barriers available.

It is quite a simple relationship among factors of influences and is very generic. The form of relationship is in question could be thought to be one among additive, multiplicative or exponential; however, available literatures do not have indication of any types of relationship in this field of work. The mathematical concept of logarithmic application in

multiplication or exponentials can modify the relationships in simpler additive form which is quite useful.

The other issue of this relationship comes up regarding co-efficient of the individual factors in the relationship to establish the nature and trend. There could be some errors, unobserved elements, specific preference or deterrent to the relationship present which also needs to be taken into account.

Based on the nature of those factors, they influence the e-GP as these are mostly of human factors and largely socio-psychological having no simple form and scale, the relationship in Equation 5 is expected to be variable in different forms based on situation and time; and so is complex.

2.9.1 Goodness of Fit

The goodness of fit statistics helps to determine whether a model adequately describes the data. Measures of goodness of fit typically summarize the discrepancy between observed values and the values expected under the model in question. Such measures can be used in statistical hypothesis testing whether outcome frequencies follow a specified distribution (Wikipedia 2014 online).

A model fits the data well if the differences between the observed values and the model's predicted values are small and unbiased. R-squared is a statistical measure of how close the data are fitted to the regression line. It is also known as the coefficient of (multiple) determinations for (multiple) regressions. The model with the largest R-squared statistic is expected according to this measure.

The R-squared is defined as the percentage of the response variable variation that is explained by a linear model, i.e. $R\text{-squared} = \text{Explained variation} / \text{Total variation}$. The value of R-squared is a continuum between 0 and 100% in which the lowest end 0% indicates that the model do not explain any variability of the response data around its mean; while the highest end 100% indicates that the model explains all the variability of the response data around its mean. In general, the higher the R-squared, the better the model fits your data. The R-squared at upper middle, say 50~70% are regarded as satisfactory fit as it accommodates the expected variations in the e-GP user community. However, R-squared does not indicate whether a regression model is adequate or not; because a low R-squared value for a good model or a high R-squared value for a model that does not fit the data are also possible. A negative R-squared is impossible and such one could be adjusted or predicted, not in case of a regular R-squared (Frost 2013). This study reveals a good R-squared which reveals that the model could explain approximately 73.5% of the prediction.

2.9.2 Correlation of Factors

Correlation refers to dependence of two or more random variables. It measures the relationship between two mathematical variables or measured data values. There are several correlation coefficients, measuring the degree of relationship; the most common is the Pearson correlation coefficient, which is sensitive to a linear relationship between two variables. Other correlation coefficients, more robust than the Pearson correlation are also available which are more sensitive to nonlinear relationships. The correlation coefficient defines the dependence structure only in very particular cases, for

example when the distribution is a multivariate normal distribution. The correlation matrix is symmetric due to the correlation between X_i and X_j is reciprocal and same as the correlation between X_j and X_i for example.

If a data-set having more than two variables, partial correlation coefficient is useful - this measures the degree of dependence between a pair of variables. Partial correlation resolves the two associated linear regression problems, get the residuals, and calculate the correlation between them.

The correlations without any control variables are zero-order correlations; it gives correlation between the transformed predictor and the transformed response. This is useful for this research work.

2.9.3 Multicollinearity Among Variables

Multicollinearity is a statistical phenomenon having two or more predictor variables in a multiple regression model are highly correlated, which means one can be linearly predicted from the others with a reasonable degree of accuracy. One of the features of multicollinearity is that the standard errors of the affected coefficients tend to be large. It is expected that the predictor variables correlate highly with the dependent (outcome) variable, and correlate at minimum with each other (among independent variables) in the relationship. It increases the standard errors of the coefficients which mean the coefficients for some independent variables may be found to be around 0, whereas if no multicollinearity and have lower standard errors, these same coefficients might be significant. Thus multicollinearity misleads and inflates the standard errors and makes some variables statistically insignificant.

Multicollinearity can be identified in a model by observing large changes in the estimated regression coefficients when predictor variables are added or deleted. Variance inflation factors (VIF) is a tool to measure the variance of the estimated coefficients for this purpose. If two variables are not correlated, then all the VIFs will be 1.0. If VIF of a variable is 5 or more, then there is the presence of collinearity with that variable. To overcome this problem, one of such variables should be removed from the regression model.

Chapter Three: Data Analysis

3.1 Data Organisation

Statistical techniques include both compilation procedures and adjustments to be made to raw data by ensuring that errors are minimized; also estimating of missing observations. The task of data compilation covers the extraction of data from collections of questionnaire responses made online by the respondents. Extraction of data collected requires the knowledge of analysis platform to be used, in this case the SPSS, and the coding procedures. Both the tasks of storing and manipulating data and assessment of data quality critically are most valuable in this stage. Compilation requires sound judgment on responses based on the background of the respondents and planned estimation methods.

The extracted data were entered directly to the IBM® SPSS® Statistics data file which is organized by cases (rows) and variables (columns). In this data file, cases represent individual respondents to a survey and variables represent responses to each question in the survey. Defining descriptive variable labels and value labels for variable names and data values are essential as they are used in statistical reports and charts. Variables could be of different types, including numbers, strings, currency, and dates.

There are other options for organizing the data which use spreadsheet applications (Microsoft Excel), database applications (Microsoft Access) and text files.

3.2 Analytical Techniques

To understand the data gives message about the population are reflected by descriptive statistics (Frequencies, Descriptives, Cross tabulation, etc.) and bivariate statistics (Means, t-test, Correlation) which are quite versatile. However, descriptive statistics as well as inferential statistics were utilized to accomplish the conclusion and have a fair understanding of the research issues.

At outset, checking the presence of any missing data in the database is the prime job to ensure all relevant information is taken into account for analysis. The presence of data as unexpected and beyond the general perception is also important as such a case may influence the result and could yield a surprise.

The respondent's attributes including age, experience, knowledge base, and relevance with procurement and e-GP systems are initial subjects of investigation. At secondary level, their attitude to the factors of influence as listed in the questionnaire and their level of perception about individual factors are the matter of interest. Then selecting a compromised set of factors according to their ranks depending on choice and statistical justifications those favour the e-GP or do not.

For the purpose of identifying factors justifiably influence the e-GP, a linear relationship of the factors was assumed based on which regression model to be estimated. The linear regression model assumes that there is a linear, or "straight line," relationship between the dependent variable and each predictor. The form of relationship between variables within the model should keep linear as far as possible and it was taken care of through

necessary transformations. The better the value of statistical significance, the variables are more likely to be mutually independent.

Finally, a common set of factors influencing the e-GP would have been developed from those recognised as perceived by the respondents and those factors identified by the regression work.

3.3 Characteristics of the Respondents

The respondents, almost all are from procurement environment, thus the expectation of the survey work meets satisfactorily. As mentioned, the targeted respondents were from e-GP environment such as the Head of the Procuring Entity, approving authority, Procuring Entity, opening and evaluation Committee members, Tenderers, Applicants, Bank users, System administrators etc.

A total of 63 responses were received of which 71.4% were from registered users of e-GP and one did not answer (Table-6), however more than the registered users (93.7%) were trained in procurement (Table-7) and 84.1% got training on e-GP (Table-8).

The most proportion of the users (44.3%) was 'Procuring Entity' and 29.5% were TEC/PEC members; this is significant due to the fact that they actually drive the procurement process and play the major role. A significant proportion of the users do not use e-GP by themselves which reflect against the spirit of decision making in tendering process and potential to abuse of the system. The length of experience of the e-GP users shows a fair distribution (Table-9). Table-10 shows that the users (77.4%) were matured enough being 30~50 years old and their behaviour about use of e-GP reflects some lack of governance in the system.

Table-6: Registered e-GP Users Among Respondents

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	45	71.4	72.6	72.6
	No	17	27.0	27.4	100.0
	Total	62	98.4	100.0	
Missing	System	1	1.6		
Total		63	100.0		

Table-7: Respondents Got Training on Procurement

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	59	93.7	96.7	96.7
	No	2	3.2	3.3	100.0
	Total	61	96.8	100.0	
Missing	System	2	3.2		
Total		63	100.0		

Table-8: Respondents Got Training on e-GP

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	53	84.1	84.1	84.1
	No	10	15.9	15.9	100.0
	Total	63	100.0	100.0	

Table-9: Experience in Public Procurement

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	> 20 years	17	27.0	27.4	27.4
	15 ~ 20 years	13	20.6	21.0	48.4
	10 ~ 15 years	4	6.3	6.5	54.8
	5 ~ 10 years	14	22.2	22.6	77.4
	< 5 years	14	22.2	22.6	100.0
	Total	62	98.4	100.0	
Missing	System	1	1.6		
Total		62	63	100.0	

Table-10: Age Band of Respondents

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid				
50 ~ 60 years	7	11.1	11.3	11.3
40 ~ 50 years	27	42.9	43.5	54.8
30 ~ 40 years	21	33.3	33.9	88.7
< 30 years	7	11.1	11.3	100.0
Total	62	98.4	100.0	
Missing System	1	1.6		
Total	63	100.0		

The respondent's pattern with respect to experience, age and knowledge shows prospective to the objectives to this study. The composition of respondents was from a distributed type of varying experience in procurement functions where 40% were with less than 10 years, while 54% were with 15 years or more (Table-9), thus allowed a balance in feedback to the questionnaire. 74% of them are at their middle of the age - around 40 years (Table-10) reflecting psycho-physical maturity and potentially have ability to brainstorm properly.

Although 77.6% of the respondents were registered with e-GP, more than 10% of them were lacking to use e-GP themselves, they allowed others to use in favour of them. This is alarming due to the risks that the other users might misuse of the delegation they got from the authorized users which could cause litigation as well as indiscipline in the procurement process.

One-fifth of the users were not registered however they use e-GP which could be as authorized by registered users or they use training suit of the system, one of the respondents was trainer of e-GP for example.

3.4 Involvement of Respondents in Procurement and e-GP

The targeted population for the survey was among those in procurement and concerned with e-GP. The survey result shows about 98% of them were trained on procurement (Table-7) and 86% got e-GP training (Table-8). It is clear that private sector do not have much facilities for training on procurement, even the academic curriculum do not reflect it in depth. So the contractors, applicants or suppliers, although they are essential parts of procurement (also e-GP), are lacking to have formal training in this regard. The public sector also struggling to disseminate the technology to its human resources. In spite of limited scope of training, this activity is seen a value adding to governance processes.

According to role in procurement systems, the majority of respondents are procuring entities (43%) and committee members (37%); while the Registered Contractor/Supplier/Consultants were only 6.5% (Table-11); and unfortunately no HOPE took part in the survey. Among 'non-registered' and 'other' categories, the respondents were trainer of procurement, system administrator, authorized user and procurement specialists.

Table-11: Role/Function of Respondents in e-GP

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Other	3	4.8	4.8	4.8
Registered Contractor/ Supplier/ Consultant	4	6.3	6.5	11.3
TEC/PEC member	19	30.2	30.6	41.9
TOC/POC member	4	6.3	6.5	48.4
Procuring Entity	27	42.9	43.5	91.9
HOPE/Approving authority	5	7.9	8.1	100.0
Total	62	98.4	100.0	
Missing System	1	1.6		
Total	63	100.0		

Table-12: Cross-Tabulation of Registered vs. Actual User of e-GP

			Actual user e-GP					Total
			Self	Subordinate officers	Other office	Committee member	Other	
Registered user of e-GP	Yes	Count	39	4	1	0	1	45
		%	67.2%	6.9%	1.7%	.0%	1.7%	77.6%
	No	Count	6	0	3	1	3	13
		%	10.3%	.0%	5.2%	1.7%	5.2%	22.4%
Total		Count	45	4	4	1	4	58
		% of Total	77.6%	6.9%	6.9%	1.7%	6.9%	100.0%

Although most of the respondents use e-GP in their own (requiring a security password), a significant proportion - 14% of them depends on others to deliver the responsibilities in e-GP (Table-12). It is a cause of concern that there is a possibility to a significant misuse of the system and subsequent hazards could be in the operational procedures such as administration and control.

3.5 Response to the Factors of Influence

The response to the question seeking the level of overall impact due to the presence of influencing factors of e-GP were found to be positive which meets the expectations. The result shows the factors mentioned in the questionnaire have a medium to high impact on e-GP according to 76% of the respondents (Table-13). This is due to the collective impacts of those factors as individuals could perceive in the survey. This relationship satisfies Equation 5 mentioned in Section 3.5 and can be modified as below:

$$\text{Overall impact} = \int \text{Presence of Supporting \& Opposing factors} + \text{Unobserved factors}$$

..... Equation 6

Table-13: Level of Overall Impact Due to Influencing Factors of e-GP

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Moderate impact	7	11.1	11.3	11.3
	Medium impact	19	30.2	30.6	41.9
	High impact	28	44.4	45.2	87.1
	Heavy impact	8	12.7	12.9	100.0
	Total	62	98.4	100.0	
Missing	System	1	1.6		
	Total	63	100.0		

3.6 Perceived Factors and Their Ranking

The rating of the factors of influences results in identifying those favours or opposes the e-GP. A number of factors were ranked in a varying degree to favour ranging from 49% to 86% of respondents choose them as supportive when accounted the votes of both 'supports' and 'supports strongly' categories.

The factors such as Decision making, Efficiency in procurement, Good governance, Data reliability & accuracy, Transparency & equal treatment, Regulation & support by CPTU, Knowledge, experience & skill, Secure and interoperable platform, Access to e-GP free and unrestricted, Performance monitoring, Government legislation, Telecommunication and internet, and Reporting capability won over 70% of votes. However, for Performance monitoring, Government legislation and Reporting capability 20% of the respondents in each case kept them neutral. Considering this significance, these factors are ranked to medium influence category and the remaining factors mentioned are categorized to have high influence. Another factor 'Potential for mobile phone e-GP' which relates the possibility of mobile phone use for e-GP operation suggests having influence to medium

category as it gained 67% supports. For three factors Level of visibility (67%), Document transmission (67%) and Infrastructure with appropriate hardware and software (60%), 20% of the respondents were seen neutral in each case. Therefore they are categorized to have some influence.

A vast number of respondents (25% to 34%) did not vote keeping them neutral for other factors - Provision for training, Available time to use e-GP, Top management support, Nature of organisation or procurement, Length of procurement cycle, Control over budget & purchasing, and Software updating. These are considered as dubious to their direction of influence the e-GP and dropped from the influence list.

Several factors were found to be reactive to e-GP, among those Cash transaction, Influence of vested interests, Leakage/disclosure of information, Cartel, corruption, fraudulent, collusion or coercive activity, End user resistance, and Fear and inertia of organisation were supported by 56% to 65% respondents as they oppose e-GP. These are categorized to have medium influence. However, the factors such as Leakage/disclosure of information, Cartel, corruption, fraudulent, collusion or coercive activity, End user resistance might create serious consequences to procurement operations and so procurement professionals should be very careful of these factors.

Human intervention and Digital divide were opposed by 58% and 47% respondents respectively, but 23% of respondents for earlier factor and 20% of respondents for later factor were neutral. Due to this uncertain condition, they are ranked to have lower influence.

Other factors used in the questionnaire such as Manager pursue functional targets, Power interruption & failure, Supplier integration, and Supplier number were identified as they oppose the e-GP, but many respondents (up to 55%) were neutral. This significance drove them out of the decision regarding their position. However, if manager pursue functional targets or incidence to power interruption & failure occur, then e-GP operation must suffer seriously. So influence of these factors should not be ignored.

Two contesting sets of factors among which one is active in favour and the other is working against e-GP in Bangladesh are summarized. Figure-7 shows these counteracting factors of e-GP with their degree of influence. It shows that factors such as Leakage/disclosure of information, Influence of vested interests, Cash transaction, and Cartel corruption fraudulent collusion or coercive activities are most detrimental to the e-GP process.

Table-14: Set of Factors For and Against e-GP

Factors in Favour	Factors Against
Decision making Level of visibility Good governance Reporting capability Government legislation Document transmission Performance monitoring Efficiency in procurement Data reliability & accuracy Execution of law and order Knowledge, experience & skill Regulation & support by CPTU Potential for mobile phone e-GP Transparency & equal treatment Telecommunication and internet Secure and interoperable platform Access to e-GP free and unrestricted Infrastructure with appropriate hardware and software	Digital divide Cash transaction End user resistance Human intervention Influence of vested interests Fear and inertia of organisation Leakage/disclosure of information Cartel, corruption, fraudulent, collusion or coercive activity

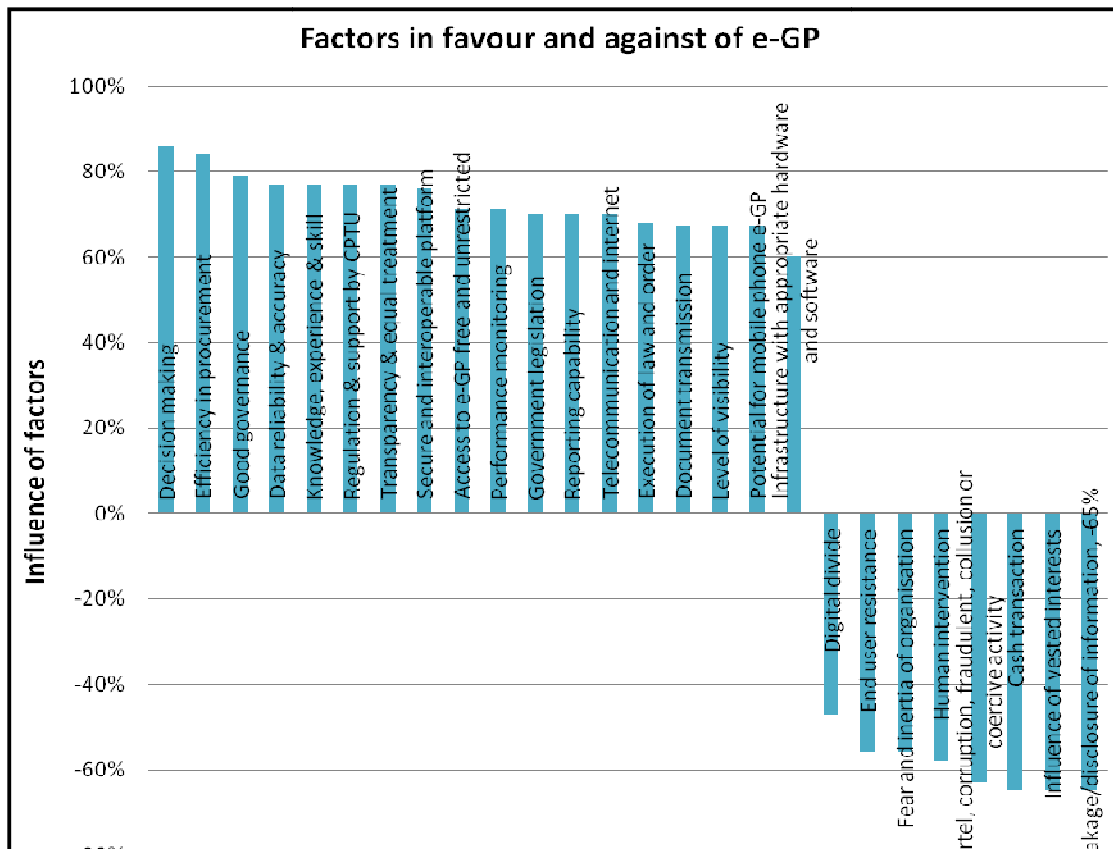


Figure-7: Factors in favour and against of e-GP

3.7 Regression Modeling

The regression of original model summary showed a good fit and 73.5% of the variations in factors of influences on e-GP could be explained by this model. However, a negative adjusted R Square indicates the presence of some problems in the model. Also the analysis of variance reported a low level of F statistic, indicating that the variance were by chance. The coefficients indicated that there were a number of predictors in the model. There were several variables with significant coefficients, indicating that those variables contribute much to the model. The standardized coefficients could help to determine the relative importance of the significant predictors. Among the predictors,

Influence of vested interests, Supplier number, Secure and interoperable platform, Infrastructure with appropriate hardware and software, Execution of law and order, Cash transaction, Access to e-GP free and unrestricted, Manager pursue functional targets, Transparency & equal treatment, End user resistance, Fear and inertia of organisation, Data reliability & accuracy, Human intervention, and Software updating contribute to the model significantly because of their larger absolute standardized coefficients.

For many predictors, the values of the partial and part correlations were dropped significantly from the zero-order correlation which means that much of the variance in one predictor is explained by multiple variables. Thus the coefficients show that there are the possibilities of multicollinearity problem. Moreover, the small tolerances show that about 90% of the variance in a predictor can be explained by the other predictors. With small tolerances, there were high multicollinearity and the standard error of the regression coefficients could be inflated. As variance inflation factor (VIF) greater than 2 is usually considered problematic and the smallest VIF in the table is 5.513 the data set required further treatment.

Moreover, coefficient table contained the collinearity diagnostics which reflect considerable problems with multicollinearity in the model relationship. As there were many eigenvalues of very low, the predictors indicate highly inter-correlated in which small changes in the data values may lead to big changes in the estimates of the coefficients. Almost 90% of the condition indices were greater than 15 (serious problem

when greater than 30); thus model dimensions were found problematic in terms of collinearity.

Z scores treatment of the independent variables gave the eigenvalues improved relative by two-third of the factors to the original model; the problems of condition indices were almost eliminated. However, the collinearity statistics reported in the coefficients table remained similar as before. This can be explained by the fact that the z-score transformations do not change the correlation between two variables, where z scores are standardized values of the variables.

Using the Factor Analysis, a set of uncorrelated independent variables that fits the dependent variable and original independent variables can be created. Factor Analysis is used for data reduction or structure detection. The purpose of data reduction is to remove highly correlated variables from the data file; and structure detection examines the underlying relationships between the variables.

Using the factor scores, a linear regression on factor component scores resulted a far better model fit (Tables-15 & 16) than that of original predictors. The collinearity statistics also became better and the factor scores were uncorrelated (Table-25). Analysis of variance shows that the factors of e-GP significantly influence it.

Table-15: ANOVA (Dependent Variable: LogOverall) Factor Score

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	3.316	20	0.166	26.038	0.000
Residual	0.178	28	0.006		
Total	3.494	48			

Table-16: Model Summary (Dependent Variable: LogOverall) Factor Score

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.974	0.949	0.913	0.07980

Stepwise methods are also convenient to focus on a smaller subset of predictors. It selects models based solely upon statistical merit; however it may choose predictors that have no practical significance. Thus the new model explained the predictors more favorably compared to that of the previous model. The adjusted R-square statistics became nearly identical in just 6 iterations (Table-17). Almost 93% of the variations in the factors of influences on e-GP now are explained by this model.

Table-17: Model Summary (Dependent Variable: LogOverall) Iterations

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.887 ^a	0.787	0.783	0.12579
2	0.933 ^b	0.871	0.866	0.09895
3	0.949 ^c	0.900	0.894	0.08803
4	0.957 ^d	0.916	0.909	0.08154
5	0.964 ^e	0.929	0.921	0.07592
6	0.967 ^f	0.936	0.927	0.07304

The stepwise algorithm chose the factor scores 15, 1, 3, 9, 2, and 7 as predictors (Table-29 in Annexure-3). The rotated component matrix in the Factor Analysis output (Table-30 in Annexure-3) gives results below:

- The fifteenth component (factor scores) loads more to Potential for mobile phone e-GP. Since the regression coefficient is positive for factor score 15, the mobile application of e-GP is potential to its higher use.
- The first component (factor scores) loads strongly on eight negative factors such as Influence of vested interests, Digital divide, End user resistance, Human intervention, Fear and inertia of organisation, Leakage/disclosure of information, Power interruption & failure, Manager pursue functional targets, and Cash transaction. Since

the regression coefficient is positive for factor score 1, the higher influences of these factors can lead to lower uses of e-GP.

- The third component loads most strongly on Supplier number, Supplier integration, Software updating, and Top management support. The positive coefficient for factor score 3 suggests that Suppliers motivation and involvement are expected to have higher e-GP usage.
- The ninth component loads most strongly on Efficiency in procurement and Document transmission. Since the regression coefficient is positive for factor score 9, this suggests that greater efficiency in procurement are expected to have higher use of e-GP.
- The second component loads most to seven factors i.e. Good governance, Performance monitoring, Transparency & equal treatment, Decision making, Secure and interoperable platform, Government legislation, Top management support, Potential for mobile phone e-GP, and Infrastructure with appropriate hardware and software. Since the regression coefficient is positive for factor score 2, suggesting overall governance in governmental procurement systems are expected to have higher use of e-GP.
- The seventh component loads most strongly on Regulation & support by CPTU along with Decision making and Data reliability & accuracy; the component loading combined with the negative coefficient for factor score 7 suggests that regulations are understood as deterrent, public sector decision making and data reliability is also poor. However, supportive regulation, prompt decision making and reliable data flow can impact positively.

Table-18: Coefficients of Factor Components

Factor scores	Factors	Co-efficient	t	Significance
15	Potential for mobile phone e-GP	0.748	13.754	.000
1	Influence of vested interests, Digital divide, End user resistance, Human intervention, Fear and inertia of organisation, Leakage/disclosure of information, Power interruption & failure, Manager pursue functional targets, and Cash transaction	0.291	7.453	.000
3	Supplier number, Supplier integration, Software updating, and Top management support	0.154	3.903	.000
9	Efficiency in procurement and Document transmission	0.189	3.480	.001
2	Good governance, Performance monitoring, Transparency & equal treatment, Decision making , Secure and interoperable platform, Government legislation, Top management support , Potential for mobile phone e-GP , and Infrastructure with appropriate hardware and software	0.114	2.901	.006
7	Regulation & support by CPTU, Decision making , and Data reliability & accuracy	-0.083	-2.111	.041

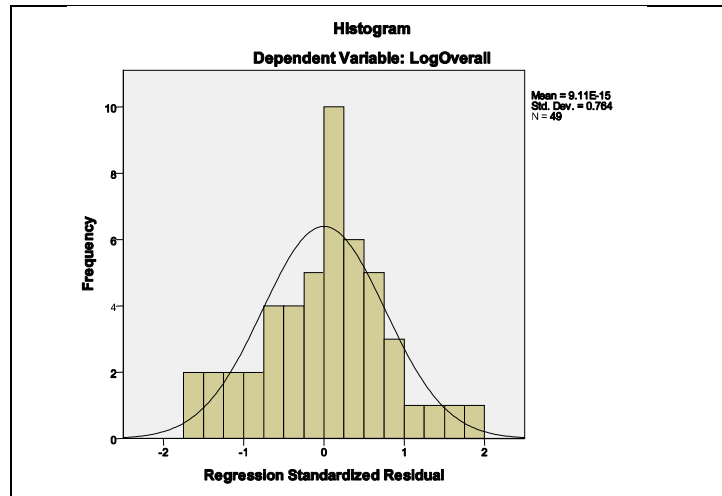


Figure-8: Histogram of Dependent Variables (Modified data)

The histogram of modified data implies acceptance of the hypothesis of normality.

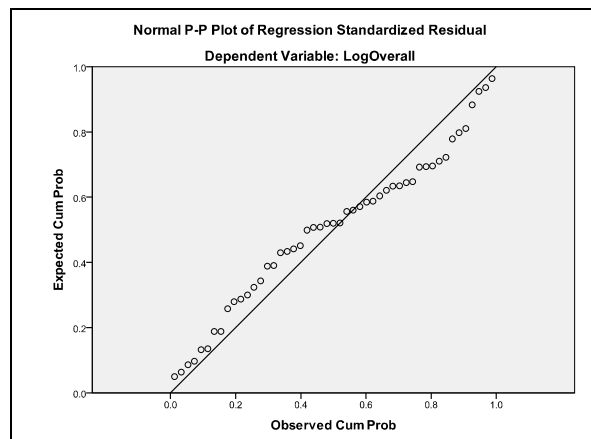
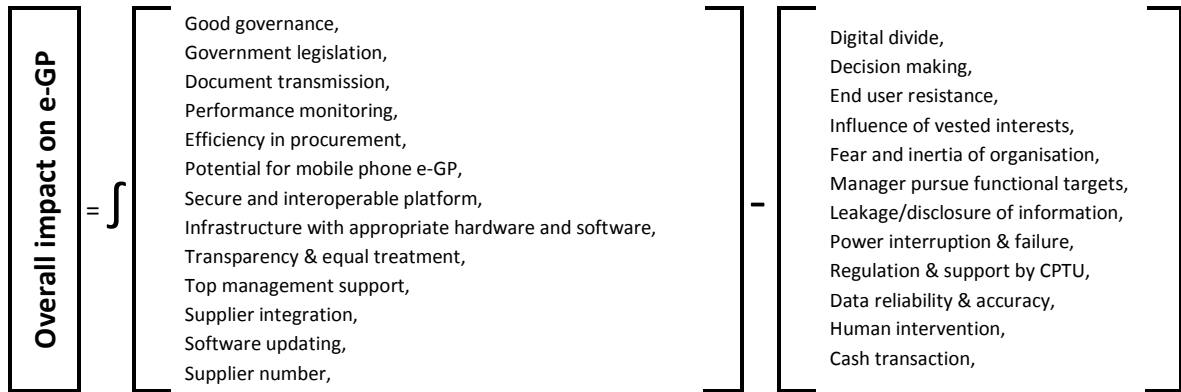


Figure-9: Normal P-P Plot with Modified Data

The model combined by the matrix of factors in which 13 were found prominent in favour of, and 12 were against the e-GP stands in the following figure.



Chapter Four: Discussion on Results

4.1 Empirical Results

Due to functional presence of the respondents in a procurement environment they possess a good knowledge of practicing procurements and had skills in e-GP. They took about 14 minutes time to respond the questionnaire and spent 18.5 seconds for each choice which reflects the length and complexity of the questionnaire design was reasonable and suitable.

The respondents formed a good sample and their inputs were quite useful. Bangladesh government intends to expand practicing e-GP and simultaneously giving training to the users. Some respondents were seen to use e-GP even they did not get relevant trainings. This shows an influence of the e-GP that developed around government procurement environment and attracts the interests of users. Their proactive role to capture the knowledge of e-GP undoubtedly helps the progressing of paperless tendering.

Within the e-Tendering process, procurement legislation in Bangladesh allows more roles to the procuring entity and committee members. According to the results of the research work, about three-fourth of the respondents were from procuring entities and committee members which show a fair quality of responses although few responses were seen lack of knowledge or proper concentration in making responses. The questionnaire did not ask for the level education or background of the respondents; so this remains a grey to justify the reasons of such responses.

Although most of the respondents were registered with e-GP (72.6%), some of them were lacking in use of e-GP themselves, rather they let others to use in favour of them. This poses the risks of misuse of the system due to unauthorized access which could cause litigation as well as indiscipline in the procurement process. So this is contradictory to the government's intention to fair service delivery and governance.

Some respondents use e-GP even though they were not registered with the system; part of them was users of e-GP training suit – one respondent was the trainer of e-GP for example. There is an argument in favour of accessing e-GP for others is that some organisations deal with a huge number of procurements, say RHD and LGED. The role of HOPE in such case is usually performed by delegation as 'Approving Authority' however the HOPE needs to carry out some critical role which sometimes may require to allow the others for using e-GP to accelerate the service delivery process, however, such attempt requires a higher degree of control.

Statistical results give a clear indication that the listed factors have a great influence on e-GP. So it became essential to look for the factors which were active to favour or oppose the system. Based on the perceived choice of the respondents a clear set of counteracting factors was developed considering the level of choice and silence as they could influence the result if the choice was otherwise.

The factors of influence such as Decision making, Efficiency in procurement, Good governance, Data reliability & accuracy, Transparency & equal treatment, Regulation & support by CPTU, Knowledge, experience & skill, and Secure and interoperable platform were most supportive their efficient utilization requires dealing them careful and wisely in

order to maximise the benefits of e-GP. Provision for training, motivating and incorporating relevant factors in the policy and practice, also reinforcing by the senior officials can maximise the benefits.

As the factors such as Leakage and disclosure of information, Influence of vested interests, Cash transaction, and Cartel corruption fraudulent collusion or coercive activities have damaging role to e-GP, they need careful deals in minimise the harm. This also needs training and motivating with strong defense by the authority. The control measure against leakage and disclosure of information is considered under Section 64 of PPA 2006 and Rule 127 of PPR 2008, but only legal provision may not suffice and it requires something more role from the appropriate authority. A strict provision of technology is essential which would prevent accessing tendering information before deadline of public disclosure, opening the tenders for example. Incidence investigation and sharing, internal policing, whistle blowing also can help to safeguard the system and benefit all. Influence of vested interests can be counteracted by the active support from outside the organisation structure; political consensus can be a backing for example. Minimizing cash transaction using secured online banking and tracking any cartel, corruption, fraudulent, collusion or coercive activities can help e-GP a lot. The procuring entity, committee members and HOPE have a great role in this respect.

Implementing good governance in the organisation, using supportive human resource and ensuring anti-corruption and social safeguard policy could promote a favourable environment for e-procurement especially in public sector of Bangladesh.

4.2 Statistical Analysis

R Square value of the original regression model 0.735 agrees that the model fit, however the F-statistic was low. The coefficients of the model produced significant coefficients of a number of predictors and several variables, thus these variables were found to have considerable influence on e-GP. The standardized coefficients show the relative importance of significant predictors. Many predictors had larger absolute standardized coefficients and so contribute the model more. There were the issues of correlations and multicollinearity but various techniques such as factor analysis, especially the stepped one resolves to a distinctive outcome by giving better model fit (R-squared 0.949), a good F statistic (26.038) and other indices.

Evidence shows that use of mobile phone has potential for e-GP (Table-19) and found to be the main factor. The mobile phone based e-GP would gain more acceptance of the system and increase the speed of operation. The users might find it easy to use by accessing from anywhere. Mobile phone apps for e-GP could make the difference.

Table-19: Mobile Phone based e-GP

SN	Variables	Factor loading
1	Potential for mobile phone e-GP	0.484

Some opposing factors have serious impacts on e-GP (Table-20). These appear to be the second most influencing factors of e-GP. Vested interests such as politicians, bureaucracy and local elites generally wish to drive the system in their line of interests whatever be the provisions in legal term; e-GP is not the different one. Digital divide is supposed to be a major cause behind the failures of e-service implementation in public sector which can

be minimised through encouraging technology education and making easy access to the electronic wide area network system. End user resistance, Human intervention, and Fear and inertia of organisation are closely related human factors that generally hinder the system to operate smoothly.

Table-20: Vested interests, Digital divide, Attitude of individuals, Organisational culture, Ethical values and Energy infrastructure

SN	Variables	Factor loading
1	Influence of vested interests	0.886
2	Digital divide	0.839
3	End user resistance	0.811
4	Human intervention	0.803
5	Fear and inertia of organisation	0.798
6	Leakage/ disclosure of information	0.718
7	Power interruption & failure	0.718
8	Manager pursue functional targets	0.668
9	Cash transaction	0.442

The most detrimental element is the leakage and disclosure of information, the others are managers pursue for their functional targets, and intention to make transactions in cash which can also be characterized as poor human quality. Power interruption & failure is another factor that also hinders the e-GP system which can be improved by better service delivery in the power sector.

Table-21: Suppliers, Systems Support and Top Management Role

SN	Variables	Factor loading
1	Supplier number	0.933
2	Supplier integration	0.858
3	Software updating	0.489
4	Top management support	0.432

Table-21 shows the third group of influencing factors that depicts Supplier is the key to source the requirements that needed for any system to operate. The more suppliers the e-GP could attract, the procuring entity would be able to source by switching the supplier and e-GP would get more vibrant. However, having the quality suppliers and retaining them is important. Updating the systems software, and Top management support also influence the e-GP positively.

Table-22: Efficient System Development

SN	Variables	Factor loading
1	Efficiency in procurement	0.857
2	Document transmission	0.511

As the e-GP system gets efficient and document transmission becomes secured and easy, use of e-GP could potentially be wider and speedier. So the e-GP provider organization CPTU should play appropriate role to ensure the operational efficiency and faster transmission of documents.

Table-23: Good Governance and Transparency with Support from Management and Technology

SN	Variables	Factor loading
1	Good governance	0.830
2	Performance monitoring	0.754
3	Transparency & equal treatment	0.734
4	Decision making	0.692
5	Secure and interoperable platform	0.687
6	Government legislation	0.650
7	Top management support	0.550
8	Potential for mobile phone e-GP	0.428
9	Infrastructure with appropriate hardware and software	0.401

Ensuring good governance and transparency (Table-23) could benefit e-GP as expected. Nonetheless support from top management and availability of a good operational infrastructure also could accelerate the higher use of e-GP. Government has a vital role in this respect. Political, business and social climate as a whole are also important.

Table-24: Red Tape Regulation and System Security

SN	Variables	Factor loading
1	Regulation & support by CPTU	0.831
2	Decision making	0.476
3	Data reliability & accuracy	0.471

The factors regulation is not expected in general; however, a soft regulation, prompt decision making and data reliability may influence in favouring e-GP.

4.3 Summary of the Results

From the results above, a comprehensive set of driving and restraining factors was developed which can be seen below.

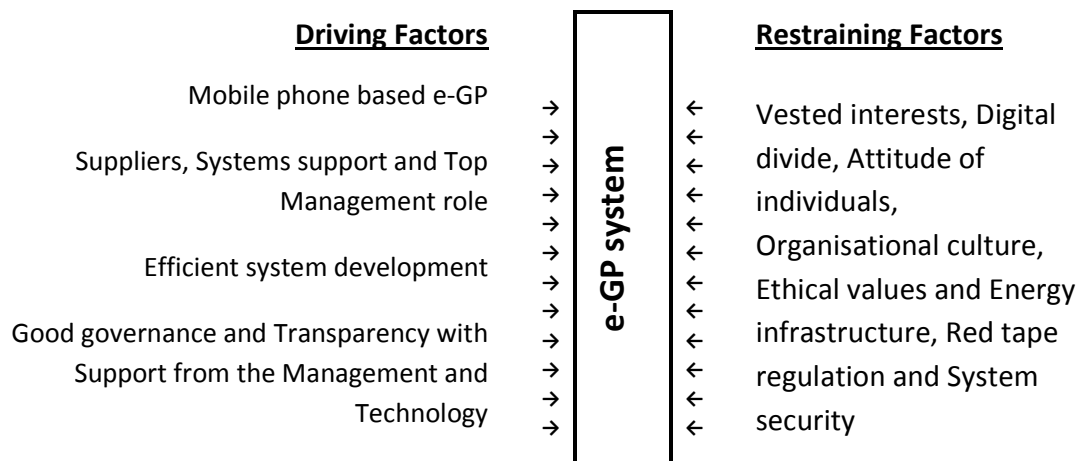


Figure-10: The Comprehensive Set of Factors For and Against e-GP

Above result supports great influences of a number of factors of e-GP. Among them, mobile phone based e-GP (for example, mobile phone apps) along with secure and

interoperable platform might offer 'touch and play' benefits to its users and could boost the use of e-GP in Bangladesh.

Suppliers are the valuable player in this system that requires to develop by facilitating and getting them involved. Systems support by software updating and network maintenance has a great role to run the e-GP system; without this the users may go back to paper-based system and e-GP might lose reliability. Top management's role can make the difference in promoting e-GP usage. LGED is an example of e-GP operation considering the scale of usage that has 716 PEs, most of them at upazila level, and achieved publishing 10,932 (62.8%) and finalizing 6,273 (62.6%) e-Tenders/Proposals. Thus performance of e-GP largely depends on the performance of LGED. This could happen mostly due to the strong backing by its top management.

Efficient system development is possible as e-GP is based on electronic technology. With immense development and expansion of ICT globally, e-GP has the opportunity to utilize it and prove itself as efficient in procurement service delivery. This study supports the proposition.

Good governance and transparency is at forefront of the procurement reform and establishment of e-GP system. With Support from management and having technological provisions this goal can be achieved easily. Supportive bureaucracy and system security is another factor that also helpful to boost up the e-GP.

Concern about ethical breach by leakage and disclosure of bidding information is addressed by the PPA 2006 Section 64 and PPR 2008 Rule 128. However, there is chance of offense by the parties involved as a result of the study which supports the argument

that only regulatory provisions are not sufficient to tackle such behaviour. Along with ethical declaration, some other provisions must be considered such as investigation, sharing the incidence, punishment and reward, whistle blowing, technological provision so that none can access the bidding information before deadline of submission of tenders.

Digital divide is a barrier to economic opportunities, especially for least developing countries like Bangladesh which needs to bridge as soon as possible. ICT sector is believed to have tremendous potential for poverty eradication and socioeconomic advancement. Bangladesh has remarkable progress in accessing ICT and their application, however, broadband deployment not kept pace with the world so made the progress, resulting in continuing gap in digital access. As the appeal of smart phones grows in Bangladesh, people can access the Internet more through mobile devices that call for greater focus on wider use and the full involvement of the Government, subsidizing the sector for example. However, there are challenges in promoting ICT as an enabler for promoting development.

Understanding the need and potential benefit of e-GP system can reduce fear and inertia of the user organisations. Communicating clear vision to every stages of the organization can help in this regard. Motivation by the superior executives, also by the members of the board through inclusion the vision in policy documents and using it as a slogan of the organization can overcome such fear and inertia.

Media news shows that Public Works Department official in Khulna (Annexure-5) was unwilling to use e-GP which is an example of end user resistance that is experienced as

changes in traditional method. Change leader has a great role to overcome such reactions. Advance information that demands loyalty of the officials to comply with the requirements of e-GP implementation is in place. However, provision of motivation and extensive training as well as involving the users well ahead and getting feedback can improve such resistances.

The vested interests (politicians, bureaucrats and local elites for example) in least developed countries are seen to be prominent and against implementation of a reform, even there are legal provisions. E-GP is also influenced by those as which is another output of the research that needs to address properly so that those do not hinder the e-GP process to function effectively. Involvement of politicians, bureaucrats and local elites with e-GP process and attempting to motivate them and a strong policy leadership can help to countervail the problem.

In terms of research questions, section 1.5 responds the first question; section 4.3 gives solution of the last question and the other questions regarding the factors of influence are the main work of this research which is covered mainly by the Chapter Three.

Chapter Five: Conclusion and Recommendations

5.1 Conclusions

This research reveals that e-GP is greatly influenced by facilitating through technology and infrastructure in place, maintaining of efficient system management, having support from top management, availability of supportive bureaucracy and overall ensuring good governance and transparency. The tenderers/ suppliers are important parties in influencing the system that needs to develop and maintain for better outcome of the procurement.

It is also highly influenced by the vested interests, digital divide in the society, individual's attitude to the system, organisational culture, ethical values and efficient energy infrastructure. However, strong control of ethical malpractice such as leakage and disclosure of bidding information, minimizing digital divide, removing fear and inertia of the user organisations, assuring the end users, and managing the influence of vested interests are essential for a well functioning e-GP. The counter acting forces must be managed in order to reap the benefits of enhanced governance and maintain a sustainable procurement system.

Government of Bangladesh, especially CPTU has a considerable role to enhance the promotional factors of e-GP as well as to treat the counteracting issues such as dealing with the vested interests and ensuring the demand management in power supply so that e-GP can be operational and be uninterrupted.

The evidences found as a result of the study could help better understanding and prediction of procurements issues. The findings are expected to be useful to the planners and policy-makers of the country to improve the e-government procurement processes by adopting appropriate measure and ensure collaborative and win-win business environment in ongoing and future e-government applications in Bangladesh. As the socio-political and economical conditions challenge the public procurement environment continuously, assessments of factors of influence on e-GP should also be reviewed and updated on a regular basis to ensure its incremental effectiveness.

Finally, the research outcome shows that it responds the research questions appropriately and meets the requirements of the objectives sufficiently.

5.2 Recommendations

A good management strategy is critical to success of e-GP. As the best practice e-procurement system, e-GP must identify the barriers and opportunities. The barriers may be specific to procurement process, in the organisation itself or in existing communication channels. The presence of favoring factors as well as counteracting factors of e-GP demands the enhancement of potentials of favoring factors and managing the odds.

Based on this research, following actions are recommended to further step forward the e-GP system:

- Develop mobile phone based apps and offer user friendly operation for its users;
- Mechanisms are developed that suppliers get encouraged more to use the system;

- Top executive in the organisations play a lead role to keep pace of growth in transforming procurement system to paperless electronic option;
- Continued systems support and ensure system security so that e-GP operation are hindered; also keep the platform interoperable by providing a good infrastructure utilizing skilled personnel; the technology should keep pace of global changes;
- Ensure good governance and transparency in procurement environment; also make support from the top management available; and bureaucracy should be supportive to need of the system flexibly;
- Effective control of leakage and disclosure of bidding information through technological provision as well as proper administration and ethical practice;
- Implementation of a communication plan for stakeholders to remove fear and inertia of the user organisations and assure the end users;
- Managing the influence of vested interests by involving them in steering committees and by communicating and educating;
- Promote digital society and thus minimize the digital division;
- Review and update the set of factors of influence on e-GP to ensure its incremental effectiveness;
- Future studies may consider inclusion of more personal attributes such as education, sex etc.

The authority may consider above recommendations. While the role of leadership is vital in achieving the goals and bringing about collective commitment, management should ensure availability of implementation plan, training program, stakeholder management,

dealing with the barriers to e-GP and several other organizational aspects as mentioned. Without this, governance in procurement especially the e-GP might suffer.

5.3 Limitations

Scope of the research work on e-GP is very wide that could carry activities to the quantifying its overall impacts on economy as a whole. However, the prevalent factors, such as available time, finance resources, human factor and requirement of the degree governs the boundary of the work. Thus scope of the work was limited to determination of for and against metrics around e-GP in Bangladesh based on their level of influence from user perspectives. The shorter period of time also limits access to appropriate resources and to interact wider range of stakeholders about the subject matter. Also there are only a few research works on e-GP in Bangladesh context and so advances in this field are yet to make.

Another limitation is the survey itself – the respondents were mainly the e-GP users; wider range of stakeholder opinion could result a greater variation in outcome. Moreover, the method of survey was electronic, the understanding of the respondents could not be realized well which is possible in face to face interview; also the queries of the respondents could not be clarified and hence few responses in the survey might be inappropriate. The questionnaire was limited to choice in its main part, the explanations or reasons of respondent's choice were not explained; even the potential factors were not elaborated. If these shortcomings could overcome, this research work could give a clear guidance to its readers especially the policy makers, researchers and practitioners.

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Appendices

Appendix-1: The Questionnaire

Factors Influencing Electronic Government Procurement (e -GP) in Bangladesh

1. Are you a registered user of e-GP in Bangladesh?

Yes

No

Other (please specify)

2. Which one is your role or function in e-GP? Mention your main role.

HOPE

Approving authority

Procuring entity

Bank official

TOC/POC member

TEC/PEC member

Contractor

Consultant

Other (please specify)

3. Have you got training on procurement?

Yes

No

If yes, duration (days):

4. Have you got training on e-GP?

Have you got training on e-GP? Yes

No

If yes, duration (days):

5. Who do use e-GP for you?

Myself

- My office staff
- Tender inviting office
- Committee member
- Officers under me
- Other (please specify)

6. What is the level of overall impact due to the presence of influencing factors of e-GP in Bangladesh? (List available below Q.9)

<input type="checkbox"/> No impact	<input type="checkbox"/> Moderate impact	<input type="checkbox"/> Medium impact	<input type="checkbox"/> High impact	<input type="checkbox"/> Heavy impact
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7. How long experience do you have in public procurement?

- Less than 5 years
- 5 to 10 years
- 10 to 15 years
- 15 to 20 years
- Above 20 years

8. Please indicate your age band.

- Please indicate your age band. Less than 30 years
- 30 to 40 years
- 40 to 50 years
- 50 to 60 years
- Above 60 years

9. To what extent the factors of e-GP impact it's implementation in Bangladesh? Please RATE the factors according to their level of influence - supportive or not.

	Oppose strongly	Oppose	Neutral	Supports	Supports strongly
Access to e-GP systems is open, free, equal and unrestricted	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Available time to use e-GP	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cartel, corruption, fraudulent, collusion or coercive activity	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cash transaction	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Control over budget and purchase	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Regulation and support by CPTU	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Data reliability and accuracy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Decision making	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Digital divide	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Document transmission	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Efficiency in procurement	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
End user resistance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Execution of law and order	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fear and inertia of organization	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Government legislation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Good governance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Human intervention or interference	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Influence of vested interests	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Infrastructure with appropriate hardware and software	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Knowledge, experience and skills	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Leakage/ disclosure of information	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Length of procurement cycle	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Level of visibility	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Manager pursue functional targets	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Nature of procurement or organization	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Secure and interoperable platform	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Performance monitoring	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Potential for mobile phone e-GP	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Power interruption and failure	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Provision for training	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Reporting capability	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Software updating	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Supplier integration	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Supplier number	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Top management support	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Transparency and equal treatment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Telecommunication and internet	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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Appendix-2: Coding the Questionnaire

1. Are you a registered user of e-GP in Bangladesh? [1=Yes, 0=No]
2. Which one is your role/function in e-GP? [1= HOPE/Approving authority, 2= Procuring Entity, 3= Registered Bank user, 4=TOC/POC member, 5= TEC/PEC member, 6= Registered Contractor/ Supplier/ Consultant, 7= Other]
3. Have you got training on procurement? [1=Yes, 0=No] If yes, duration_days
4. Have you got training on e-GP? [1=Yes, 0=No] If yes, duration_days
5. Who do use e-GP for you? [1=Myself, 2=My office staff, 3=Officers under me, 4=Tender inviting office, 5= Committee member, 6= Other]
6. What is the level of overall impact due to the presence of influencing factors of e-GP in Bangladesh? [1= No impact, 2= Moderate impact, 3= Medium impact, 4= High impact, 5= Heavy impact]
7. How long experience do you have in public procurement? [1= < 5 years, 2= 5 ~ 10 years, 3= 10 ~ 15 years, 4= 15 ~ 20 years, 5= > 20 years]
8. Please indicate your age band: [1= < 30 years, 2= 30 ~ 40 years, 3= 40 ~ 50 years, 4= 50 ~ 60 years, 5= > 60 years]
9. To what extent the factors of e-GP impact its implementation in Bangladesh? Please RATE the factors below according to their level of influence. [1= Oppose strongly, 2= Oppose, 3= Neutral, 4= Supports, 5= Supports strongly]

Appendix-3: Tables

Table-25: Collinearity Diagnostics (Dependent Variable: Log Overall)

Model	Dimension	Eigenvalue	Condition index
1	1	35.073	1.000
	2	1.256	5.285
	3	.289	11.016
	4	.188	13.645
	5	.134	16.172
	6	.123	16.882
	7	.117	17.298
	8	.107	18.111
	9	.097	19.056
	10	.079	21.082

Table-26: Eigenvalue of the Model (z-scored)

Model	Dimension	Eigenvalue	Condition Index
1	1	11.632	1.000
	2	6.850	1.303
	3	2.635	2.101
	4	1.892	2.480
	5	1.745	2.582
	6	1.549	2.740
	7	1.258	3.041
	8	1.204	3.108
	9	.966	3.470
	10	.863	3.671
	11	.851	3.697
	12	.799	3.817
	13	.697	4.085
	14	.609	4.370
	15	.551	4.594
	16	.519	4.736

Table-27: Coefficients (Dependent Variable: LogOverall) Factor Score

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations			Collinearity Statistics		
	B	Std. Error	Beta			Zero-order	Partial	Part	Tolerance	VIF	
1 (Constant)	1.251	.011		109.748	.000						
REGR factor score 8 for analysis 3	-.021	.018	-.078	-1.198	.241	-.043	-.221	-.051	.430	2.325	
REGR factor score 11 for analysis 3	.028	.018	.103	1.562	.130	-.104	.283	.067	.423	2.367	
REGR factor score 18 for analysis 3	.000	.016	.000	-.008	.993	-.028	-.002	.000	.532	1.881	
REGR factor score 19 for analysis 3	-.018	.015	-.066	-1.156	.258	.037	-.213	-.049	.567	1.763	
REGR factor score 20 for analysis 3	.028	.013	.103	2.105	.044	.004	.370	.090	.754	1.327	
REGR factor score 1 for analysis 4	.075	.012	.276	6.186	.000	.287	.760	.264	.913	1.095	
REGR factor score 2 for analysis 4	.034	.012	.125	2.911	.007	.121	.482	.124	.982	1.019	
REGR factor score 3 for analysis 4	.037	.012	.137	3.098	.004	.174	.505	.132	.925	1.081	
REGR factor score 4 for analysis 4	-.004	.013	-.014	-.279	.782	-.001	-.053	-.012	.748	1.336	
REGR factor score 5 for analysis 4	-.018	.013	-.068	-1.373	.181	-.081	-.251	-.059	.751	1.331	
REGR factor score 6 for analysis 4	-.024	.013	-.089	-1.888	.069	-.086	-.336	-.081	.819	1.221	
REGR factor score 7 for analysis 4	.026	.013	.095	1.975	.058	.060	.350	.084	.788	1.269	
REGR factor score 8 for analysis 4	.027	.014	.099	1.920	.065	.055	.341	.082	.687	1.455	
REGR factor score 9 for analysis 4	.011	.012	.041	.920	.366	.071	.171	.039	.903	1.107	
REGR factor score 10 for analysis 4	.016	.012	.058	1.255	.220	.039	.231	.054	.851	1.175	
REGR factor score 11 for analysis 4	-.002	.013	-.006	-.127	.900	.034	-.024	-.005	.750	1.334	
REGR factor score 12 for analysis 4	.008	.012	.031	.678	.503	.032	.127	.029	.888	1.126	
REGR factor score 13 for analysis 4	.248	.012	.920	20.497	.000	.880	.968	.875	.904	1.106	
REGR factor score 14 for analysis 4	-.017	.016	-.063	-1.089	.286	.004	-.202	-.046	.540	1.853	
REGR factor score 15 for analysis 4	.002	.017	.008	.133	.895	-.003	.025	.006	.464	2.154	

Table-28: Coefficients (Dependent Variable: LogOverall) Stepwise

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	1.251	.018		69.621	.000
REGR factor score 15 for analysis 3	.239	.018	.887	13.185	.000
2 (Constant)	1.251	.014		88.507	.000
REGR factor score 15 for analysis 3	.240	.014	.888	16.778	.000
REGR factor score 1 for analysis 1	.078	.014	.290	5.473	.000
3 (Constant)	1.251	.013		99.480	.000
REGR factor score 15 for analysis 3	.240	.013	.888	18.858	.000
REGR factor score 1 for analysis 1	.079	.013	.292	6.197	.000
REGR factor score 3 for analysis 3	.046	.013	.171	3.621	.001
4 (Constant)	1.251	.012		107.407	.000
REGR factor score 15 for analysis 3	.207	.016	.767	12.691	.000
REGR factor score 1 for analysis 1	.079	.012	.291	6.679	.000
REGR factor score 3 for analysis 3	.043	.012	.158	3.592	.001
REGR factor score 9 for analysis 1	.048	.016	.176	2.908	.006
5 (Constant)	1.251	.011		115.360	.000
REGR factor score 15 for analysis 3	.204	.015	.757	13.442	.000
REGR factor score 1 for analysis 1	.079	.011	.291	7.170	.000
REGR factor score 3 for analysis 3	.041	.011	.151	3.698	.001
REGR factor score 9 for analysis 1	.049	.015	.183	3.242	.002
REGR factor score 2 for analysis 1	.031	.011	.113	2.785	.008
6 (Constant)	1.251	.010		119.909	.000
REGR factor score 15 for analysis 3	.202	.015	.748	13.754	.000
REGR factor score 1 for analysis 1	.079	.011	.291	7.453	.000
REGR factor score 3 for analysis 3	.041	.011	.154	3.903	.000
REGR factor score 9 for analysis 1	.051	.015	.189	3.480	.001
REGR factor score 2 for analysis 1	.031	.011	.114	2.901	.006
REGR factor score 7 for analysis 1	-.022	.011	-.083	-2.111	.041

Table-29: ANOVA (Dependent Variable: LogOverall) Stepwise

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2.751	1	2.751	173.832	.000 ^a
	Residual	.744	47	.016		
	Total	3.494	48			
2	Regression	3.044	2	1.522	155.448	.000 ^b
	Residual	.450	46	.010		
	Total	3.494	48			
3	Regression	3.146	3	1.049	135.292	.000 ^c
	Residual	.349	45	.008		
	Total	3.494	48			
4	Regression	3.202	4	.800	120.398	.000 ^d
	Residual	.293	44	.007		
	Total	3.494	48			
5	Regression	3.247	5	.649	112.662	.000 ^e
	Residual	.248	43	.006		
	Total	3.494	48			
6	Regression	3.270	6	.545	102.178	.000 ^f
	Residual	.224	42	.005		
	Total	3.494	48			

a. Predictors: (Constant), REGR factor score 15 for analysis 3

b. Predictors: (Constant), REGR factor score 15 for analysis 3, REGR factor score 1 for analysis 1

c. Predictors: (Constant), REGR factor score 15 for analysis 3, REGR factor score 1 for analysis 1, REGR factor score 3 for analysis 3

d. Predictors: (Constant), REGR factor score 15 for analysis 3, REGR factor score 1 for analysis 1, REGR factor score 3 for analysis 3, REGR factor score 9 for analysis 1

e. Predictors: (Constant), REGR factor score 15 for analysis 3, REGR factor score 1 for analysis 1, REGR factor score 3 for analysis 3, REGR factor score 9 for analysis 1, REGR factor score 2 for analysis 1

f. Predictors: (Constant), REGR factor score 15 for analysis 3, REGR factor score 1 for analysis 1, REGR factor score 3 for analysis 3, REGR factor score 9 for analysis 1, REGR factor score 2 for analysis 1, REGR factor score 7 for analysis 1

Table-30: Rotated Component Matrix (Factor Analysis)

	Component						
	1	2	3	5	7	9	15
Zscore: Cash transaction	.442	-.158	.119	.656	-.059	-.063	-.155
Zscore: Regulation & support by CPTU	-.308	.063	.115	-.117	.831	.117	-.009
Zscore: Decision making	.056	.692	-.048	.047	.476	.192	.075
Zscore: Digital divide	.839	.096	.197	.032	.115	.025	.023
Zscore: Document transmission	.182	.231	-.240	.279	.257	.511	.193
Zscore: Efficiency in procurement	.118	.281	.156	.022	.095	.857	-.030
Zscore: End user resistance	.811	.095	-.018	.130	.023	.135	-.050
Zscore: Fear and inertia of organisation	.798	-.055	-.087	.160	-.016	.050	.296
Zscore: Government legislation	-.066	.650	.381	-.134	.170	.200	.183
Zscore: Good governance	.060	.830	.091	-.040	-.173	-.010	.179
Zscore: Human intervention	.803	-.025	-.049	.071	-.413	.091	-.134
Zscore: Influence of vested interests	.886	-.079	-.176	-.022	-.273	.074	-.069
Zscore: Infrastructure with appropriate hardware and software	-.385	.401	.119	-.154	.232	.343	.141
Zscore: Leakage/ disclosure of information	.718	-.089	-.058	.338	.098	-.211	-.178
Zscore: Manager pursue functional targets	.668	.135	.162	.169	.048	-.052	-.110
Zscore: Performance monitoring	.049	.754	.193	.061	.018	.098	-.046
Zscore: Potential for mobile phone e-GP	-.272	.428	.212	-.316	-.001	.067	.484
Zscore: Power interruption & failure	.718	-.159	.047	.360	-.127	-.040	.269
Zscore: Software updating	-.325	.297	.489	-.320	.009	.119	-.026
Zscore: Supplier integration	-.014	.243	.858	.005	.030	.070	-.005
Zscore: Supplier number	.074	.114	.933	-.020	.049	.010	.030
Zscore: Top management support	-.194	.550	.432	.043	.181	.030	-.051
Zscore: Transparency & equal treatment	-.079	.734	.268	.058	.110	.157	-.244

Extraction Method: Principal Component Analysis.

Abstract

This research work looks for some empirical findings from the survey conducted regarding the factors of influence on e-Procurement system (the e-GP) in Bangladesh from users perspective. Following reform of public sector procurement which was started in Bangladesh in 2003, a transformational change was implemented in 2012 through a step forward from traditional paper-based system to electronic; the users are progressively being capable of benefiting from this. However some concerns were seen in public through experiences and media that the e-GP system has been confronting with some counter-productive factors although there are many supportive elements to take it forward. It was attempted here to understand those factors active in the move and counter-move of e-GP system as relevant to its users.

A questionnaire based online survey was conducted using the 'survey monkey' e-platform aiming the responses from e-GP users or those having substantial experience of procurement in public sector of Bangladesh.

Result reveals that a majority of factors such as Mobile phone based e-GP, Suppliers, Systems support and Top Management role, Efficient systems development, Good governance and Transparency with support from the management and technological provisions do favour the system substantially; while the other factors Red tape regulation and System security, Vested interests, Digital divide, Attitude of individuals, Organisational culture, Ethical values and Energy infrastructure do counter it which could harm the e-GP system seriously if not addressed properly.

Key words: Correlations, e-Procurement, e-Tender, Governance, Transparency.

Chapter One: Introduction

1.1 Background

In Bangladesh, procurement expenditure in Government of Bangladesh (GoB) accounts for about 21% of the national budget which is about 70%-90% of ADP allocation each year (CPTU 2014d). Procurement reform in Bangladesh was initiated in 1999 aiming to introduce governance in utilization of state budget for procurement of all necessary inputs for its operational purpose and thereby to enhance the capacity of public procurement system to achieve openness acceptability, and transparency. The reform is also intended to improve integrity and accountability through a more efficient and effective procurement process in public sector, especially in governmental purchases. There is strong evidence of progressive improvement of procurement regime in Bangladesh.

The legal regime of public procurement in Bangladesh was based on procedures and practices that date back to the British era. For example, the Compilation of General Financial Rules (CGFR), originally issued under the British rule, which broadly outlined the principles governing government contracts, remained the primary legal framework for public contracts and procurements (World Bank 2002). The two contract documents such as Form No. 2908 for supply of goods, and Form No. 2911 for works were instrumental within this legal framework in GoB procurement functions. Building on CGFR principles, government departments and autonomous public bodies and corporations developed

their own rules and codes of practices for public contracts and largesse to follow (Hoque n.d.).

The World Bank initiated a study on status of formal procurement process in 1999 which recommended a reform of procurement process in Bangladesh (World Bank 2002) following this the Public Procurement Regulations (PPR 2003) was introduced. The PPR 2003 was the breakthrough in Bangladesh Public Procurement system which was supported by the *Procedures* for Implementation of The Public Procurement Regulations 2003. In 2006, Public Procurement Act (PPA 2006) came into force and later the Public Procurement Rules (PPR 2008) was formed.

While application of electronic technology and Information and Communication Technology (ICT) in all-round functions of governance in Bangladesh was considered as a vital instrument to establish 'Digital Bangladesh' to enable stronger contacts between the government and its citizens, it was believed that e-Governance could accomplish the mandate of government in formulating a new vision of how government views its citizens, employees and businesses, and building a citizen-centered, service-oriented, public-participative government with efficient, accountable, transparent and performance government system (Al-Hossienie and Barua 2013). As ICT together with the diffusion of the technological advances results in the digital revolution and the emergence of the Information age and created an enormous impact on social, political, and cultural livelihood of the masses - taking the whole world into a different era (Alam, Ahmed and Islam 2008).

The breakthrough in Bangladesh public procurement system came with circulation of 'The e-GP guidelines 2011' which was instrumental to transform the paper-based tendering system to electronic form. Accordingly, the Electronic Government Procurement (e-GP) was introduced in Bangladesh on 2 June, 2011 in pursuant to Section 65 of the PPA 2006. The *strategy for e-Government* states that a sound e-government policy should include a focus on end-users and demand-driven services. Government services will be made available through e-government and the government should prioritize the services that they will initially offer online (GED, Bangladesh Planning Commission 2012).

The e-GP guideline targeted initially four governmental organisations including Bangladesh Water Development Board (BWDB), Local Government Engineering Department (LGED), Roads and Highways Department (RHD) and Rural Electrification Board (REB) for implementing it with the aim to spread over other organisations (CPTU 2011). LGED pioneered the e-GP system implementation and entered into e-Procurement system in January 2012 (LGED 2014). Currently e-GP is under practice by above mentioned public agencies and the use of e-GP is expanding; CPTU is monitoring the progress and achievements made so far. Now the e-GP draws attention of the knowledge community and practitioners to know whether it progresses smoothly. As a part of this interest, this research has been undertaken as a part of academic purpose.

1.2 Concept of Procurement

Procurement encompasses every aspect of the service delivery processes starting from determination of the need for goods, works or services to ensure procurement and delivery on time. Lysons & Farrington defines procurement as the process undertaken by

the organisational unit that, either as a function or as part of an integrated supply chain, is responsible for procuring or assisting users to procure, in the most efficient manner, required supplies at the right time, quality, quantity and price, and the management of suppliers (CIPS D1 Context Module 2012).

The procurement activity starts with the development of needs and requirements which proceeds through sourcing, contracting, receiving the goods or services and consumption by the end users. A typical procurement cycle is shown in Figure-1 below.

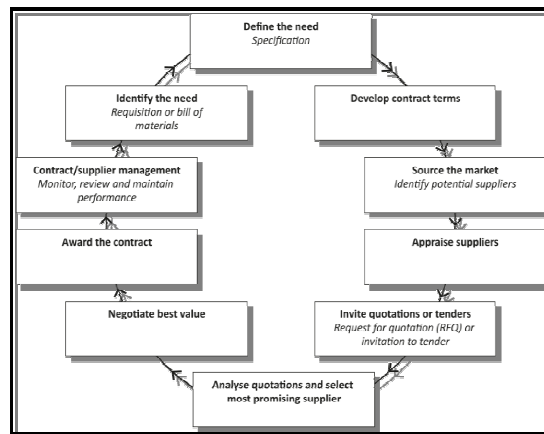


Figure-1: A typical procurement cycle
(Source: CIPS Context module 2014)

1.3 Sectors of Procurement

Procurement happens in public, private or non-profit sectors which is required for their operational purpose. The public sector buyers generally have the overall objective of achieving defined service levels. They are responsible ultimately to the general public for national and community development and to pursue socio-economic goals. They have to satisfy a wider range of stakeholders – the politicians, local vendors, businessmen and suppliers, civil society, media men, etc. They have a wider range of activities to ensure public service and efficient use of resources. These are subject to established

procurement procedures, and legislative directives. They are often subject to budgetary constraints, cash limits and efficiency targets.

Private sector purchasing is different from that of public sector in terms of Objectives (primarily to ensure profit margin), Responsibility (buyers are responsible to owners, directors), Stakeholders, Activity/process (organisational capabilities and resources used to produce goods/services), Legal restrictions (company law, employment law, product liability law etc.), Competition between firms, and Value for money that maintains lowest cost for competitive strategy, customer value and profit maximisation. Private sector purchasing also have Diversity of items (specialised stock lists), Publicity (confidentiality applies in dealings between suppliers and buyers), Budgetary limits, Information exchange (do not exchange information with other firms), Procurement policies/procedures (organisation-specific), Supplier relationships (emphasis on long-term partnership development, to support value chain).

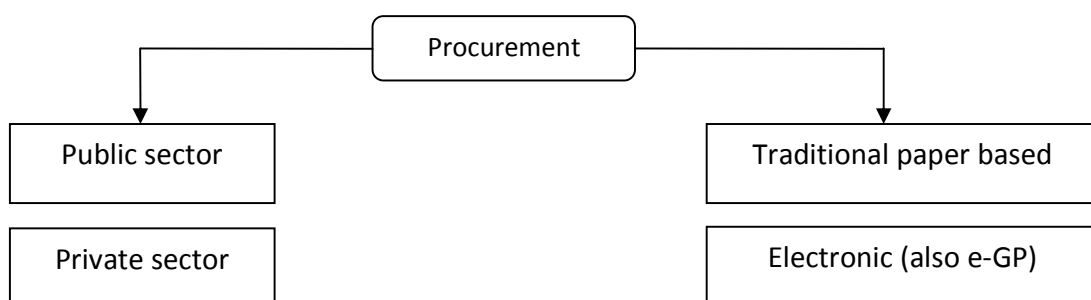


Figure-2: Procurement Contexts and Types

Public Procurement System in Bangladesh is largely decentralized. Ministry of Finance issues instructions on delegation of financial powers from time to time which are exercised by public entities in procuring goods or services. To facilitate an efficient and professionalism in public procurement in Bangladesh the Central Procurement Technical

Unit has been working with different government agencies since 2002, in providing for information and technical know-how as and when required (Hoque n.d.). However, public sector purchasing tends to face a lot of challenges. It is critical for both internal stakeholders and communicating the vendors to ensure they are on-board with the program.

1.4 Electronic Procurement

Electronic procurement is basically a tool that enables procurement activities such as sourcing, ordering, commissioning, receipting and making payment in an electronic way. Industries and government agencies are constantly spectacular to e-Procurement and giving lots of attention on it. Electronic Procurement generally mean web based ERP (Enterprise Resource Planning), e-MRO (Maintenance, Repair and Operating supplies), e-sourcing, e-tendering, e-reverse auctioning, e-informing, e-market sites etc.

Neupane et. al. (n.d.) cites from literature “Public e-procurement has been defined as the use of information and communication technology such as internet/web based system by governments in conducting their procurement relationship with bidders for the acquisition of goods, works, services and other consulting services required by the public sectors (Davila, Gupta & Palmer, 2003; Leipold et al., 2004). It has been defined as an inter-organizational information system, which automatizes any part of the procurement process in order to improve efficiency, quality, and transparency in government procurement (Vaidya, 2007)”

Vaidya et.al. 2004 quotes....the first-level definition of e-Procurement provided by the World Bank (2003) which states that “electronic Government Procurement (e-GP) is the

use of information and communication technology (especially the Internet) by governments in conducting their procurement relationships with suppliers for the acquisition of goods, works, and consultancy services required by the public sector”.

Electronic government procurement (e-GP) is the part of e-governance programme of a country in which paperless office is attempted to establish by leveraging the ICT. It uses Information Technology (especially the internet) by governments in conducting their procurement relationships with suppliers for the procurement of works, goods and consulting services required for the public sector. This e-GP Process contains two phases – the pre-award phase involves e-Notification, e-Access, e-Submission, e-Evaluation and e-Awarding of contracts; and the post-award phase involves e-Ordering, e-Invoicing and e-Payments (Baghdasaryan 2011). The contractual module types are e-Tendering and e-Purchasing and the infrastructure module types are Contract Management, e-Certificates, e-Signatures, Vendor Management, Statistics etc. The e-GP is believed to significantly increase the efficiency, effectiveness and transparency of government procurement process and enhance other governmental objectives. However, e-GP implementation is vulnerable by risks of systems obsolescence, lack of interoperability, higher operating costs, vested interest influences, sub-optimal functionality and reduced innovation (ADB 2004).

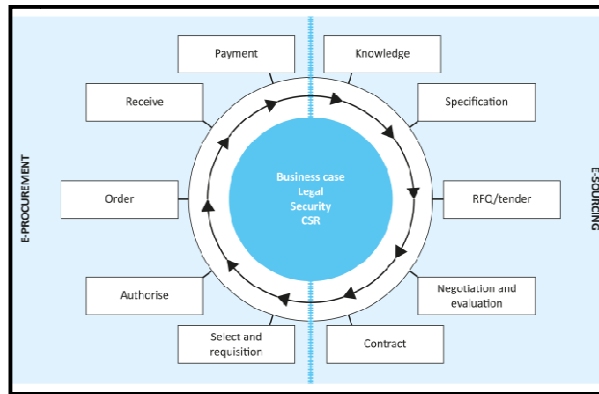


Figure-3: A typical e-Purchasing Process
(Source: CIPS Sourcing module 2014)

In e-Tendering System (Baghdasaryan 2011), there are three types of models are considered in order to meet the specific demands related to implementation of e-GP - the public model (all tasks, including the investment and risks of building the portal, are run by the government), the private model (all tasks are run by private entities that bear the investment risks of the project), and the mixed model (public-private partnership). In public-private partnership model the participants share investment risks and the benefits of the project among themselves.

1.5 Electronic Government Procurement (e-GP)

The e-GP System in Bangladesh has been implemented in two phases (CPTU 2014a) - the e-Tendering System and e-Contract Management System (e-CMS). The first phase of e-Tendering System covers complete e-Tendering processes such as centralized user registration, preparation of Annual Procurement Plan (APP), preparation of Tender document, preparation of Tenders, invitation of Tenders, sale of Tender Documents (e-TD), conducting online pre-bid meeting, collection of Tender security, on-line Tender submission, Bid opening & evaluation, negotiations (where applicable), and contract

awards; while the e-CMS covers complete e-Contract Management processes, such as preparation of work plan and its submission, defining milestone, tracking and monitoring progress, generating reports, performing quality checks, generating running bills, vendor rating and generating completion certificate.

Bangladesh e-GP uses a web portal which is accessible by the users through internet to perform their procurement operations using a web based dashboard (Bangladesh National e-GP Portal 2011).

In the first phase, e-Tendering has been introduced on pilot basis in the CPTU and 16 other Procuring Entities (PEs) under 4 (four) sector agencies – BWDB, LGED, RHD, and REB. The system rolled out to 291 PEs of those 4 sector agencies is now expanding to all the PEs of the government up to Districts and sub-Districts level. In the second phase, e-Contract Management System (e-CMS) has been developed and introduced and implemented. The e-CMS is a complete electronic contract management system which provides platform for preparation of work plan and its submission; defining milestone, tracking and monitoring progress, generating reports, performing quality checks, generation of running bills, vendor rating, generation and issuance of completion certificate (GED, Bangladesh Planning Commission 2012). Total number of PEs enrolled are 1501 including 1036 of four agencies.

The e-GP was developed by the CPTU as a uniform national web portal having centralized registration system that contains a comprehensive system from proc. plan up to final payment (e-Tendering and e-Contract Management), automatic procurement performance monitoring (e-PMIS). It has robust security features & back-up arrangement

with full redundancy to ensure uninterrupted service and harmonized with Multilateral Development Bank (MDB) guidelines. The process was reviewed by an independent consultant for World Bank's use, following which World Bank was accepted the Bangladesh e-GP system for financing. It is believed to be a self sustainable model – system is generating required fund. The security features claimed for e-GP to have tender information encrypted till opening, integrity of submitted tenders, audit log of all activity of all users, no password saving in database, password complexity control and the last login time display.

The payment provisions in e-GP allow Tender Security & Performance Security to Online through Banks; and Registration fees, Tender Document fees, Renewal fees to pay through payment gateway. It facilitates a Tender Dropping system to virtual Tender Box. The e-GP has been supported by an 'Online Helpdesk System' on board.

The e-GP System comprises of key Modules/Functionalities such as Centralized Registration System for Contractors/Applicants/Consultants, Procuring Entities and other actors; e-Tendering which includes e-Publishing/e-Advertisement, e-Lodgment, e-Evaluation, e-Contract award System; Procurement Management Information System (PROMIS); Workflow management System; e-Contract Management System (e-CMS); e-Payment System; System and Security Administration; Handling Errors and Exceptions; and Application Usability & Help etc.

The progress of e-GP in Bangladesh as on January 2015, the Registered Tenderers and Consultants are 13060, 1468 Procuring Entity offices, 31 Banks with 1444 users, so the total Registered Users are over 16000 (Source: National e-GP Portal of Bangladesh).

Table-1: Bangladesh e-GP Activity Summary

Period	# Registered Bidders	# Bids invited	Value of bids (US\$ M)
June -2012	294	14	3
December -2012	525	144	18
June -2013	1,067	498	62
December-2013	7,459	4,548	319
March-2014	8,353	6,558	506
January 2015*	13,144	17,398	--

Source: CPTU (2014d) Delivering Procurement Performance: Success Stories Bangladesh, a power point presentation for Second South Asia Region Public Procurement Conference held in Islamabad, Pakistan.

*Bangladesh e-GP Portal @ <http://115.127.40.33/> accessed on 23 January 2015

All the stakeholders, including Bidders/Tenderers / Applicants / Consultants (National and International), PEs, procurement related Committees, payment service providers, Development Partners (DPs), media, Operation, Maintenance and Management Entity (OMME), e-GP system administrators, auditors and general public have access to e-GP system and information (CPTU 2014a).

Among the public sector agencies, LGED operates e-GP at a great deal in range (48.4% of all PEs) and scale (62.8%) and finalized 62.6%. RHD also shows a great efficiency in operating on e-GP system (20.5%) and already finalized 12.8 tenders per PE (Table-2).

Table-2: e-GP Operation Among Agencies

e-GP Active Agencies	PE	Tenders/Proposals Published		Tenders/Proposals being Processed		Tenders/Proposals Finalized	
		Number	per PE	Number	per PE	Number	per PE
LGED	726	10932	15.1	3034	4.2	6273	8.6
RHD	167	3574	21.4	1089	6.5	2130	12.8
BWDB	124	2218	17.9	677	5.5	1295	10.4
REB	19	189	9.9	97	5.1	91	4.8
PGCB	49	120	2.4	61	1.2	47	1.0
BPDB	204	288	1.4	117	0.6	155	0.8
All Agencies	1501	17398	11.6	5117	3.4	10017	6.7

Source: CPTU (2015) <http://115.127.40.33/RegistrationDetails.jsp>

BWDB (12.7%), BPDB (1.7%) and REB (1.1%) also show a remarkable activity in this field. Among new organisations involved in e-GP, PGCB has been getting momentum in dealing with e-GP. The overall progress of e-GP implementation is encouraging and gaining momentum, however, the ground reality is that actual users are very few as compared to the registered number of users. This impediment might be caused due to many factors including fear of the systems, reliance on someone capable of dealing the system, non-participating in tendering process, also due to competing demand for other responsibilities of the e-GP users. There are concerns over the ability and readiness of its stakeholders that some key stakeholders may fail to come forward to carry out the process due to various reasons which is subject to investigation under this research work.

1.6 Literature Review

Many studies have been conducted since development of the concept of e-commerce around the globe, since 2000's. The flow of digitization touched Bangladesh on time and due to the growing concerns about efficiency in procurement processes in terms of fairness, transparency, better visibility, cost reduction, timeliness, accuracy, competitiveness etc. for private service and provision for level of service for public sector modernization of the procurement system and implement enhanced governance became prominent in this field. As far as governance in public procurement is concerned, along with improvement of efficiency in utilization of public financial resources, their effectiveness could also be enhanced through the reform in procurement systems and now leveraged it through the widespread use of informational and communication

technology (ICT); thus the electronic government procurement (e-GP) is being introduced in many countries.

Al-Hossienie and Barua (2013) recognised that available resources for e-Governance in Bangladesh are inadequate. He noted, however, the rapid growth of information technology development might overcome this barrier.

Alam, SR. (2012) cites at NAPM (2001), the main reasons behind this are the overall ineffectiveness of the business processes, the difficulties of integration with back-office systems and the lack of common standards. He stressed on perceiving ICT by public institutions as the only solution. He highlighted the remarks by Ontology.org that both public institutions and vendors would benefit from a common platform where the former can get the information to make a purchase decision and the later can reach potential customers more than usual.

Bhuiyan (2010) acknowledged lack of proper infrastructure and digital divide were the known major causes behind the failures of e-service implementation, however he noted that e-government applications have been growing in Bangladesh. Again he viewed the prospects of mobile phone based e-service development, and public private partnership (PPP), but also recognised the challenges of frequent power interruption, lack of techno-savvy people in public organizations to look after the systems, etc. He noticed the increased number of e-services reflecting the progress of the country.

Hoque (n.d.) recognized the procurement law in Bangladesh as modern, but he expressed concern about the level of accountability, transparency and efficiency in public

procurements were far from satisfactory. Taking the experience of some Southeast Asian nations, he noted from Jones (2007) some common problems with public procurement systems - fragmented procurement procedures; lack of professional procurement expertise; absence of open, competitive tendering, especially for foreign suppliers; widespread corruption; and the lack of transparency.

Cascapera (2007) recognized e-procurement through which the buyer achieves the target set out during the sourcing project which leads to lower transaction and processing costs and increases efficiency due to increased choice and competition. He pointed out that efficiency is obtained not just via reduced printing and transportation costs, but also via reduced process cycle time in e-procurement. According to him, e-procurement changes the role of buyers in the purchasing function by removing administrative tasks e.g. placing orders and reconciling deliveries and invoices with purchase orders, buyers can spend more time on value-adding activities.

Vanjoki (n.d.) referred the researches he found in the literature (Kalakota and Robinson 2001; Attaran & Attaran 2002; de Boer et al. 2002; Davila et al. 2003; Croom and Brandon-Jones 2005) that the benefits of adopting e-procurement technologies had been widely. The companies primarily adopted e-procurement solutions for cost reductions and process efficiencies. He cites research by Quesada et al. (2010) proposes that e-Procurement technologies affected positively to company's procurement practices and procurement performance. Another research by Davila et al. (2003), he found to identify that companies used e-Procurement gain additional control over maverick spending and can reduce the headcount supporting purchasing transactions. He also quote from Croom

and Johnston (2003) that e-procurement can have a major impact on compliance on many different levels of the procurement process, such as managerial budgetary control; reduced data entry failures; greater transparency and accessibility to corporate level spending; improved system reliability; and improved access to information.

Foroughi (n.d.) noted from Reese (2003) that e-Procurement enables companies to make better decisions related to rationalizing their supplier base by providing a broad overview of the market. He cited from Bedell (2002) that e-Procurement provided new levels of visibility about what the company was buying and from whom; but there were problems with integration to backend systems, which might be incompatible platforms, and were a stumbling block to many e-Procurement efforts. The e-Procurement enabled companies to have better control of enterprise spending by aggregating spend of different groups within an organization. From Moore (2007) he highlighted e-Procurement that enabled companies to maintain lean inventory levels. It was recognized that inconsistencies in nomenclature for parts, between companies and even within different departments or sites of the same enterprise, often led to costly delays and errors. Aisbett, Lasch, and Pires (2005) also referred where e-Procurement could reduce material and service costs... .. Since e-Procurement systems are a self-service tool, end users sometimes resist using it and effectiveness depends, ultimately, on its being adopted and regularly used by employees (Bedell, 2002). By Singer (2003) he mentioned that many suppliers, especially smaller ones, do not have the technological capability to integrate with e-Procurement platforms. Also from Foster (2000) he noted that e-Procurement created a new set of responsibilities for purchasing departments.

Jönsson et al. (2010) summarized the key factors as defining an e-procurement strategy, change management and training and education which affect all. And the secondary factors were well defined steering group and communication that would affect some companies which they must take them into their perspective depending on situation. benefits are compliance savings, reduced supplier base and lowered administrative costs. CIPS Knowledge (2014) notes from Preite (2004) '...the data that feeds into the procurement system is accurate'.

Vinter and Papaux (2013) warned that even if potential benefits of e-procurement were obvious, theoretical and practical results clearly indicate that e-procurement for public markets was still the exception rather than the rule. They commented that the aim of a well integrated internal market for public procurement led far behind the EU's stated goals.

Veit, Parasie and Huntgeburth (2011) evaluated that in spite of high potentials and sophisticated goals set by the federal governments, municipalities were reluctant to move procurement to the Internet.

Leipold (2007) appraised that effective e-GP program could offer the opportunity of adding value to the relationship between government buyers and private businesses through delivering a broad range of benefits to taxpayers, the economy and the community generally. And the online technology provided the potential to significantly reform the accountabilities and performance of public procurement systems. An e-GP system could automate the procurement procedures and implement control the processes in which neither purchasing agencies nor bidders to deviate from the public

procurement process. Thus e-GP helped governments to reduce the opportunities for corruptive, fraudulent, collusive, and even coercive practices. Moreover, the bad practices (attacking bidders on their way to the bid submission, manipulating access to procurement notices, submitting overpriced bids, bypassing mandatory public procurement procedures, colluding with competitors, or bribing public procurement officials etc.) could be prevented by using e-GP systems. However, he considered e-GP as not the guarantor for improved governance and reduced corruption. He mentioned the need for strong political will, leadership, and management to design and implement appropriate e-GP systems which would ensure a maximum of transparency and compliance. He also mentioned about the efficiency gains (reduced costs and time) as the key benefits of e-GP; the technologies provide a high level of security through encryption and digital signatures. Further, the introduction of e-GP in a country activates the majority of suppliers to get ready and connected for the web-based government businesses. In doing so, public procurement laws provide support to e-Procurement a basis for policies and procedures as part of legislation up to more comprehensive and prescriptive way.

Arzu (2008) reflected from Pant et al. (2003) that the benefits of forming an e-supply chain were streamlining both internal and external operations; ability to provide real-time response to market conditions; ability to provide real-time response to customer queries; ability to undertake real-time, joint demand planning. He quoted from Rehan (2006), greatest advantages mentioned were to obtain cost savings through integration of the supply chain; overall reduction in the inventory levels throughout the supply chain;

reduction in procurement costs; improved vendor management; cycle time reduction; improved profitability.

Koseva (2012) cited from Eakin (2002), the hard benefits were those that can be directly measured as price savings and process cost reductions, and the soft benefits were those that affect cash flows directly but cannot be quantified easily such as the saving of individuals' time that can be spent more efficiently. Intangibles were all benefits that were not directly measurable in financial terms e.g. cultural change, high visibility of supplier performance, new e-platforms, financial approval for all spending.

He also noted from Cole (2004) who identified that in most of the cases the internal barriers were resulted from of factors such as lack of ownership of the project; diminishing of the quality or prestige of the current role, after the introduction of the new system; lack of knowledge of the subject; political reasons; insufficient time and opportunity for the involvement; personal conflicts; lack of needed knowledge about technology and IT projects; loss of supplier contacts or control. He highlighted that people found electronic payment transactions are still risky, because they are relatively new (Kheng and Al-Hawamdeh 2002). Waarts and Everdingen (2005) consider that culture is affecting the adoption status. Vaidya et al. (2006) defined end users' uptake and training as one of eleven key success factors.

Vaidya et. al. (2004) emphasized that implementing e-Procurement initiatives required the public sector agencies to have the organizational and management ability and flexibility to learn and share the lessons in regards to the new systems and technology and adjust themselves to new procurement practices and processes in a timely fashion.

He also referred S&A (2003) who regarded change management and training as the most important implementation issue and concluded that most other issues are also related to change management.

The problems of implementation and integration of existing infrastructure, according to Parida and Sophonthummapharn (2010), were holding back companies from implementing e-procurement; but benefits were overpowering the risks and companies were moving toward more aggressive strategic approach of implementing e-procurement.

Kaliannan and Awang (2009) pointed out that the suppliers had positive perception about information technology and the use of Internet to do their business transactions; thus they were ready to use the e-Procurement system. They noted that there were many problems and challenges faced by both the buyer community i.e. government, and seller community i.e. suppliers, even a certain level of acceptance and usage show positive development of e-Procurement.

Tonkin (2003) explored that public sector undertook e-procurement initiatives to achieve certain cost reductions and benefits including those related to public policy imperatives.

The role of trust in e-government success using the updated DeLone and McLean IS success model is tested via a survey of 214 Singapore e-government Web site users. Teo, Srivastava and Jiang (2014) found that there were trust in government, but not trust in technology which is positively related to trust in e-government web sites; subsequently to information quality, system quality, and service quality.

Anonymous (2009) research cited that e-procurement led to considerable improvements interaction & communication; also change from standard procurement to e-procurement was not easy to adopt, but beneficial to Kuwait Maastricht Business School (KNPC) and its suppliers.

The findings indicate significant relationships existed between individual factor, organisational factor, environmental factor, technological factor and e-procurement system use. There were also evidences of dynamic capability as a mediator to the organisational factor and system use relationship (Kassim 2011).

Puschmann and Alt (2005) recognized that in the successful practices the redesigning of the procurement process is focused on - reduction or elimination of authorization stages; regulation of exceptions to a limited degree in the beginning; elimination of paper; integration of suppliers in the entire process chain; and consideration of the complete process from searching for goods through to invoicing.

Angeles and Nath (2007) identified three important challenges to e-Procurement implementation - lack of system integration and standardization issues; immaturity of e-procurement-based market services and end user resistance; maverick buying and difficulty in integrating e-procurement with other systems.

Vanjoki (n.d.) observed that lack of system integration and standardization issues were related to the fact that e-Procurement was still relatively new business application and it was not unusual to find a lack of benchmarkable reference models. Other challenges he found to be software immaturity, immaturity of providers of e-procurement services, lack

of supplier preparation, resistance of solutions by end users, difficulty of changing purchasing-related behavior by company's employees.

Mibenge and Okoye (2007) explored that the significance of e-procurement was an important instrument to improve Internal Customer Service and thus external customer satisfaction had also been achieved. They stressed to remember that e-procurement might not be right for all types of organisations depending on their business operations and level of technological development.

Alam (2012) suggested in educating parties for both long-term and short-term benefits that would encourage the application of e-GP. He also mentioned some critical success factors including adequate financial support, availability of interoperability and standards of communication systems, top management support and commitment, understanding the priorities of the company, and having suitable security systems.

Vinter and Papaux (2013) studied e-Government and found the key benefits of fairness and non-discrimination among tenderers that were potential to increase SME and cross-country participation in EU. Savings due to lower price for procurement as well as E-tendering, e-notices etc. administrative burden were also reduced when compared to paper based procurements. They recognized the challenges of persuading stakeholders to embrace new electronic tools and to make sure that the systems put in place facilitate wider access to those valuable markets across the EU. Overcoming structural inertia and fear was also the main reason that companies avoid e-procurement. Moreover language was a barrier to encourage practical participation by foreign companies; and until then e-procurement was not totally developed.

Neupane et. al. (n.d.) noted from Gupta, Jha and Gupta (2009) that e-Procurement centralize data in order to improve audit and analysis. He also referred Ndou (2004) that e-Procurement eliminated the direct human interaction on bidding and other work and services, corruption was decreased significantly, and internal efficiency was increased in government departments. The other benefits they mentioned that from an e-procurement system, government could monitor all the works and services more easily and efficiently (Aman & Kasimin 2011; Kaliannan & Awang 2009); e-Procurement system provided better status monitoring and tracking of applications; increased transparency in works and services and improves better interaction between supplier, vendors and citizens through online system (Adebiyi, Ayo & Adebiyi Marion, 2010); online bidding system automatically reduces the cartel, collusion and riggings among the bidders (Pathak et al., 2006); and also improved transparency and efficiency, reduce cost, better decision-making, supplier performance monitoring, quality of service and so on.

GeBIZ (2005) reported that e-Procurement technology performance of countries like Bahrain, Norway, Italy, Singapore, Turkey, India, and Malaysia indicate it helped them to increase competition among bidders in public work and services evidenced by eighteen countries' governments were obtaining best quality and price ratio after implementing public e-procurement technology. Peru, Pakistan, New Zealand, Italy, Fiji, and Hong Kong (China) also obtained best quality of governance by implementing e-procurement in government level. Singapore government using GeBIZ on-stop e-procurement portal which enhance transparency in government procurement, easy access to information, increase procurement efficiency, global reach among the bidders and suppliers, and

increase more competition among bidders. The main implementation benefits of this system were to make more consistency in procurement process, more visibility into procurement process, and secure document transmission (Guadamuz and Jiménez 2009). Fifteen countries' focus on e-Procurement helped increase efficiency in document transmission and reduce more chances of corruption. Nine countries' government e-procurement implementation benefits result indicated that e-procurement helped to reduce human interference in bidding process and avoided unnecessary physical threat to the other bidders in tendering process (Neupane, Soar, Vaidya and Yong 2004).

Somasundaram wrote for ADB (2011), government departments in India those implement e-GP system reported the key benefits such as average number of bidders per tender were increased; tender premium had decreased by about 15%; and the cycle time taken to evaluate tenders was decreased.

Smart (2010) recorded the potential benefits of e-procurement mechanisms as increased order accuracy, transaction efficiency and greater integration between trading partners; ...it acted as an enabler to more effective management of the function; ... e-Procurement led to improvement in process and price for buying firms; e-Procurement was used by buyers and suppliers as a means to channel dominance; e-Procurement led to automation of process, not supply chain integration....however, procurement managers pursued functional targets rather than supply chain-level objectives. Furthermore, buying firms could use e-Procurement mechanisms inter alia to exploit market competition, improve processes, support supplier rationalisation programmes, enforce compliance and support a segmented approach to supply markets. Although e-procurement was an enabler of the

purchasing firm's supply strategy;integration with suppliers was not greatly enhanced by e-procurement deployment.

1.7 Rationale of the Study

The CPTU adopted a well managed strategy which is critical to the successful implementation of e-GP. However, the best practice e-procurement implementation should identify its barriers and opportunities so that they can be addressed in proactive manner, CPTU also to consider the same. The potential barriers might be specific to the procurement process, the organisation itself or existing communication channels and their elimination is important – to neutralize them is at threshold. For example, some government officials were unwilling to use e-GP as published in Bangladesh media such as the Daily Jugantor dated: 23 September 2014. On the other hand, it is required to exploit the potential favours of factors of e-GP and to enhance their utilization. A World Bank evaluation showed e-Tendering was seen effective to restrict coercive and collusive practices which was also published in Bangladesh media such as the Daily Janakantha, dated: 17 December 2014.

This a novel research and possibly the first of its kind in Bangladesh and it is expected that the results of the study would help a range of stakeholders, especially the e-GP users, it's planners, policy-makers and researchers to address the challenges of e-government applications in Bangladesh. Any future research could benefit by the outcomes of this study in quantifying the contribution of e-GP to the national account and gain through waste minimization and process efficiency.

1.8 Research Objectives

The research objectives of the study are to identify the factors of influence on electronic government procurement in Bangladesh that could affect it either positively or negatively. In this respect two counter acting sets of factors of e-GP would result from the study which would require considering some measures to minimise the effects of those counterproductive factors.

1.8.1 Broad Objectives

The broad objectives relate to the 'scope' of the research study which is suitable for its time horizon and considering the available resources. Thus the desired future of this research is to attempting to understand the factors influencing e-GP and identifying their core directions; grouping them into two counter acting sets those may act as key barriers and enablers by grading their influence in ranks to high, medium or low.

1.8.2 Specific Objectives

Stretching the above general objectives, the specific objectives of this research would look into the outcomes – they are:

- I. To give an overview of procurement system in Bangladesh;
- II. To identify the factors affecting procurement system in Bangladesh;
- III. To identify the relationship of the factors influencing procurement system in Bangladesh with e-GP; and
- IV. To suggest some measures to increase the efficiency of e-GP in Bangladesh.

1.9 Research Questions

The research questions (what is to study) and research strategy (how to conduct the study) are very important as they influence the strategy that is employed in order to either provide answers to the questions or verify them. The research strategy to be used depends on the nature of the problem and formulation of research questions.

In present case, the research poses to look for responses to questions those are based on e-government procurement depending upon the level of understanding and capacity to react on proper course by the users, thus the questions are as follows:

- a) What are the elements of e-government procurement in Bangladesh and what does it would like to do?
- b) What are the factors of e-government procurement that influence it?
- c) What are the factors of e-government procurement favours the e-GP and what others challenge it?
- d) How to overcome those challenges?

1.10 Structure of the Document

The structure has a sequence with an introduction followed by methodology, a brief of related theories, data analysis, discussion on results highlighting the factors of influence and identifying those factors as supportive or offensive to e-GP; and finally a concluding chapter.

The first chapter gives an introduction of the study focusing the rationale of the research and review of literature. It provides objectives of the study and formulates the research questions based on those objectives.

The second chapter discusses about the methodology covering data, sampling the population, discussion on target population, data analysis covering descriptive and inferential statistics, model concept and appropriateness, goodness of fit, correlation issues etc.

The third chapter includes data organisation, analysis and interpretation of results. The fourth chapter highlights both empirical and statistical results of factors of e-GP those influence it, ranks and summarize them.

The final chapter covers the conclusions of the work and put few recommendations; then admits some limitations of the study.

Chapter Two: Methodology

2.1 Main Methodologies

The history of e-governance study reveals that there are various methods of analysis adopted by the researchers such as Case Study, Comparative Analysis, Content Analysis, Correlation Analysis, Factorial Analysis, Life History Method, Variance Analysis etc. Keeping these approaches in mind, efforts were made in this research work to utilize appropriate methods in understanding of issues as expected and meet the objectives.

Since 2012 e-GP has been operational in Bangladesh and the level of its use has been spreading in both dimensions of concentrations and wider aspects of users. The number of users is increasing with the increase of implementing agencies, from four target agencies to 22 agencies at present. Not only e-Tendering, e-management of contracts is also gaining momentum, the use of e-CMS for example.

In these courses of practicing e-GP, experiences show some adverse factors from both external and internal to the organisations, the public agencies, challenging the proper functioning of the system. Literatures also show evidences of the difficulties to implement e-GP worldwide including Bangladesh. Attempts have been made to explore the potential factors of influences on e-GP on the basis of experience, discussion and dialogue with its users to be termed here as primary source; also by searching the current literatures to be termed as secondary sources.

Both types of factors were screened through mirroring the broad factors underlying in the theories of environmental scanning and conflicting situations, using the frameworks such

as PESTLE, Porter's five forces, Force-Field analysis etc. A consolidated set of influencing factors were drawn and attempted to test them with the e-GP users either in public sector or of general public. They are basically the Bidders/Tenderers/Applicants /Consultants (National and International), Procuring Entities, Procurement related Committee members, Payment service providers at banks, Development Partners (DPs), media, Operation, Maintenance and Management Entity (OMME), e-GP System Administrators, Auditors and the general public. It was emphasized to have reflection of regular users, such as the Tenderers/Consultants, Procuring Entities, Approving Authorities, Procurement related Committee members, Payment service providers at banks etc. during the survey.

2.2 Scope of the Work

The scope of research work with e-GP is very wide that could account to the quantifying its overall impacts on economy as a whole. However, the prevalent factors, such as available time, finance resources, human factor and requirement of the university for Masters Study governs the boundary of the work. The scope of the work was kept limited to determination of 'for' and 'against' metrics around e-GP in Bangladesh based on their level of influence from user perspectives so that it becomes attainable. This work could contribute to some extent for further research in this field.

The available time also limits access to academic resources and interact professional personnel about the subject matter. Also there are very few research works in Bangladesh context and so advances yet to make in this field.

2.3 Data Source

The findings of the previous studies are important sources for the research. As this study aims to work on factors influencing e-GP existing literature have already identified many of those factors. However, the context and environment of the e-GP system are obviously different, it also varies in course of time; so these elements needs to be checked to recommend in present context. A number of factors of influence as identified in the previous literature were considered for this research.

Experience study is another source of information where skillful users of the public procurement personnel can point out some distinctive information. This valuable resource was also attempted to utilize in contextualizing the related aspects that available studies may not cover.

The flow chart below depicts the ways how above factors of influence was organized and tested under this research.

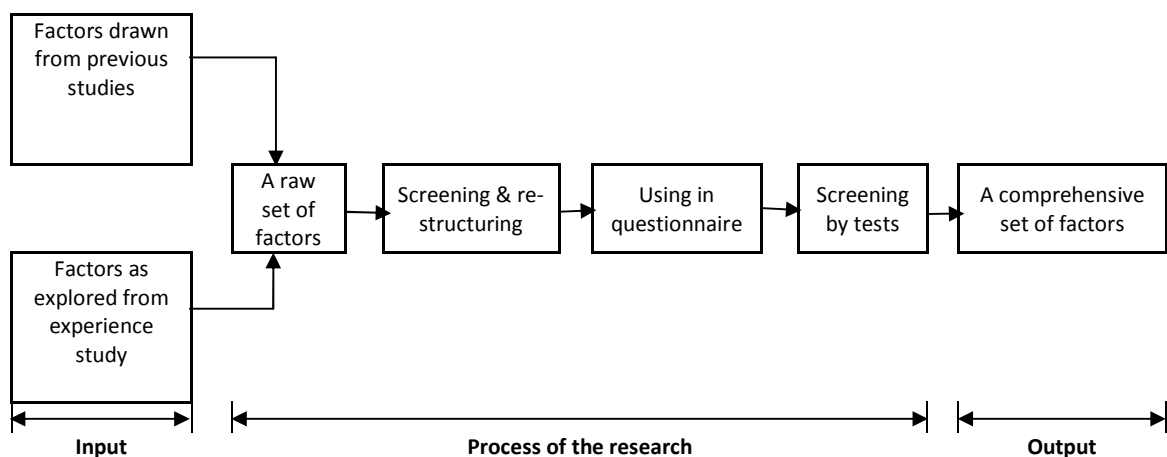


Figure-4: Process of Determining the Factors of Influence of e-GP

2.4 Tools and Frameworks

The variant factors of electronic procurement can be identified through the use of various techniques including direct understanding based on the facts of and the use of previous literature. Frameworks like PESTLE, SWOT analysis, the force-field analysis, the Porter's five forces, etc. could help to understand the environmental factors and simulate the situations around a project or function such as e-GP. As a public sector business, e-GP contributes to enhanced governance to its service environment which is susceptible to be effected by many environmental factors and thus above frameworks are much useful.

2.4.1 PESTLE Factors

The PESTLE factors are useful to understand environmental drivers and constraints which are very relevant to this study. There are variant macro-environmental aspects that impact the operation of electronic procurement can be judged in terms of PESTLE framework that stands for Political, Economic, Social and Technological analysis. It describes a framework of macro-environmental factors used in the environmental scanning component of strategic management. Some analysts added the Legal factor and rearranged the mnemonic to SLEPT; inserting Environmental factors it was expanded to PESTEL or PESTLE. The model has been further extended to STEEPLE and STEEPLED, by adding Ethics and Demographic factors. It is also a useful strategic tool for understanding market growth or decline, business position, potential and direction for operations. Another similar framework STEER analysis systematically considers Socio-cultural, Technological, Economic, Ecological, and Regulatory factors.

In particular to Bangladesh e-GP, the range of social factors including psychographic nature of human; technological innovations along with shorter lifecycle equipments and techniques; economic issues of cost matters, availability and speed of service; governmental legislations, fast changing market conditions (i.e. public demand for better and better services) and political preferences can largely affect.

2.4.2 SWOT of e-GP

A SWOT analysis includes analyzing a business's strengths, flaws, possibilities, and risks. It can help to uncover the opportunities that are beneficial to exploit. And by understanding the weaknesses, one can manage and eliminate threats that would otherwise affect unawares.

The PESTLE factors, combined with external micro-environmental factors and internal drivers when applied to e-GP systems, can be classified as opportunities and threats in a SWOT analysis. Moreover, by looking at competitive environment using the SWOT framework, a strategy can be developed based on the influencing factors of e-GP which could help to distinguish it from traditional paper based system and be able to sustain.

A thematic diagram of SWOT of e-GP has been developed as below:

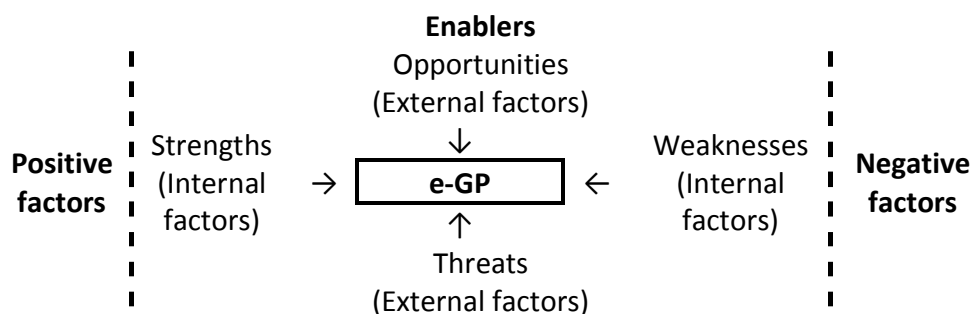


Figure-5: SWOT of e-GP

For this study SWOT, as a tool, is quite relevant and the factors available in the literature as well as judged by the experience and learning could be framed by it. In fact the objectives of this study demand identifying proactive and counter-active factors. The positive factors might include supportive elements that can boost strengths and opportunities of e-GP while the negative factors could include offensive elements that can restrain it and damage the benefits.

2.4.3 Force-Field Analysis

The force-field analysis model was developed by Kurt Lewin. This model is based on the idea that in a given organisational situation there is an interplay of restraining and driving forces which keeps things in equilibrium such an equilibrium may vary over time and depending on situations. It aims to chart the forces that are pushing in the desired direction and those that push in other directions to maintain status quo. Once this has been done, it is possible to focus on the resisting forces and either to overcome or at least to reduce them.

The e-GP system also faces the pressure by its competing environment. The system is still to implement in many government entities although it has been spreading steadily. By this time only 22 agencies have come under e-GP implementation; but the four target organisations practice it widely.

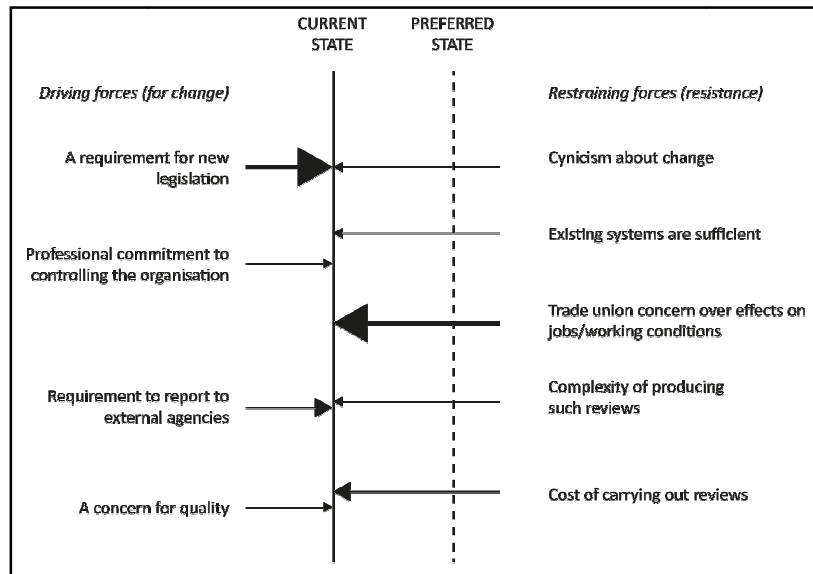


Figure-6: A Typical of Force-Field Method

2.4.4 Porter's Five Forces

The Porter's five forces framework is another tool that helps to understand industry attractiveness and competitive forces. It could be useful to understand the influencing factors of competitive environment around the e-GP. The five forces are competitors; the power of buyers; the power of suppliers; the threat of new entrants; and the threat of substitute products. In research context of e-GP, the external stakeholders are media, development partners, and general public. The factors such as benefits of e-GP service delivery i.e. efficiency, timeliness, shorter procurement cycle, transparency etc. could be considered as buyers and the organisational users such as procuring entities, committee members could be considered as suppliers side. However, this technique applies for a particular point of time and in a specific context.

2.5 Sample Design

In statistics, sampling is the selection of a subset of individuals from within a statistical population to estimate characteristics of the whole population. The sampling process in any research work comprises several stages – defining the population, specifying a set of items to measure, specifying a sampling method for selecting items, determining the sample size, implementing the sampling plan, and data collection. This study followed the same principle in designing the sample.

2.5.1 Sample Size Criteria

Main aspects of determining the size of a sample are the purpose of the study, population size, sampling error (the level of precision), the confidence level, and the degree of variability in the main measured attributes (Polonia 2013). However, later three criteria usually needs to be specified to determine the appropriate sample size – these are reviewed below (Glenn 2013):

The Level of Precision

The *level of precision* (also *sampling error*) is the range in which the true value of the population is to be estimated. This range is often expressed in percentages (say, ± 10 percent). Thus, if 60% of the population in the sample has adopted a recommended practice with a precision rate of $\pm 10\%$, then conclusion results between 50% and 70% of the population have adopted the practice.

The level of Confidence

The *confidence or risk level* is based on ideas encompassed under the Central Limit Theorem. The basic concept of the Central Limit Theorem is that when a population is repeatedly sampled, the average value of the attribute obtained by those samples is equal to the true population value. Also the values obtained by these samples are distributed normally about the true value, with some samples having a higher value and some obtaining a lower score than the true population value. In a normal distribution, approximately 85-95% of the sample values are found within two standard deviations of the true population value such as mean.

The Degree of Variability

The third criterion, the *degree of variability* in the attributes being measured, refers to the distribution of attributes in the population. The more heterogeneous a population, the larger the sample size required to obtain a given level of precision. The less variable (more homogeneous) a population, the smaller the sample size will be. For example, a proportion of 50% indicates a greater level of variability than either 20% or 80%. This is because 20% and 80% indicate that a large majority do not or do, respectively, have the attribute of interest. Because a proportion of 0.5 indicates the maximum variability in a population, it is often used in determining a more conservative sample size, that is, the sample size may be larger than if the true variability of the population attribute were used.

The common ways of determining the sample size are:

- by using or conducting a census survey;

- transfer a sample size from a similar study;
- using published tables; and
- applying of formulas to calculate a sample size.

2.5.2 Sample Bias

When a sample is collected in such a way that some members of the intended population are less likely to be included than others, this is termed as sample bias in statistics (Wikipedia 2014 online). It is a non-random sample that a biased sample of a population results in which all individuals were not equally likely to have been selected. If this is not taken into account, the analysis can result erroneously attributed under study rather than to the method of sampling.

2.5.3 Sample Size Determination

For populations that are large, Cochran (1963) developed the Equation 1 to yield a representative sample for proportions.

$$n_0 = \frac{Z^2 pq}{e^2} \dots\dots\dots \text{Equation 1}$$

which is valid where n_0 is the sample size, Z^2 is the abscissa of the normal curve that cuts off an area α at the tails ($1 - \alpha$ equals the desired confidence level, e.g., 95%), e is the desired level of precision, p is the estimated proportion of an attribute that is present in the population, and q is $1-p$. The value for Z is found in statistical tables which contain the area under the normal curve.

Finite population correction for proportions is given in Equation 2:

$$n = \frac{n_0}{1 + \frac{(n_0 - 1)}{N}} \dots\dots\dots\text{Equation 2}$$

where n_0 - the initial sample size, n - adjusted sample size, N - the population size.

A simplified formula for proportions, developed by Taro Yamane (1967):

$$n = \frac{N}{1 + N * (e)^2} \dots\dots\dots\text{Equation 3}$$

where n - the sample size, N - the population size, e - the acceptable sampling error. (Say 95% confidence level and $p = 0.5$ are assumed)

According to Yamane formula (1967), Potential error limit

$$e^2 = [z^2 p (1- p)/ n_0] - [z^2 p (1- p)/N] \dots\dots\dots \text{Equation 4}$$

2.5.4 Sample Size for the Survey Work

The e-GP user in Bangladesh includes government users as the system allows – Heads of the Procuring Entities, Approving Authorities, Procuring Entities, Tender/Proposal Opening Committee, Tender/Proposal Evaluation Committee, System administrators (at CPTU and at organisation level), Tenderer/Consultants, Bank users, Development Partners, Media personnel etc. Considering the e-GP users in Bangladesh as registered by 2012, the total number was 13,609 in 2012. The registration details page of the e-GP web portal supports this statistics. As there were potential to rise in number of registered users, current figure may be assumed to be around 15,000.

As the sample size and effective sample size have moderate impact on quality measures, it is necessary to consider the possibility of increasing sample size. Present work would

use the simpler form of estimating the sample size using Taro Yamane's formula which is based on the level of precision.

Table-4: Estimating Sample Size

Population (N)	level of precision (e)	Sample size, $n = \frac{N}{1 + N * (e)^2}$	Response rate	Critical value (z)	Potential error limit, $e^2 = [z^2 p (1- p)/ n_0] - [z^2 p (1- p)/N]$
15,000	20%	25	0.166%	1.28	1.04%
15,000	15%	44	0.295%	1.44	1.17%
15,000	63	0.420%
15,000	10%	99	0.662%	1.64	1.33%
15,000	5%	390	2.597%	1.96	1.54%
15,000	2%	2,143	14.286%	2.33	1.38%
15,000	1%	6,000	40%	2.58	-

According to Table-4, given a response rate of 0.295% (derived from 44 responses out of 15,000) the e-GP survey therefore has an 85% confidence level with 1.17% of potential error. Similarly, 0.662% (99 responses) gives a 90% confidence level with 1.33% of error. Hussey and Hussey (1997) noted that no survey can ever be deemed to be free from error or provide 100% surety; so error limits having below 10% with confidence levels of 85 ~90% is acceptable. For the purpose of this research work, a sample size of 99 was targeted, but the responses received were 63 (0.42% of the population).

The experience shows wide variations in level of use of e-GP by the registered users. As there are legal requirements for e-GP user registration, and the number of users are about 15,000; but the ground scenario reveals the number of actual users is far below than that. For example, a Procuring Entity may require at least 10/15 users to participate in a tender processing cycle that includes committee members to open and evaluate the

tenders, participating tenders, bank users, an administrator, the approving authority or HOPE. But the active users are only a few where someone works for the others; for example, the study shows over 10% of registered users do not use e-GP in their own where as another 10% non-registered people use e-GP by themselves. It is revealed from experience study that some alternate people work for the users of e-GP to complete the tendering process. Private users were seen to depend on public sector users for support in operating e-GP. This practice is worse among tenderers whose share accounts to 61% of total registered users (Table-6). Thus ultimate populations for e-GP users are far less than estimated (or assumed); in fact, determination of a reliable population size is a complex matter.

2.5.5 Description of the Sampled Population

The respondents were targeted from the government organisations and their related players of the e-GP systems such as the Head of the Procuring Entity, approving authority, Procuring Entity, opening and evaluation Committee members, Tenderers, Applicants, Bank users, System administrators etc.

The four governmental organisations – Bangladesh Water Development Board (BWDB), Local Government Engineering Department (LGED), Roads and Highways Department (RHD) and Rural Electrification Board (REB) mainly were targeted for the survey. The contact persons of these organisations (www.eprocure.gov.bd/contactUs.jsp; date: 11 October 2014) were contacted through e-mail requesting them to communicate it to respective officials so that they consider it authentic and respond accordingly. The responses show that the respondents were from approving authority, Procuring Entity,

opening and evaluation Committee members, Tenderers, Applicants, Trainers, and System administrators.

2.6 Design of the Questionnaire

The initial point of research is to look for the questions to be answered. The questionnaire is to focus the experience and feeling of users with e-GP with respect to how far they are 'friendly' with the system to use and to know if they feel difficulties to deal with it.

Surveys often contain questions with a set of possible responses. For example, Likert-type scales use fixed choice response formats that are designed to measure attitudes or opinions (Bowling 1997; Burns & Grove 1997). These ordinal scales measure levels of agreement/disagreement. This survey also used similar set of given responses in five point scale such as 1 = oppose strongly, 2 = oppose, 3 = neutral, 4 = supports, and 5 = supports strongly. The questionnaire also covered the user's personal attributes; their personal settings of procurement orientation; their personal involvement with e-GP system.

The factors of influences of e-GP were identified based on available literature as well as experience study. Most of them were short listed and re-structured such that the respondents find easy to understand the issue and react accordingly. The dialogue with e-GP users i.e. experienced people, and having feedback on a draft questionnaire contributed to develop the survey. At the outset a draft questionnaire was distributed to few experienced practitioners of e-GP, and their feedback were utilized to finalize its size.

The relationship between number of questions in a survey and the time required for answering them is not linear. The more questions to respond, the less time the respondents wish to spend in answering each question. If the respondents begin satisficing (aiming to achieve only satisfactory results) or speeding through a survey then the quality and reliability of data may suffer. The respondents take just over a minute to answer the first question in a survey (including the time to reading any survey introductions) and spend about 5 minutes in total, answering a 10 question survey. However, respondents take more time per question when responding to shorter surveys compared to longer surveys (Brent 2011).

Considering above, the length of the questionnaire was maintained such that the users do not get exhausted while answering it and the time would require about 10 to 15 minutes, thus achieve expected level of response.

While the questionnaire contains the potential factors of influences on electronic government procurement (e-GP), it also have some personal attributes of the respondents covering their age, experience, registration status to the e-GP system and respective role, and background knowledge on procurement and the e-GP (Appendix-1). The reliability statistics having alpha value 0.893 confirms that the questionnaire (Table-5) can reliably explain the prediction which seems quite reasonable. It is noteworthy that Nunnally (1978) suggested the alpha value as a rule of thumb to be 0.70; however, recent expectations of alpha value are a minimum 0.80.

Table-5: Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	No. of Items
0.877	0.893	38

2.7 Data Collection Technique

Various instruments are available for facilitating the data collection process. These include interviews, questionnaires, document analysis, observations, Focus Group Discussions (FGD), etc. (Lancaster 2005). However, the choice of data collection instruments is determined by the nature of the information needs intended to achieve the objective of the study and data sources (ibid.). In other words, each instrument is known to best facilitate the collection a particular kind of data (Yonazi 2010). The questionnaire survey could be face to face interview or remote; video based; web based; and predesigned cards of alternative sets of choice, photographs or a stated scenario may also be used.

In this study, an internet based survey techniques were used based on a structured questionnaire, lodged on 'surveymonkey' platform (<https://www.surveymonkey.com/NQHMQ8Q>). The respondents were contacted via e-mail by giving them this web link to take the survey. The responses were logged to the 'surveymonkey' system and individual responses were extracted for analysis.

2.8 Data Analysis Tool and Outcomes

Statistical Package for the Social Sciences (SPSS) was used for data analysis. This tool is a widely used program for data analysis in social sciences. It is also used by market researchers, health researchers, survey companies, government, education researchers, marketing organizations, data miners, and others. The original SPSS manual (Nie, Bent and Hull, 1970) has been described as one of "sociology's most influential books" for

allowing ordinary researchers to do their own statistical analysis. In addition to statistical analysis, data management (case selection, creating derived data) and data documentation are the features of the base software. SPSS datasets have a two-dimensional table structure, where the rows typically represent cases (such as individuals) and the columns represent measurements (such as age, sex etc.). Only two data types are defined: numeric and text (or "string"). All data processing occurs sequentially case-by-case through the file. Files can be matched one-to-one and one-to-many, but not many-to-many (Wikipedia 2014 online).

2.8.1 Descriptive Statistics

Descriptive statistics are useful to understand the features of a set of data. These are numerical measures which do not allow reaching conclusions regarding any hypotheses made. Descriptive statistics enables to present the data in a meaningful way and allows interpretation such as the distribution and pattern of data and their spread. These are the summarizing of data using measure of the center (average, mean, median, mode or mid range), spread of a dataset (range or standard deviation), skewness and kurtosis, correlations between data, and presentation of statistical results using a combination of tables, graphs and charts and discussion of the results. SPSS is quite useful in this respect; its 19th version was used for analysis.

2.8.2 Inferential Statistics

Inferential statistics use samples representing its populations and help to come to a conclusion about the population from which the sample was drawn. As it is not feasible to study each member of the population individually, a representative subset of the

population (i.e. sample) is chosen. Inferential statistics examines the statistical sample, and thus can say something about the population. There are two main divisions of inferential statistics – a confidence interval that gives a range of values for an unknown parameter of the population (the level of significance due to some uncertainty); and the tests of significance by analyzing the sample.

2.9 Model Form and Appropriateness

It was aimed to identify and rank the factors affecting Electronic Government Procurement (e-GP) in this research. A model covering these factors could result an overall impact which may take the form as a model relationship (Equation 5).

$$y = f(p, q, r, s, \dots + c) \dots \dots \dots \text{Equation 5}$$

Where, y represents overall impacts on e-GP; and p, q, r, s represent factors affecting i.e. benefits and enablers, challenges and barriers of e-GP and c is a constant representing unobserved elements and errors.

Above relationship represents that an overall impact on e-GP as a dependent variable which is influenced by a number of independent variables of its attractions having perceived benefits due to the presence of several enablers; also influenced by the threats of challenges and due to numerous barriers available.

It is quite a simple relationship among factors of influences and is very generic. The form of relationship is in question could be thought to be one among additive, multiplicative or exponential; however, available literatures do not have indication of any types of relationship in this field of work. The mathematical concept of logarithmic application in

multiplication or exponentials can modify the relationships in simpler additive form which is quite useful.

The other issue of this relationship comes up regarding co-efficient of the individual factors in the relationship to establish the nature and trend. There could be some errors, unobserved elements, specific preference or deterrent to the relationship present which also needs to be taken into account.

Based on the nature of those factors, they influence the e-GP as these are mostly of human factors and largely socio-psychological having no simple form and scale, the relationship in Equation 5 is expected to be variable in different forms based on situation and time; and so is complex.

2.9.1 Goodness of Fit

The goodness of fit statistics helps to determine whether a model adequately describes the data. Measures of goodness of fit typically summarize the discrepancy between observed values and the values expected under the model in question. Such measures can be used in statistical hypothesis testing whether outcome frequencies follow a specified distribution (Wikipedia 2014 online).

A model fits the data well if the differences between the observed values and the model's predicted values are small and unbiased. R-squared is a statistical measure of how close the data are fitted to the regression line. It is also known as the coefficient of (multiple) determinations for (multiple) regressions. The model with the largest R-squared statistic is expected according to this measure.

The R-squared is defined as the percentage of the response variable variation that is explained by a linear model, i.e. $R\text{-squared} = \text{Explained variation} / \text{Total variation}$. The value of R-squared is a continuum between 0 and 100% in which the lowest end 0% indicates that the model do not explain any variability of the response data around its mean; while the highest end 100% indicates that the model explains all the variability of the response data around its mean. In general, the higher the R-squared, the better the model fits your data. The R-squared at upper middle, say 50~70% are regarded as satisfactory fit as it accommodates the expected variations in the e-GP user community. However, R-squared does not indicate whether a regression model is adequate or not; because a low R-squared value for a good model or a high R-squared value for a model that does not fit the data are also possible. A negative R-squared is impossible and such one could be adjusted or predicted, not in case of a regular R-squared (Frost 2013). This study reveals a good R-squared which reveals that the model could explain approximately 73.5% of the prediction.

2.9.2 Correlation of Factors

Correlation refers to dependence of two or more random variables. It measures the relationship between two mathematical variables or measured data values. There are several correlation coefficients, measuring the degree of relationship; the most common is the Pearson correlation coefficient, which is sensitive to a linear relationship between two variables. Other correlation coefficients, more robust than the Pearson correlation are also available which are more sensitive to nonlinear relationships. The correlation coefficient defines the dependence structure only in very particular cases, for

example when the distribution is a multivariate normal distribution. The correlation matrix is symmetric due to the correlation between X_i and X_j is reciprocal and same as the correlation between X_j and X_i for example.

If a data-set having more than two variables, partial correlation coefficient is useful - this measures the degree of dependence between a pair of variables. Partial correlation resolves the two associated linear regression problems, get the residuals, and calculate the correlation between them.

The correlations without any control variables are zero-order correlations; it gives correlation between the transformed predictor and the transformed response. This is useful for this research work.

2.9.3 Multicollinearity Among Variables

Multicollinearity is a statistical phenomenon having two or more predictor variables in a multiple regression model are highly correlated, which means one can be linearly predicted from the others with a reasonable degree of accuracy. One of the features of multicollinearity is that the standard errors of the affected coefficients tend to be large. It is expected that the predictor variables correlate highly with the dependent (outcome) variable, and correlate at minimum with each other (among independent variables) in the relationship. It increases the standard errors of the coefficients which mean the coefficients for some independent variables may be found to be around 0, whereas if no multicollinearity and have lower standard errors, these same coefficients might be significant. Thus multicollinearity misleads and inflates the standard errors and makes some variables statistically insignificant.

Multicollinearity can be identified in a model by observing large changes in the estimated regression coefficients when predictor variables are added or deleted. Variance inflation factors (VIF) is a tool to measure the variance of the estimated coefficients for this purpose. If two variables are not correlated, then all the VIFs will be 1.0. If VIF of a variable is 5 or more, then there is the presence of collinearity with that variable. To overcome this problem, one of such variables should be removed from the regression model.

Chapter Three: Data Analysis

3.1 Data Organisation

Statistical techniques include both compilation procedures and adjustments to be made to raw data by ensuring that errors are minimized; also estimating of missing observations. The task of data compilation covers the extraction of data from collections of questionnaire responses made online by the respondents. Extraction of data collected requires the knowledge of analysis platform to be used, in this case the SPSS, and the coding procedures. Both the tasks of storing and manipulating data and assessment of data quality critically are most valuable in this stage. Compilation requires sound judgment on responses based on the background of the respondents and planned estimation methods.

The extracted data were entered directly to the IBM® SPSS® Statistics data file which is organized by cases (rows) and variables (columns). In this data file, cases represent individual respondents to a survey and variables represent responses to each question in the survey. Defining descriptive variable labels and value labels for variable names and data values are essential as they are used in statistical reports and charts. Variables could be of different types, including numbers, strings, currency, and dates.

There are other options for organizing the data which use spreadsheet applications (Microsoft Excel), database applications (Microsoft Access) and text files.

3.2 Analytical Techniques

To understand the data gives message about the population are reflected by descriptive statistics (Frequencies, Descriptives, Cross tabulation, etc.) and bivariate statistics (Means, t-test, Correlation) which are quite versatile. However, descriptive statistics as well as inferential statistics were utilized to accomplish the conclusion and have a fair understanding of the research issues.

At outset, checking the presence of any missing data in the database is the prime job to ensure all relevant information is taken into account for analysis. The presence of data as unexpected and beyond the general perception is also important as such a case may influence the result and could yield a surprise.

The respondent's attributes including age, experience, knowledge base, and relevance with procurement and e-GP systems are initial subjects of investigation. At secondary level, their attitude to the factors of influence as listed in the questionnaire and their level of perception about individual factors are the matter of interest. Then selecting a compromised set of factors according to their ranks depending on choice and statistical justifications those favour the e-GP or do not.

For the purpose of identifying factors justifiably influence the e-GP, a linear relationship of the factors was assumed based on which regression model to be estimated. The linear regression model assumes that there is a linear, or "straight line," relationship between the dependent variable and each predictor. The form of relationship between variables within the model should keep linear as far as possible and it was taken care of through

necessary transformations. The better the value of statistical significance, the variables are more likely to be mutually independent.

Finally, a common set of factors influencing the e-GP would have been developed from those recognised as perceived by the respondents and those factors identified by the regression work.

3.3 Characteristics of the Respondents

The respondents, almost all are from procurement environment, thus the expectation of the survey work meets satisfactorily. As mentioned, the targeted respondents were from e-GP environment such as the Head of the Procuring Entity, approving authority, Procuring Entity, opening and evaluation Committee members, Tenderers, Applicants, Bank users, System administrators etc.

A total of 63 responses were received of which 71.4% were from registered users of e-GP and one did not answer (Table-6), however more than the registered users (93.7%) were trained in procurement (Table-7) and 84.1% got training on e-GP (Table-8).

The most proportion of the users (44.3%) was 'Procuring Entity' and 29.5% were TEC/PEC members; this is significant due to the fact that they actually drive the procurement process and play the major role. A significant proportion of the users do not use e-GP by themselves which reflect against the spirit of decision making in tendering process and potential to abuse of the system. The length of experience of the e-GP users shows a fair distribution (Table-9). Table-10 shows that the users (77.4%) were matured enough being 30~50 years old and their behaviour about use of e-GP reflects some lack of governance in the system.

Table-6: Registered e-GP Users Among Respondents

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	45	71.4	72.6	72.6
	No	17	27.0	27.4	100.0
	Total	62	98.4	100.0	
Missing	System	1	1.6		
Total		63	100.0		

Table-7: Respondents Got Training on Procurement

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	59	93.7	96.7	96.7
	No	2	3.2	3.3	100.0
	Total	61	96.8	100.0	
Missing	System	2	3.2		
Total		63	100.0		

Table-8: Respondents Got Training on e-GP

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	53	84.1	84.1	84.1
	No	10	15.9	15.9	100.0
	Total	63	100.0	100.0	

Table-9: Experience in Public Procurement

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	> 20 years	17	27.0	27.4	27.4
	15 ~ 20 years	13	20.6	21.0	48.4
	10 ~ 15 years	4	6.3	6.5	54.8
	5 ~ 10 years	14	22.2	22.6	77.4
	< 5 years	14	22.2	22.6	100.0
	Total	62	98.4	100.0	
Missing	System	1	1.6		
Total		62	63	100.0	

Table-10: Age Band of Respondents

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid				
50 ~ 60 years	7	11.1	11.3	11.3
40 ~ 50 years	27	42.9	43.5	54.8
30 ~ 40 years	21	33.3	33.9	88.7
< 30 years	7	11.1	11.3	100.0
Total	62	98.4	100.0	
Missing System	1	1.6		
Total	63	100.0		

The respondent's pattern with respect to experience, age and knowledge shows prospective to the objectives to this study. The composition of respondents was from a distributed type of varying experience in procurement functions where 40% were with less than 10 years, while 54% were with 15 years or more (Table-9), thus allowed a balance in feedback to the questionnaire. 74% of them are at their middle of the age - around 40 years (Table-10) reflecting psycho-physical maturity and potentially have ability to brainstorm properly.

Although 77.6% of the respondents were registered with e-GP, more than 10% of them were lacking to use e-GP themselves, they allowed others to use in favour of them. This is alarming due to the risks that the other users might misuse of the delegation they got from the authorized users which could cause litigation as well as indiscipline in the procurement process.

One-fifth of the users were not registered however they use e-GP which could be as authorized by registered users or they use training suit of the system, one of the respondents was trainer of e-GP for example.

3.4 Involvement of Respondents in Procurement and e-GP

The targeted population for the survey was among those in procurement and concerned with e-GP. The survey result shows about 98% of them were trained on procurement (Table-7) and 86% got e-GP training (Table-8). It is clear that private sector do not have much facilities for training on procurement, even the academic curriculum do not reflect it in depth. So the contractors, applicants or suppliers, although they are essential parts of procurement (also e-GP), are lacking to have formal training in this regard. The public sector also struggling to disseminate the technology to its human resources. In spite of limited scope of training, this activity is seen a value adding to governance processes.

According to role in procurement systems, the majority of respondents are procuring entities (43%) and committee members (37%); while the Registered Contractor/Supplier/Consultants were only 6.5% (Table-11); and unfortunately no HOPE took part in the survey. Among 'non-registered' and 'other' categories, the respondents were trainer of procurement, system administrator, authorized user and procurement specialists.

Table-11: Role/Function of Respondents in e-GP

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Other	3	4.8	4.8	4.8
Registered Contractor/ Supplier/ Consultant	4	6.3	6.5	11.3
TEC/PEC member	19	30.2	30.6	41.9
TOC/POC member	4	6.3	6.5	48.4
Procuring Entity	27	42.9	43.5	91.9
HOPE/Approving authority	5	7.9	8.1	100.0
Total	62	98.4	100.0	
Missing System	1	1.6		
Total	63	100.0		

Table-12: Cross-Tabulation of Registered vs. Actual User of e-GP

			Actual user e-GP					Total
			Self	Subordinate officers	Other office	Committee member	Other	
Registered user of e-GP	Yes	Count	39	4	1	0	1	45
		%	67.2%	6.9%	1.7%	.0%	1.7%	77.6%
	No	Count	6	0	3	1	3	13
		%	10.3%	.0%	5.2%	1.7%	5.2%	22.4%
Total		Count	45	4	4	1	4	58
		% of Total	77.6%	6.9%	6.9%	1.7%	6.9%	100.0%

Although most of the respondents use e-GP in their own (requiring a security password), a significant proportion - 14% of them depends on others to deliver the responsibilities in e-GP (Table-12). It is a cause of concern that there is a possibility to a significant misuse of the system and subsequent hazards could be in the operational procedures such as administration and control.

3.5 Response to the Factors of Influence

The response to the question seeking the level of overall impact due to the presence of influencing factors of e-GP were found to be positive which meets the expectations. The result shows the factors mentioned in the questionnaire have a medium to high impact on e-GP according to 76% of the respondents (Table-13). This is due to the collective impacts of those factors as individuals could perceive in the survey. This relationship satisfies Equation 5 mentioned in Section 3.5 and can be modified as below:

$$\text{Overall impact} = \int \text{Presence of Supporting \& Opposing factors} + \text{Unobserved factors}$$

..... Equation 6

Table-13: Level of Overall Impact Due to Influencing Factors of e-GP

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Moderate impact	7	11.1	11.3	11.3
	Medium impact	19	30.2	30.6	41.9
	High impact	28	44.4	45.2	87.1
	Heavy impact	8	12.7	12.9	100.0
	Total	62	98.4	100.0	
Missing	System	1	1.6		
	Total	63	100.0		

3.6 Perceived Factors and Their Ranking

The rating of the factors of influences results in identifying those favours or opposes the e-GP. A number of factors were ranked in a varying degree to favour ranging from 49% to 86% of respondents choose them as supportive when accounted the votes of both ‘supports’ and ‘supports strongly’ categories.

The factors such as Decision making, Efficiency in procurement, Good governance, Data reliability & accuracy, Transparency & equal treatment, Regulation & support by CPTU, Knowledge, experience & skill, Secure and interoperable platform, Access to e-GP free and unrestricted, Performance monitoring, Government legislation, Telecommunication and internet, and Reporting capability won over 70% of votes. However, for Performance monitoring, Government legislation and Reporting capability 20% of the respondents in each case kept them neutral. Considering this significance, these factors are ranked to medium influence category and the remaining factors mentioned are categorized to have high influence. Another factor ‘Potential for mobile phone e-GP’ which relates the possibility of mobile phone use for e-GP operation suggests having influence to medium

category as it gained 67% supports. For three factors Level of visibility (67%), Document transmission (67%) and Infrastructure with appropriate hardware and software (60%), 20% of the respondents were seen neutral in each case. Therefore they are categorized to have some influence.

A vast number of respondents (25% to 34%) did not vote keeping them neutral for other factors - Provision for training, Available time to use e-GP, Top management support, Nature of organisation or procurement, Length of procurement cycle, Control over budget & purchasing, and Software updating. These are considered as dubious to their direction of influence the e-GP and dropped from the influence list.

Several factors were found to be reactive to e-GP, among those Cash transaction, Influence of vested interests, Leakage/disclosure of information, Cartel, corruption, fraudulent, collusion or coercive activity, End user resistance, and Fear and inertia of organisation were supported by 56% to 65% respondents as they oppose e-GP. These are categorized to have medium influence. However, the factors such as Leakage/disclosure of information, Cartel, corruption, fraudulent, collusion or coercive activity, End user resistance might create serious consequences to procurement operations and so procurement professionals should be very careful of these factors.

Human intervention and Digital divide were opposed by 58% and 47% respondents respectively, but 23% of respondents for earlier factor and 20% of respondents for later factor were neutral. Due to this uncertain condition, they are ranked to have lower influence.

Other factors used in the questionnaire such as Manager pursue functional targets, Power interruption & failure, Supplier integration, and Supplier number were identified as they oppose the e-GP, but many respondents (up to 55%) were neutral. This significance drove them out of the decision regarding their position. However, if manager pursue functional targets or incidence to power interruption & failure occur, then e-GP operation must suffer seriously. So influence of these factors should not be ignored.

Two contesting sets of factors among which one is active in favour and the other is working against e-GP in Bangladesh are summarized. Figure-7 shows these counteracting factors of e-GP with their degree of influence. It shows that factors such as Leakage/disclosure of information, Influence of vested interests, Cash transaction, and Cartel corruption fraudulent collusion or coercive activities are most detrimental to the e-GP process.

Table-14: Set of Factors For and Against e-GP

Factors in Favour	Factors Against
Decision making Level of visibility Good governance Reporting capability Government legislation Document transmission Performance monitoring Efficiency in procurement Data reliability & accuracy Execution of law and order Knowledge, experience & skill Regulation & support by CPTU Potential for mobile phone e-GP Transparency & equal treatment Telecommunication and internet Secure and interoperable platform Access to e-GP free and unrestricted Infrastructure with appropriate hardware and software	Digital divide Cash transaction End user resistance Human intervention Influence of vested interests Fear and inertia of organisation Leakage/disclosure of information Cartel, corruption, fraudulent, collusion or coercive activity

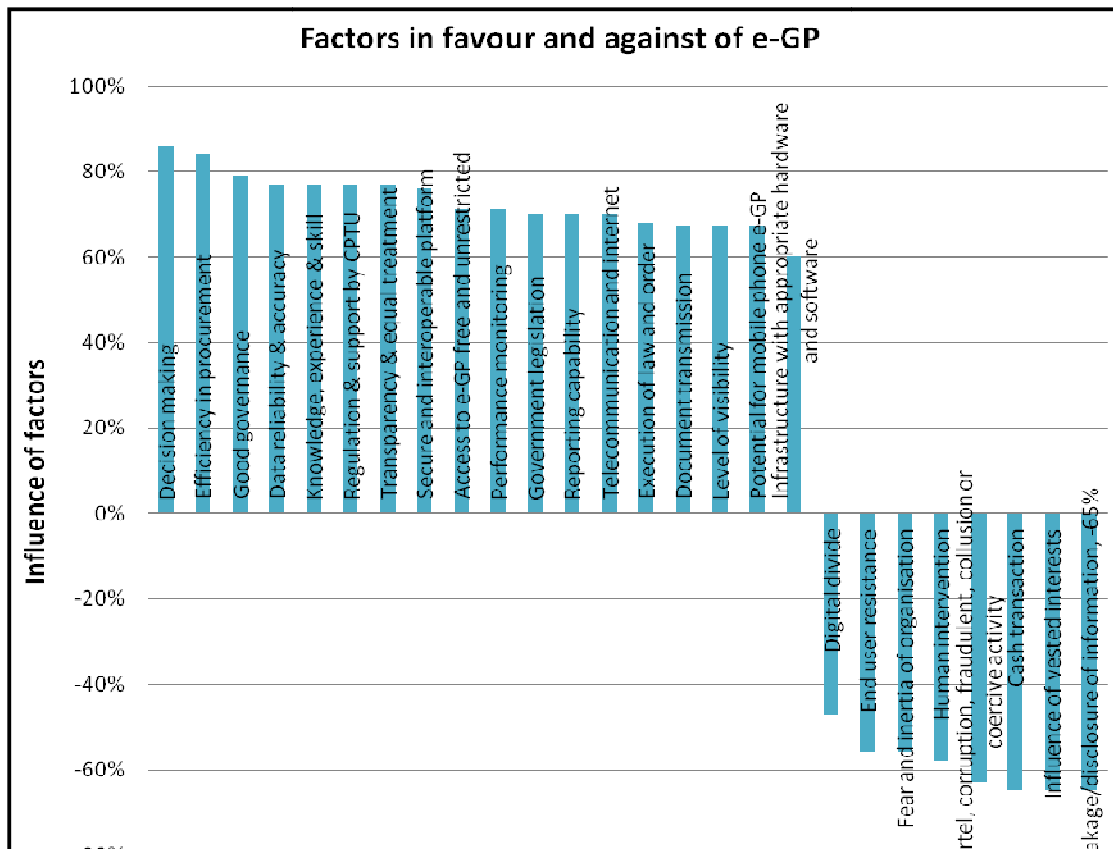


Figure-7: Factors in favour and against of e-GP

3.7 Regression Modeling

The regression of original model summary showed a good fit and 73.5% of the variations in factors of influences on e-GP could be explained by this model. However, a negative adjusted R Square indicates the presence of some problems in the model. Also the analysis of variance reported a low level of F statistic, indicating that the variance were by chance. The coefficients indicated that there were a number of predictors in the model. There were several variables with significant coefficients, indicating that those variables contribute much to the model. The standardized coefficients could help to determine the relative importance of the significant predictors. Among the predictors,

Influence of vested interests, Supplier number, Secure and interoperable platform, Infrastructure with appropriate hardware and software, Execution of law and order, Cash transaction, Access to e-GP free and unrestricted, Manager pursue functional targets, Transparency & equal treatment, End user resistance, Fear and inertia of organisation, Data reliability & accuracy, Human intervention, and Software updating contribute to the model significantly because of their larger absolute standardized coefficients.

For many predictors, the values of the partial and part correlations were dropped significantly from the zero-order correlation which means that much of the variance in one predictor is explained by multiple variables. Thus the coefficients show that there are the possibilities of multicollinearity problem. Moreover, the small tolerances show that about 90% of the variance in a predictor can be explained by the other predictors. With small tolerances, there were high multicollinearity and the standard error of the regression coefficients could be inflated. As variance inflation factor (VIF) greater than 2 is usually considered problematic and the smallest VIF in the table is 5.513 the data set required further treatment.

Moreover, coefficient table contained the collinearity diagnostics which reflect considerable problems with multicollinearity in the model relationship. As there were many eigenvalues of very low, the predictors indicate highly inter-correlated in which small changes in the data values may lead to big changes in the estimates of the coefficients. Almost 90% of the condition indices were greater than 15 (serious problem

when greater than 30); thus model dimensions were found problematic in terms of collinearity.

Z scores treatment of the independent variables gave the eigenvalues improved relative by two-third of the factors to the original model; the problems of condition indices were almost eliminated. However, the collinearity statistics reported in the coefficients table remained similar as before. This can be explained by the fact that the z-score transformations do not change the correlation between two variables, where z scores are standardized values of the variables.

Using the Factor Analysis, a set of uncorrelated independent variables that fits the dependent variable and original independent variables can be created. Factor Analysis is used for data reduction or structure detection. The purpose of data reduction is to remove highly correlated variables from the data file; and structure detection examines the underlying relationships between the variables.

Using the factor scores, a linear regression on factor component scores resulted a far better model fit (Tables-15 & 16) than that of original predictors. The collinearity statistics also became better and the factor scores were uncorrelated (Table-25). Analysis of variance shows that the factors of e-GP significantly influence it.

Table-15: ANOVA (Dependent Variable: LogOverall) Factor Score

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	3.316	20	0.166	26.038	0.000
Residual	0.178	28	0.006		
Total	3.494	48			

Table-16: Model Summary (Dependent Variable: LogOverall) Factor Score

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.974	0.949	0.913	0.07980

Stepwise methods are also convenient to focus on a smaller subset of predictors. It selects models based solely upon statistical merit; however it may choose predictors that have no practical significance. Thus the new model explained the predictors more favorably compared to that of the previous model. The adjusted R-square statistics became nearly identical in just 6 iterations (Table-17). Almost 93% of the variations in the factors of influences on e-GP now are explained by this model.

Table-17: Model Summary (Dependent Variable: LogOverall) Iterations

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.887 ^a	0.787	0.783	0.12579
2	0.933 ^b	0.871	0.866	0.09895
3	0.949 ^c	0.900	0.894	0.08803
4	0.957 ^d	0.916	0.909	0.08154
5	0.964 ^e	0.929	0.921	0.07592
6	0.967 ^f	0.936	0.927	0.07304

The stepwise algorithm chose the factor scores 15, 1, 3, 9, 2, and 7 as predictors (Table-29 in Annexure-3). The rotated component matrix in the Factor Analysis output (Table-30 in Annexure-3) gives results below:

- The fifteenth component (factor scores) loads more to Potential for mobile phone e-GP. Since the regression coefficient is positive for factor score 15, the mobile application of e-GP is potential to its higher use.
- The first component (factor scores) loads strongly on eight negative factors such as Influence of vested interests, Digital divide, End user resistance, Human intervention, Fear and inertia of organisation, Leakage/disclosure of information, Power interruption & failure, Manager pursue functional targets, and Cash transaction. Since

the regression coefficient is positive for factor score 1, the higher influences of these factors can lead to lower uses of e-GP.

- The third component loads most strongly on Supplier number, Supplier integration, Software updating, and Top management support. The positive coefficient for factor score 3 suggests that Suppliers motivation and involvement are expected to have higher e-GP usage.
- The ninth component loads most strongly on Efficiency in procurement and Document transmission. Since the regression coefficient is positive for factor score 9, this suggests that greater efficiency in procurement are expected to have higher use of e-GP.
- The second component loads most to seven factors i.e. Good governance, Performance monitoring, Transparency & equal treatment, Decision making, Secure and interoperable platform, Government legislation, Top management support, Potential for mobile phone e-GP, and Infrastructure with appropriate hardware and software. Since the regression coefficient is positive for factor score 2, suggesting overall governance in governmental procurement systems are expected to have higher use of e-GP.
- The seventh component loads most strongly on Regulation & support by CPTU along with Decision making and Data reliability & accuracy; the component loading combined with the negative coefficient for factor score 7 suggests that regulations are understood as deterrent, public sector decision making and data reliability is also poor. However, supportive regulation, prompt decision making and reliable data flow can impact positively.

Table-18: Coefficients of Factor Components

Factor scores	Factors	Co-efficient	t	Significance
15	Potential for mobile phone e-GP	0.748	13.754	.000
1	Influence of vested interests, Digital divide, End user resistance, Human intervention, Fear and inertia of organisation, Leakage/disclosure of information, Power interruption & failure, Manager pursue functional targets, and Cash transaction	0.291	7.453	.000
3	Supplier number, Supplier integration, Software updating, and Top management support	0.154	3.903	.000
9	Efficiency in procurement and Document transmission	0.189	3.480	.001
2	Good governance, Performance monitoring, Transparency & equal treatment, Decision making , Secure and interoperable platform, Government legislation, Top management support , Potential for mobile phone e-GP , and Infrastructure with appropriate hardware and software	0.114	2.901	.006
7	Regulation & support by CPTU, Decision making , and Data reliability & accuracy	-0.083	-2.111	.041

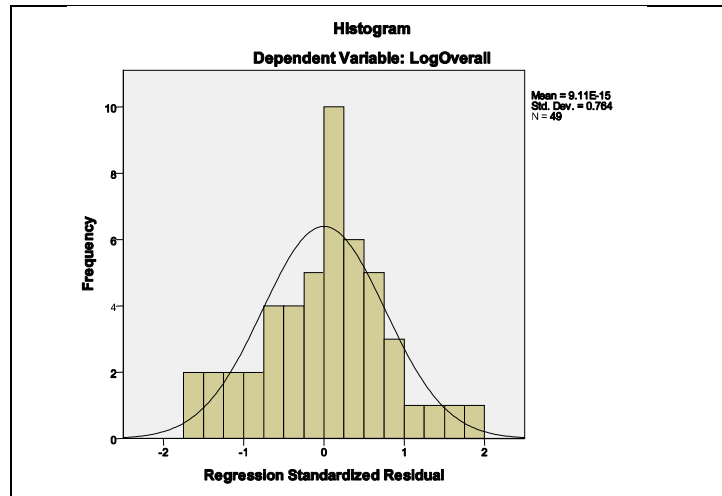


Figure-8: Histogram of Dependent Variables (Modified data)

The histogram of modified data implies acceptance of the hypothesis of normality.

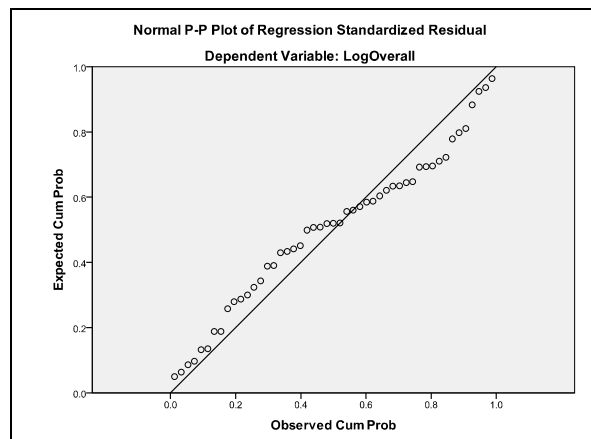
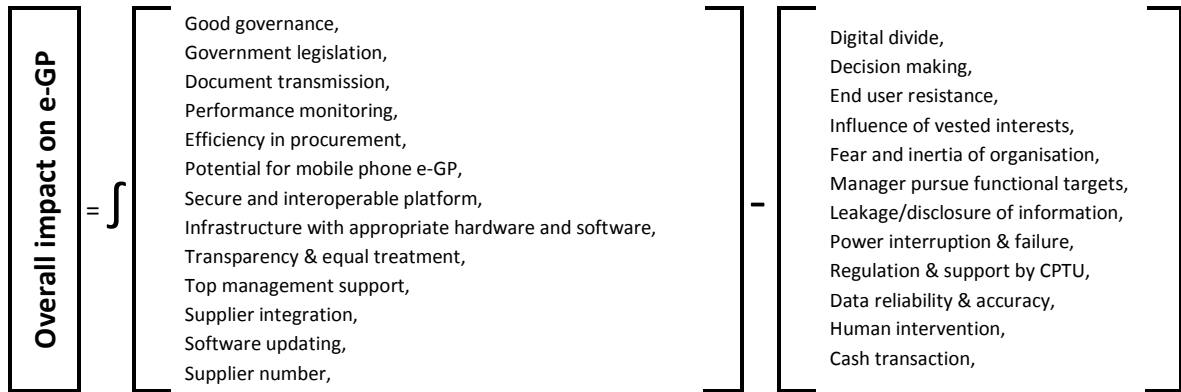


Figure-9: Normal P-P Plot with Modified Data

The model combined by the matrix of factors in which 13 were found prominent in favour of, and 12 were against the e-GP stands in the following figure.



Chapter Four: Discussion on Results

4.1 Empirical Results

Due to functional presence of the respondents in a procurement environment they possess a good knowledge of practicing procurements and had skills in e-GP. They took about 14 minutes time to respond the questionnaire and spent 18.5 seconds for each choice which reflects the length and complexity of the questionnaire design was reasonable and suitable.

The respondents formed a good sample and their inputs were quite useful. Bangladesh government intends to expand practicing e-GP and simultaneously giving training to the users. Some respondents were seen to use e-GP even they did not get relevant trainings. This shows an influence of the e-GP that developed around government procurement environment and attracts the interests of users. Their proactive role to capture the knowledge of e-GP undoubtedly helps the progressing of paperless tendering.

Within the e-Tendering process, procurement legislation in Bangladesh allows more roles to the procuring entity and committee members. According to the results of the research work, about three-fourth of the respondents were from procuring entities and committee members which show a fair quality of responses although few responses were seen lack of knowledge or proper concentration in making responses. The questionnaire did not ask for the level education or background of the respondents; so this remains a grey to justify the reasons of such responses.

Although most of the respondents were registered with e-GP (72.6%), some of them were lacking in use of e-GP themselves, rather they let others to use in favour of them. This poses the risks of misuse of the system due to unauthorized access which could cause litigation as well as indiscipline in the procurement process. So this is contradictory to the government's intention to fair service delivery and governance.

Some respondents use e-GP even though they were not registered with the system; part of them was users of e-GP training suit – one respondent was the trainer of e-GP for example. There is an argument in favour of accessing e-GP for others is that some organisations deal with a huge number of procurements, say RHD and LGED. The role of HOPE in such case is usually performed by delegation as 'Approving Authority' however the HOPE needs to carry out some critical role which sometimes may require to allow the others for using e-GP to accelerate the service delivery process, however, such attempt requires a higher degree of control.

Statistical results give a clear indication that the listed factors have a great influence on e-GP. So it became essential to look for the factors which were active to favour or oppose the system. Based on the perceived choice of the respondents a clear set of counteracting factors was developed considering the level of choice and silence as they could influence the result if the choice was otherwise.

The factors of influence such as Decision making, Efficiency in procurement, Good governance, Data reliability & accuracy, Transparency & equal treatment, Regulation & support by CPTU, Knowledge, experience & skill, and Secure and interoperable platform were most supportive their efficient utilization requires dealing them careful and wisely in

order to maximise the benefits of e-GP. Provision for training, motivating and incorporating relevant factors in the policy and practice, also reinforcing by the senior officials can maximise the benefits.

As the factors such as Leakage and disclosure of information, Influence of vested interests, Cash transaction, and Cartel corruption fraudulent collusion or coercive activities have damaging role to e-GP, they need careful deals in minimise the harm. This also needs training and motivating with strong defense by the authority. The control measure against leakage and disclosure of information is considered under Section 64 of PPA 2006 and Rule 127 of PPR 2008, but only legal provision may not suffice and it requires something more role from the appropriate authority. A strict provision of technology is essential which would prevent accessing tendering information before deadline of public disclosure, opening the tenders for example. Incidence investigation and sharing, internal policing, whistle blowing also can help to safeguard the system and benefit all. Influence of vested interests can be counteracted by the active support from outside the organisation structure; political consensus can be a backing for example. Minimizing cash transaction using secured online banking and tracking any cartel, corruption, fraudulent, collusion or coercive activities can help e-GP a lot. The procuring entity, committee members and HOPE have a great role in this respect.

Implementing good governance in the organisation, using supportive human resource and ensuring anti-corruption and social safeguard policy could promote a favourable environment for e-procurement especially in public sector of Bangladesh.

4.2 Statistical Analysis

R Square value of the original regression model 0.735 agrees that the model fit, however the F-statistic was low. The coefficients of the model produced significant coefficients of a number of predictors and several variables, thus these variables were found to have considerable influence on e-GP. The standardized coefficients show the relative importance of significant predictors. Many predictors had larger absolute standardized coefficients and so contribute the model more. There were the issues of correlations and multicollinearity but various techniques such as factor analysis, especially the stepped one resolves to a distinctive outcome by giving better model fit (R-squared 0.949), a good F statistic (26.038) and other indices.

Evidence shows that use of mobile phone has potential for e-GP (Table-19) and found to be the main factor. The mobile phone based e-GP would gain more acceptance of the system and increase the speed of operation. The users might find it easy to use by accessing from anywhere. Mobile phone apps for e-GP could make the difference.

Table-19: Mobile Phone based e-GP

SN	Variables	Factor loading
1	Potential for mobile phone e-GP	0.484

Some opposing factors have serious impacts on e-GP (Table-20). These appear to be the second most influencing factors of e-GP. Vested interests such as politicians, bureaucracy and local elites generally wish to drive the system in their line of interests whatever be the provisions in legal term; e-GP is not the different one. Digital divide is supposed to be a major cause behind the failures of e-service implementation in public sector which can

be minimised through encouraging technology education and making easy access to the electronic wide area network system. End user resistance, Human intervention, and Fear and inertia of organisation are closely related human factors that generally hinder the system to operate smoothly.

Table-20: Vested interests, Digital divide, Attitude of individuals, Organisational culture, Ethical values and Energy infrastructure

SN	Variables	Factor loading
1	Influence of vested interests	0.886
2	Digital divide	0.839
3	End user resistance	0.811
4	Human intervention	0.803
5	Fear and inertia of organisation	0.798
6	Leakage/ disclosure of information	0.718
7	Power interruption & failure	0.718
8	Manager pursue functional targets	0.668
9	Cash transaction	0.442

The most detrimental element is the leakage and disclosure of information, the others are managers pursue for their functional targets, and intention to make transactions in cash which can also be characterized as poor human quality. Power interruption & failure is another factor that also hinders the e-GP system which can be improved by better service delivery in the power sector.

Table-21: Suppliers, Systems Support and Top Management Role

SN	Variables	Factor loading
1	Supplier number	0.933
2	Supplier integration	0.858
3	Software updating	0.489
4	Top management support	0.432

Table-21 shows the third group of influencing factors that depicts Supplier is the key to source the requirements that needed for any system to operate. The more suppliers the e-GP could attract, the procuring entity would be able to source by switching the supplier and e-GP would get more vibrant. However, having the quality suppliers and retaining them is important. Updating the systems software, and Top management support also influence the e-GP positively.

Table-22: Efficient System Development

SN	Variables	Factor loading
1	Efficiency in procurement	0.857
2	Document transmission	0.511

As the e-GP system gets efficient and document transmission becomes secured and easy, use of e-GP could potentially be wider and speedier. So the e-GP provider organization CPTU should play appropriate role to ensure the operational efficiency and faster transmission of documents.

Table-23: Good Governance and Transparency with Support from Management and Technology

SN	Variables	Factor loading
1	Good governance	0.830
2	Performance monitoring	0.754
3	Transparency & equal treatment	0.734
4	Decision making	0.692
5	Secure and interoperable platform	0.687
6	Government legislation	0.650
7	Top management support	0.550
8	Potential for mobile phone e-GP	0.428
9	Infrastructure with appropriate hardware and software	0.401

Ensuring good governance and transparency (Table-23) could benefit e-GP as expected. Nonetheless support from top management and availability of a good operational infrastructure also could accelerate the higher use of e-GP. Government has a vital role in this respect. Political, business and social climate as a whole are also important.

Table-24: Red Tape Regulation and System Security

SN	Variables	Factor loading
1	Regulation & support by CPTU	0.831
2	Decision making	0.476
3	Data reliability & accuracy	0.471

The factors regulation is not expected in general; however, a soft regulation, prompt decision making and data reliability may influence in favouring e-GP.

4.3 Summary of the Results

From the results above, a comprehensive set of driving and restraining factors was developed which can be seen below.

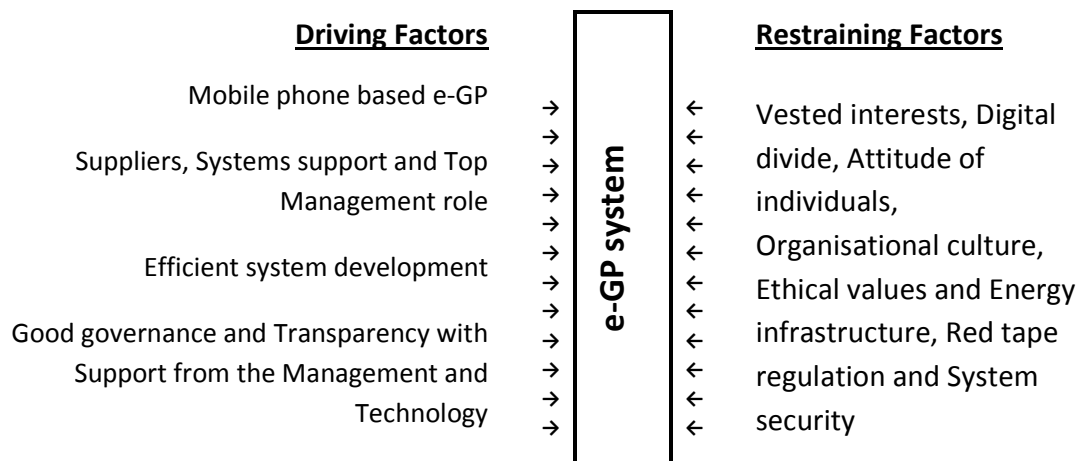


Figure-10: The Comprehensive Set of Factors For and Against e-GP

Above result supports great influences of a number of factors of e-GP. Among them, mobile phone based e-GP (for example, mobile phone apps) along with secure and

interoperable platform might offer 'touch and play' benefits to its users and could boost the use of e-GP in Bangladesh.

Suppliers are the valuable player in this system that requires to develop by facilitating and getting them involved. Systems support by software updating and network maintenance has a great role to run the e-GP system; without this the users may go back to paper-based system and e-GP might lose reliability. Top management's role can make the difference in promoting e-GP usage. LGED is an example of e-GP operation considering the scale of usage that has 716 PEs, most of them at upazila level, and achieved publishing 10,932 (62.8%) and finalizing 6,273 (62.6%) e-Tenders/Proposals. Thus performance of e-GP largely depends on the performance of LGED. This could happen mostly due to the strong backing by its top management.

Efficient system development is possible as e-GP is based on electronic technology. With immense development and expansion of ICT globally, e-GP has the opportunity to utilize it and prove itself as efficient in procurement service delivery. This study supports the proposition.

Good governance and transparency is at forefront of the procurement reform and establishment of e-GP system. With Support from management and having technological provisions this goal can be achieved easily. Supportive bureaucracy and system security is another factor that also helpful to boost up the e-GP.

Concern about ethical breach by leakage and disclosure of bidding information is addressed by the PPA 2006 Section 64 and PPR 2008 Rule 128. However, there is chance of offense by the parties involved as a result of the study which supports the argument

that only regulatory provisions are not sufficient to tackle such behaviour. Along with ethical declaration, some other provisions must be considered such as investigation, sharing the incidence, punishment and reward, whistle blowing, technological provision so that none can access the bidding information before deadline of submission of tenders.

Digital divide is a barrier to economic opportunities, especially for least developing countries like Bangladesh which needs to bridge as soon as possible. ICT sector is believed to have tremendous potential for poverty eradication and socioeconomic advancement. Bangladesh has remarkable progress in accessing ICT and their application, however, broadband deployment not kept pace with the world so made the progress, resulting in continuing gap in digital access. As the appeal of smart phones grows in Bangladesh, people can access the Internet more through mobile devices that call for greater focus on wider use and the full involvement of the Government, subsidizing the sector for example. However, there are challenges in promoting ICT as an enabler for promoting development.

Understanding the need and potential benefit of e-GP system can reduce fear and inertia of the user organisations. Communicating clear vision to every stages of the organization can help in this regard. Motivation by the superior executives, also by the members of the board through inclusion the vision in policy documents and using it as a slogan of the organization can overcome such fear and inertia.

Media news shows that Public Works Department official in Khulna (Annexure-5) was unwilling to use e-GP which is an example of end user resistance that is experienced as

changes in traditional method. Change leader has a great role to overcome such reactions. Advance information that demands loyalty of the officials to comply with the requirements of e-GP implementation is in place. However, provision of motivation and extensive training as well as involving the users well ahead and getting feedback can improve such resistances.

The vested interests (politicians, bureaucrats and local elites for example) in least developed countries are seen to be prominent and against implementation of a reform, even there are legal provisions. E-GP is also influenced by those as which is another output of the research that needs to address properly so that those do not hinder the e-GP process to function effectively. Involvement of politicians, bureaucrats and local elites with e-GP process and attempting to motivate them and a strong policy leadership can help to countervail the problem.

In terms of research questions, section 1.5 responds the first question; section 4.3 gives solution of the last question and the other questions regarding the factors of influence are the main work of this research which is covered mainly by the Chapter Three.

Chapter Five: Conclusion and Recommendations

5.1 Conclusions

This research reveals that e-GP is greatly influenced by facilitating through technology and infrastructure in place, maintaining of efficient system management, having support from top management, availability of supportive bureaucracy and overall ensuring good governance and transparency. The tenderers/ suppliers are important parties in influencing the system that needs to develop and maintain for better outcome of the procurement.

It is also highly influenced by the vested interests, digital divide in the society, individual's attitude to the system, organisational culture, ethical values and efficient energy infrastructure. However, strong control of ethical malpractice such as leakage and disclosure of bidding information, minimizing digital divide, removing fear and inertia of the user organisations, assuring the end users, and managing the influence of vested interests are essential for a well functioning e-GP. The counter acting forces must be managed in order to reap the benefits of enhanced governance and maintain a sustainable procurement system.

Government of Bangladesh, especially CPTU has a considerable role to enhance the promotional factors of e-GP as well as to treat the counteracting issues such as dealing with the vested interests and ensuring the demand management in power supply so that e-GP can be operational and be uninterrupted.

The evidences found as a result of the study could help better understanding and prediction of procurements issues. The findings are expected to be useful to the planners and policy-makers of the country to improve the e-government procurement processes by adopting appropriate measure and ensure collaborative and win-win business environment in ongoing and future e-government applications in Bangladesh. As the socio-political and economical conditions challenge the public procurement environment continuously, assessments of factors of influence on e-GP should also be reviewed and updated on a regular basis to ensure its incremental effectiveness.

Finally, the research outcome shows that it responds the research questions appropriately and meets the requirements of the objectives sufficiently.

5.2 Recommendations

A good management strategy is critical to success of e-GP. As the best practice e-procurement system, e-GP must identify the barriers and opportunities. The barriers may be specific to procurement process, in the organisation itself or in existing communication channels. The presence of favoring factors as well as counteracting factors of e-GP demands the enhancement of potentials of favoring factors and managing the odds.

Based on this research, following actions are recommended to further step forward the e-GP system:

- Develop mobile phone based apps and offer user friendly operation for its users;
- Mechanisms are developed that suppliers get encouraged more to use the system;

- Top executive in the organisations play a lead role to keep pace of growth in transforming procurement system to paperless electronic option;
- Continued systems support and ensure system security so that e-GP operation are hindered; also keep the platform interoperable by providing a good infrastructure utilizing skilled personnel; the technology should keep pace of global changes;
- Ensure good governance and transparency in procurement environment; also make support from the top management available; and bureaucracy should be supportive to need of the system flexibly;
- Effective control of leakage and disclosure of bidding information through technological provision as well as proper administration and ethical practice;
- Implementation of a communication plan for stakeholders to remove fear and inertia of the user organisations and assure the end users;
- Managing the influence of vested interests by involving them in steering committees and by communicating and educating;
- Promote digital society and thus minimize the digital division;
- Review and update the set of factors of influence on e-GP to ensure its incremental effectiveness;
- Future studies may consider inclusion of more personal attributes such as education, sex etc.

The authority may consider above recommendations. While the role of leadership is vital in achieving the goals and bringing about collective commitment, management should ensure availability of implementation plan, training program, stakeholder management,

dealing with the barriers to e-GP and several other organizational aspects as mentioned. Without this, governance in procurement especially the e-GP might suffer.

5.3 Limitations

Scope of the research work on e-GP is very wide that could carry activities to the quantifying its overall impacts on economy as a whole. However, the prevalent factors, such as available time, finance resources, human factor and requirement of the degree governs the boundary of the work. Thus scope of the work was limited to determination of for and against metrics around e-GP in Bangladesh based on their level of influence from user perspectives. The shorter period of time also limits access to appropriate resources and to interact wider range of stakeholders about the subject matter. Also there are only a few research works on e-GP in Bangladesh context and so advances in this field are yet to make.

Another limitation is the survey itself – the respondents were mainly the e-GP users; wider range of stakeholder opinion could result a greater variation in outcome. Moreover, the method of survey was electronic, the understanding of the respondents could not be realized well which is possible in face to face interview; also the queries of the respondents could not be clarified and hence few responses in the survey might be inappropriate. The questionnaire was limited to choice in its main part, the explanations or reasons of respondent's choice were not explained; even the potential factors were not elaborated. If these shortcomings could overcome, this research work could give a clear guidance to its readers especially the policy makers, researchers and practitioners.

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Appendices

Appendix-1: The Questionnaire

Factors Influencing Electronic Government Procurement (e -GP) in Bangladesh

1. Are you a registered user of e-GP in Bangladesh?

Yes

No

Other (please specify)

2. Which one is your role or function in e-GP? Mention your main role.

HOPE

Approving authority

Procuring entity

Bank official

TOC/POC member

TEC/PEC member

Contractor

Consultant

Other (please specify)

3. Have you got training on procurement?

Yes

No

If yes, duration (days):

4. Have you got training on e-GP?

Have you got training on e-GP? Yes

No

If yes, duration (days):

5. Who do use e-GP for you?

Myself

- My office staff
- Tender inviting office
- Committee member
- Officers under me
- Other (please specify)

6. What is the level of overall impact due to the presence of influencing factors of e-GP in Bangladesh? (List available below Q.9)

<input type="checkbox"/> No impact	<input type="checkbox"/> Moderate impact	<input type="checkbox"/> Medium impact	<input type="checkbox"/> High impact	<input type="checkbox"/> Heavy impact
------------------------------------	--	--	--------------------------------------	---------------------------------------

7. How long experience do you have in public procurement?

- Less than 5 years
- 5 to 10 years
- 10 to 15 years
- 15 to 20 years
- Above 20 years

8. Please indicate your age band.

- Please indicate your age band. Less than 30 years
- 30 to 40 years
- 40 to 50 years
- 50 to 60 years
- Above 60 years

9. To what extent the factors of e-GP impact it's implementation in Bangladesh? Please RATE the factors according to their level of influence - supportive or not.

	Oppose strongly	Oppose	Neutral	Supports	Supports strongly
Access to e-GP systems is open, free, equal and unrestricted	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Available time to use e-GP	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cartel, corruption, fraudulent, collusion or coercive activity	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cash transaction	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Control over budget and purchase	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Regulation and support by CPTU	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Data reliability and accuracy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Decision making	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Digital divide	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Document transmission	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Efficiency in procurement	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
End user resistance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Execution of law and order	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fear and inertia of organization	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Government legislation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Good governance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Human intervention or interference	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Influence of vested interests	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Infrastructure with appropriate hardware and software	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Knowledge, experience and skills	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Leakage/ disclosure of information	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Length of procurement cycle	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Level of visibility	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Manager pursue functional targets	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Nature of procurement or organization	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Secure and interoperable platform	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Performance monitoring	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Potential for mobile phone e-GP	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Power interruption and failure	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Provision for training	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Reporting capability	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Software updating	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Supplier integration	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Supplier number	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Top management support	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Transparency and equal treatment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Telecommunication and internet	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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Appendix-2: Coding the Questionnaire

1. Are you a registered user of e-GP in Bangladesh? [1=Yes, 0=No]
2. Which one is your role/function in e-GP? [1= HOPE/Approving authority, 2= Procuring Entity, 3= Registered Bank user, 4=TOC/POC member, 5= TEC/PEC member, 6= Registered Contractor/ Supplier/ Consultant, 7= Other]
3. Have you got training on procurement? [1=Yes, 0=No] If yes, duration_days
4. Have you got training on e-GP? [1=Yes, 0=No] If yes, duration_days
5. Who do use e-GP for you? [1=Myself, 2=My office staff, 3=Officers under me, 4=Tender inviting office, 5= Committee member, 6= Other]
6. What is the level of overall impact due to the presence of influencing factors of e-GP in Bangladesh? [1= No impact, 2= Moderate impact, 3= Medium impact, 4= High impact, 5= Heavy impact]
7. How long experience do you have in public procurement? [1= < 5 years, 2= 5 ~ 10 years, 3= 10 ~ 15 years, 4= 15 ~ 20 years, 5= > 20 years]
8. Please indicate your age band: [1= < 30 years, 2= 30 ~ 40 years, 3= 40 ~ 50 years, 4= 50 ~ 60 years, 5= > 60 years]
9. To what extent the factors of e-GP impact its implementation in Bangladesh? Please RATE the factors below according to their level of influence. [1= Oppose strongly, 2= Oppose, 3= Neutral, 4= Supports, 5= Supports strongly]

Appendix-3: Tables

Table-25: Collinearity Diagnostics (Dependent Variable: Log Overall)

Model	Dimension	Eigenvalue	Condition index
1	1	35.073	1.000
	2	1.256	5.285
	3	.289	11.016
	4	.188	13.645
	5	.134	16.172
	6	.123	16.882
	7	.117	17.298
	8	.107	18.111
	9	.097	19.056
	10	.079	21.082

Table-26: Eigenvalue of the Model (z-scored)

Model	Dimension	Eigenvalue	Condition Index
1	1	11.632	1.000
	2	6.850	1.303
	3	2.635	2.101
	4	1.892	2.480
	5	1.745	2.582
	6	1.549	2.740
	7	1.258	3.041
	8	1.204	3.108
	9	.966	3.470
	10	.863	3.671
	11	.851	3.697
	12	.799	3.817
	13	.697	4.085
	14	.609	4.370
	15	.551	4.594
	16	.519	4.736

Table-27: Coefficients (Dependent Variable: LogOverall) Factor Score

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations			Collinearity Statistics		
	B	Std. Error	Beta			Zero-order	Partial	Part	Tolerance	VIF	
1 (Constant)	1.251	.011		109.748	.000						
REGR factor score 8 for analysis 3	-.021	.018	-.078	-1.198	.241	-.043	-.221	-.051	.430	2.325	
REGR factor score 11 for analysis 3	.028	.018	.103	1.562	.130	-.104	.283	.067	.423	2.367	
REGR factor score 18 for analysis 3	.000	.016	.000	-.008	.993	-.028	-.002	.000	.532	1.881	
REGR factor score 19 for analysis 3	-.018	.015	-.066	-1.156	.258	.037	-.213	-.049	.567	1.763	
REGR factor score 20 for analysis 3	.028	.013	.103	2.105	.044	.004	.370	.090	.754	1.327	
REGR factor score 1 for analysis 4	.075	.012	.276	6.186	.000	.287	.760	.264	.913	1.095	
REGR factor score 2 for analysis 4	.034	.012	.125	2.911	.007	.121	.482	.124	.982	1.019	
REGR factor score 3 for analysis 4	.037	.012	.137	3.098	.004	.174	.505	.132	.925	1.081	
REGR factor score 4 for analysis 4	-.004	.013	-.014	-.279	.782	-.001	-.053	-.012	.748	1.336	
REGR factor score 5 for analysis 4	-.018	.013	-.068	-1.373	.181	-.081	-.251	-.059	.751	1.331	
REGR factor score 6 for analysis 4	-.024	.013	-.089	-1.888	.069	-.086	-.336	-.081	.819	1.221	
REGR factor score 7 for analysis 4	.026	.013	.095	1.975	.058	.060	.350	.084	.788	1.269	
REGR factor score 8 for analysis 4	.027	.014	.099	1.920	.065	.055	.341	.082	.687	1.455	
REGR factor score 9 for analysis 4	.011	.012	.041	.920	.366	.071	.171	.039	.903	1.107	
REGR factor score 10 for analysis 4	.016	.012	.058	1.255	.220	.039	.231	.054	.851	1.175	
REGR factor score 11 for analysis 4	-.002	.013	-.006	-.127	.900	.034	-.024	-.005	.750	1.334	
REGR factor score 12 for analysis 4	.008	.012	.031	.678	.503	.032	.127	.029	.888	1.126	
REGR factor score 13 for analysis 4	.248	.012	.920	20.497	.000	.880	.968	.875	.904	1.106	
REGR factor score 14 for analysis 4	-.017	.016	-.063	-1.089	.286	.004	-.202	-.046	.540	1.853	
REGR factor score 15 for analysis 4	.002	.017	.008	.133	.895	-.003	.025	.006	.464	2.154	

Table-28: Coefficients (Dependent Variable: LogOverall) Stepwise

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	1.251	.018		69.621	.000
REGR factor score 15 for analysis 3	.239	.018	.887	13.185	.000
2 (Constant)	1.251	.014		88.507	.000
REGR factor score 15 for analysis 3	.240	.014	.888	16.778	.000
REGR factor score 1 for analysis 1	.078	.014	.290	5.473	.000
3 (Constant)	1.251	.013		99.480	.000
REGR factor score 15 for analysis 3	.240	.013	.888	18.858	.000
REGR factor score 1 for analysis 1	.079	.013	.292	6.197	.000
REGR factor score 3 for analysis 3	.046	.013	.171	3.621	.001
4 (Constant)	1.251	.012		107.407	.000
REGR factor score 15 for analysis 3	.207	.016	.767	12.691	.000
REGR factor score 1 for analysis 1	.079	.012	.291	6.679	.000
REGR factor score 3 for analysis 3	.043	.012	.158	3.592	.001
REGR factor score 9 for analysis 1	.048	.016	.176	2.908	.006
5 (Constant)	1.251	.011		115.360	.000
REGR factor score 15 for analysis 3	.204	.015	.757	13.442	.000
REGR factor score 1 for analysis 1	.079	.011	.291	7.170	.000
REGR factor score 3 for analysis 3	.041	.011	.151	3.698	.001
REGR factor score 9 for analysis 1	.049	.015	.183	3.242	.002
REGR factor score 2 for analysis 1	.031	.011	.113	2.785	.008
6 (Constant)	1.251	.010		119.909	.000
REGR factor score 15 for analysis 3	.202	.015	.748	13.754	.000
REGR factor score 1 for analysis 1	.079	.011	.291	7.453	.000
REGR factor score 3 for analysis 3	.041	.011	.154	3.903	.000
REGR factor score 9 for analysis 1	.051	.015	.189	3.480	.001
REGR factor score 2 for analysis 1	.031	.011	.114	2.901	.006
REGR factor score 7 for analysis 1	-.022	.011	-.083	-2.111	.041

Table-29: ANOVA (Dependent Variable: LogOverall) Stepwise

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2.751	1	2.751	173.832	.000 ^a
	Residual	.744	47	.016		
	Total	3.494	48			
2	Regression	3.044	2	1.522	155.448	.000 ^b
	Residual	.450	46	.010		
	Total	3.494	48			
3	Regression	3.146	3	1.049	135.292	.000 ^c
	Residual	.349	45	.008		
	Total	3.494	48			
4	Regression	3.202	4	.800	120.398	.000 ^d
	Residual	.293	44	.007		
	Total	3.494	48			
5	Regression	3.247	5	.649	112.662	.000 ^e
	Residual	.248	43	.006		
	Total	3.494	48			
6	Regression	3.270	6	.545	102.178	.000 ^f
	Residual	.224	42	.005		
	Total	3.494	48			

a. Predictors: (Constant), REGR factor score 15 for analysis 3

b. Predictors: (Constant), REGR factor score 15 for analysis 3, REGR factor score 1 for analysis 1

c. Predictors: (Constant), REGR factor score 15 for analysis 3, REGR factor score 1 for analysis 1, REGR factor score 3 for analysis 3

d. Predictors: (Constant), REGR factor score 15 for analysis 3, REGR factor score 1 for analysis 1, REGR factor score 3 for analysis 3, REGR factor score 9 for analysis 1

e. Predictors: (Constant), REGR factor score 15 for analysis 3, REGR factor score 1 for analysis 1, REGR factor score 3 for analysis 3, REGR factor score 9 for analysis 1, REGR factor score 2 for analysis 1

f. Predictors: (Constant), REGR factor score 15 for analysis 3, REGR factor score 1 for analysis 1, REGR factor score 3 for analysis 3, REGR factor score 9 for analysis 1, REGR factor score 2 for analysis 1, REGR factor score 7 for analysis 1

Table-30: Rotated Component Matrix (Factor Analysis)

	Component						
	1	2	3	5	7	9	15
Zscore: Cash transaction	.442	-.158	.119	.656	-.059	-.063	-.155
Zscore: Regulation & support by CPTU	-.308	.063	.115	-.117	.831	.117	-.009
Zscore: Decision making	.056	.692	-.048	.047	.476	.192	.075
Zscore: Digital divide	.839	.096	.197	.032	.115	.025	.023
Zscore: Document transmission	.182	.231	-.240	.279	.257	.511	.193
Zscore: Efficiency in procurement	.118	.281	.156	.022	.095	.857	-.030
Zscore: End user resistance	.811	.095	-.018	.130	.023	.135	-.050
Zscore: Fear and inertia of organisation	.798	-.055	-.087	.160	-.016	.050	.296
Zscore: Government legislation	-.066	.650	.381	-.134	.170	.200	.183
Zscore: Good governance	.060	.830	.091	-.040	-.173	-.010	.179
Zscore: Human intervention	.803	-.025	-.049	.071	-.413	.091	-.134
Zscore: Influence of vested interests	.886	-.079	-.176	-.022	-.273	.074	-.069
Zscore: Infrastructure with appropriate hardware and software	-.385	.401	.119	-.154	.232	.343	.141
Zscore: Leakage/ disclosure of information	.718	-.089	-.058	.338	.098	-.211	-.178
Zscore: Manager pursue functional targets	.668	.135	.162	.169	.048	-.052	-.110
Zscore: Performance monitoring	.049	.754	.193	.061	.018	.098	-.046
Zscore: Potential for mobile phone e-GP	-.272	.428	.212	-.316	-.001	.067	.484
Zscore: Power interruption & failure	.718	-.159	.047	.360	-.127	-.040	.269
Zscore: Software updating	-.325	.297	.489	-.320	.009	.119	-.026
Zscore: Supplier integration	-.014	.243	.858	.005	.030	.070	-.005
Zscore: Supplier number	.074	.114	.933	-.020	.049	.010	.030
Zscore: Top management support	-.194	.550	.432	.043	.181	.030	-.051
Zscore: Transparency & equal treatment	-.079	.734	.268	.058	.110	.157	-.244

Extraction Method: Principal Component Analysis.

Abstract

This research work looks for some empirical findings from the survey conducted regarding the factors of influence on e-Procurement system (the e-GP) in Bangladesh from users perspective. Following reform of public sector procurement which was started in Bangladesh in 2003, a transformational change was implemented in 2012 through a step forward from traditional paper-based system to electronic; the users are progressively being capable of benefiting from this. However some concerns were seen in public through experiences and media that the e-GP system has been confronting with some counter-productive factors although there are many supportive elements to take it forward. It was attempted here to understand those factors active in the move and counter-move of e-GP system as relevant to its users.

A questionnaire based online survey was conducted using the 'survey monkey' e-platform aiming the responses from e-GP users or those having substantial experience of procurement in public sector of Bangladesh.

Result reveals that a majority of factors such as Mobile phone based e-GP, Suppliers, Systems support and Top Management role, Efficient systems development, Good governance and Transparency with support from the management and technological provisions do favour the system substantially; while the other factors Red tape regulation and System security, Vested interests, Digital divide, Attitude of individuals, Organisational culture, Ethical values and Energy infrastructure do counter it which could harm the e-GP system seriously if not addressed properly.

Key words: Correlations, e-Procurement, e-Tender, Governance, Transparency.

Chapter One: Introduction

1.1 Background

In Bangladesh, procurement expenditure in Government of Bangladesh (GoB) accounts for about 21% of the national budget which is about 70%-90% of ADP allocation each year (CPTU 2014d). Procurement reform in Bangladesh was initiated in 1999 aiming to introduce governance in utilization of state budget for procurement of all necessary inputs for its operational purpose and thereby to enhance the capacity of public procurement system to achieve openness acceptability, and transparency. The reform is also intended to improve integrity and accountability through a more efficient and effective procurement process in public sector, especially in governmental purchases. There is strong evidence of progressive improvement of procurement regime in Bangladesh.

The legal regime of public procurement in Bangladesh was based on procedures and practices that date back to the British era. For example, the Compilation of General Financial Rules (CGFR), originally issued under the British rule, which broadly outlined the principles governing government contracts, remained the primary legal framework for public contracts and procurements (World Bank 2002). The two contract documents such as Form No. 2908 for supply of goods, and Form No. 2911 for works were instrumental within this legal framework in GoB procurement functions. Building on CGFR principles, government departments and autonomous public bodies and corporations developed

their own rules and codes of practices for public contracts and largesse to follow (Hoque n.d.).

The World Bank initiated a study on status of formal procurement process in 1999 which recommended a reform of procurement process in Bangladesh (World Bank 2002) following this the Public Procurement Regulations (PPR 2003) was introduced. The PPR 2003 was the breakthrough in Bangladesh Public Procurement system which was supported by the *Procedures* for Implementation of The Public Procurement Regulations 2003. In 2006, Public Procurement Act (PPA 2006) came into force and later the Public Procurement Rules (PPR 2008) was formed.

While application of electronic technology and Information and Communication Technology (ICT) in all-round functions of governance in Bangladesh was considered as a vital instrument to establish 'Digital Bangladesh' to enable stronger contacts between the government and its citizens, it was believed that e-Governance could accomplish the mandate of government in formulating a new vision of how government views its citizens, employees and businesses, and building a citizen-centered, service-oriented, public-participative government with efficient, accountable, transparent and performance government system (Al-Hossienie and Barua 2013). As ICT together with the diffusion of the technological advances results in the digital revolution and the emergence of the Information age and created an enormous impact on social, political, and cultural livelihood of the masses - taking the whole world into a different era (Alam, Ahmed and Islam 2008).

The breakthrough in Bangladesh public procurement system came with circulation of 'The e-GP guidelines 2011' which was instrumental to transform the paper-based tendering system to electronic form. Accordingly, the Electronic Government Procurement (e-GP) was introduced in Bangladesh on 2 June, 2011 in pursuant to Section 65 of the PPA 2006. The *strategy for e-Government* states that a sound e-government policy should include a focus on end-users and demand-driven services. Government services will be made available through e-government and the government should prioritize the services that they will initially offer online (GED, Bangladesh Planning Commission 2012).

The e-GP guideline targeted initially four governmental organisations including Bangladesh Water Development Board (BWDB), Local Government Engineering Department (LGED), Roads and Highways Department (RHD) and Rural Electrification Board (REB) for implementing it with the aim to spread over other organisations (CPTU 2011). LGED pioneered the e-GP system implementation and entered into e-Procurement system in January 2012 (LGED 2014). Currently e-GP is under practice by above mentioned public agencies and the use of e-GP is expanding; CPTU is monitoring the progress and achievements made so far. Now the e-GP draws attention of the knowledge community and practitioners to know whether it progresses smoothly. As a part of this interest, this research has been undertaken as a part of academic purpose.

1.2 Concept of Procurement

Procurement encompasses every aspect of the service delivery processes starting from determination of the need for goods, works or services to ensure procurement and delivery on time. Lysons & Farrington defines procurement as the process undertaken by

the organisational unit that, either as a function or as part of an integrated supply chain, is responsible for procuring or assisting users to procure, in the most efficient manner, required supplies at the right time, quality, quantity and price, and the management of suppliers (CIPS D1 Context Module 2012).

The procurement activity starts with the development of needs and requirements which proceeds through sourcing, contracting, receiving the goods or services and consumption by the end users. A typical procurement cycle is shown in Figure-1 below.

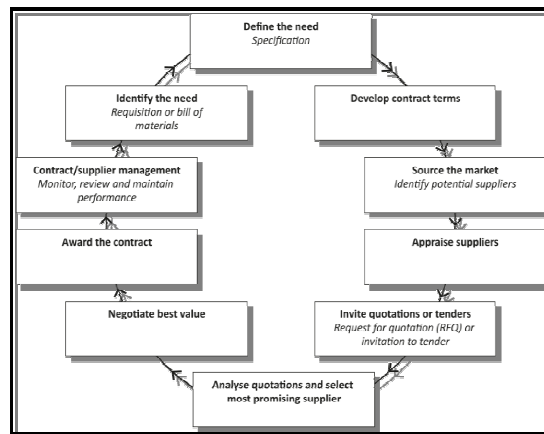


Figure-1: A typical procurement cycle
(Source: CIPS Context module 2014)

1.3 Sectors of Procurement

Procurement happens in public, private or non-profit sectors which is required for their operational purpose. The public sector buyers generally have the overall objective of achieving defined service levels. They are responsible ultimately to the general public for national and community development and to pursue socio-economic goals. They have to satisfy a wider range of stakeholders – the politicians, local vendors, businessmen and suppliers, civil society, media men, etc. They have a wider range of activities to ensure public service and efficient use of resources. These are subject to established

procurement procedures, and legislative directives. They are often subject to budgetary constraints, cash limits and efficiency targets.

Private sector purchasing is different from that of public sector in terms of Objectives (primarily to ensure profit margin), Responsibility (buyers are responsible to owners, directors), Stakeholders, Activity/process (organisational capabilities and resources used to produce goods/services), Legal restrictions (company law, employment law, product liability law etc.), Competition between firms, and Value for money that maintains lowest cost for competitive strategy, customer value and profit maximisation. Private sector purchasing also have Diversity of items (specialised stock lists), Publicity (confidentiality applies in dealings between suppliers and buyers), Budgetary limits, Information exchange (do not exchange information with other firms), Procurement policies/procedures (organisation-specific), Supplier relationships (emphasis on long-term partnership development, to support value chain).

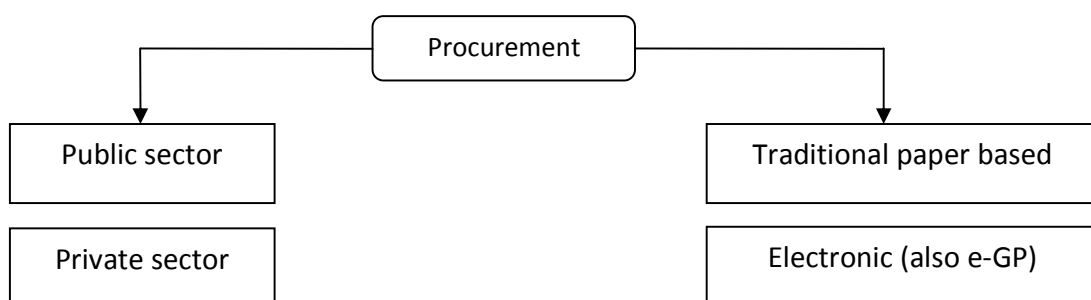


Figure-2: Procurement Contexts and Types

Public Procurement System in Bangladesh is largely decentralized. Ministry of Finance issues instructions on delegation of financial powers from time to time which are exercised by public entities in procuring goods or services. To facilitate an efficient and professionalism in public procurement in Bangladesh the Central Procurement Technical

Unit has been working with different government agencies since 2002, in providing for information and technical know-how as and when required (Hoque n.d.). However, public sector purchasing tends to face a lot of challenges. It is critical for both internal stakeholders and communicating the vendors to ensure they are on-board with the program.

1.4 Electronic Procurement

Electronic procurement is basically a tool that enables procurement activities such as sourcing, ordering, commissioning, receipting and making payment in an electronic way. Industries and government agencies are constantly spectacular to e-Procurement and giving lots of attention on it. Electronic Procurement generally mean web based ERP (Enterprise Resource Planning), e-MRO (Maintenance, Repair and Operating supplies), e-sourcing, e-tendering, e-reverse auctioning, e-informing, e-market sites etc.

Neupane et. al. (n.d.) cites from literature “Public e-procurement has been defined as the use of information and communication technology such as internet/web based system by governments in conducting their procurement relationship with bidders for the acquisition of goods, works, services and other consulting services required by the public sectors (Davila, Gupta & Palmer, 2003; Leipold et al., 2004). It has been defined as an inter-organizational information system, which automatizes any part of the procurement process in order to improve efficiency, quality, and transparency in government procurement (Vaidya, 2007)”

Vaidya et.al. 2004 quotes....the first-level definition of e-Procurement provided by the World Bank (2003) which states that “electronic Government Procurement (e-GP) is the

use of information and communication technology (especially the Internet) by governments in conducting their procurement relationships with suppliers for the acquisition of goods, works, and consultancy services required by the public sector”.

Electronic government procurement (e-GP) is the part of e-governance programme of a country in which paperless office is attempted to establish by leveraging the ICT. It uses Information Technology (especially the internet) by governments in conducting their procurement relationships with suppliers for the procurement of works, goods and consulting services required for the public sector. This e-GP Process contains two phases – the pre-award phase involves e-Notification, e-Access, e-Submission, e-Evaluation and e-Awarding of contracts; and the post-award phase involves e-Ordering, e-Invoicing and e-Payments (Baghdasaryan 2011). The contractual module types are e-Tendering and e-Purchasing and the infrastructure module types are Contract Management, e-Certificates, e-Signatures, Vendor Management, Statistics etc. The e-GP is believed to significantly increase the efficiency, effectiveness and transparency of government procurement process and enhance other governmental objectives. However, e-GP implementation is vulnerable by risks of systems obsolescence, lack of interoperability, higher operating costs, vested interest influences, sub-optimal functionality and reduced innovation (ADB 2004).

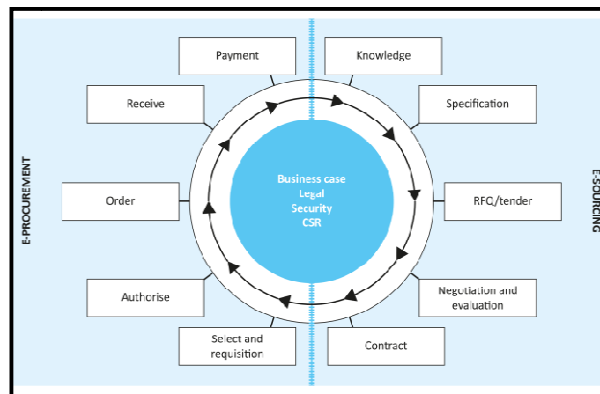


Figure-3: A typical e-Purchasing Process
(Source: CIPS Sourcing module 2014)

In e-Tendering System (Baghdasaryan 2011), there are three types of models are considered in order to meet the specific demands related to implementation of e-GP - the public model (all tasks, including the investment and risks of building the portal, are run by the government), the private model (all tasks are run by private entities that bear the investment risks of the project), and the mixed model (public-private partnership). In public-private partnership model the participants share investment risks and the benefits of the project among themselves.

1.5 Electronic Government Procurement (e-GP)

The e-GP System in Bangladesh has been implemented in two phases (CPTU 2014a) - the e-Tendering System and e-Contract Management System (e-CMS). The first phase of e-Tendering System covers complete e-Tendering processes such as centralized user registration, preparation of Annual Procurement Plan (APP), preparation of Tender document, preparation of Tenders, invitation of Tenders, sale of Tender Documents (e-TD), conducting online pre-bid meeting, collection of Tender security, on-line Tender submission, Bid opening & evaluation, negotiations (where applicable), and contract

awards; while the e-CMS covers complete e-Contract Management processes, such as preparation of work plan and its submission, defining milestone, tracking and monitoring progress, generating reports, performing quality checks, generating running bills, vendor rating and generating completion certificate.

Bangladesh e-GP uses a web portal which is accessible by the users through internet to perform their procurement operations using a web based dashboard (Bangladesh National e-GP Portal 2011).

In the first phase, e-Tendering has been introduced on pilot basis in the CPTU and 16 other Procuring Entities (PEs) under 4 (four) sector agencies – BWDB, LGED, RHD, and REB. The system rolled out to 291 PEs of those 4 sector agencies is now expanding to all the PEs of the government up to Districts and sub-Districts level. In the second phase, e-Contract Management System (e-CMS) has been developed and introduced and implemented. The e-CMS is a complete electronic contract management system which provides platform for preparation of work plan and its submission; defining milestone, tracking and monitoring progress, generating reports, performing quality checks, generation of running bills, vendor rating, generation and issuance of completion certificate (GED, Bangladesh Planning Commission 2012). Total number of PEs enrolled are 1501 including 1036 of four agencies.

The e-GP was developed by the CPTU as a uniform national web portal having centralized registration system that contains a comprehensive system from proc. plan up to final payment (e-Tendering and e-Contract Management), automatic procurement performance monitoring (e-PMIS). It has robust security features & back-up arrangement

with full redundancy to ensure uninterrupted service and harmonized with Multilateral Development Bank (MDB) guidelines. The process was reviewed by an independent consultant for World Bank's use, following which World Bank was accepted the Bangladesh e-GP system for financing. It is believed to be a self sustainable model – system is generating required fund. The security features claimed for e-GP to have tender information encrypted till opening, integrity of submitted tenders, audit log of all activity of all users, no password saving in database, password complexity control and the last login time display.

The payment provisions in e-GP allow Tender Security & Performance Security to Online through Banks; and Registration fees, Tender Document fees, Renewal fees to pay through payment gateway. It facilitates a Tender Dropping system to virtual Tender Box. The e-GP has been supported by an 'Online Helpdesk System' on board.

The e-GP System comprises of key Modules/Functionalities such as Centralized Registration System for Contractors/Applicants/Consultants, Procuring Entities and other actors; e-Tendering which includes e-Publishing/e-Advertisement, e-Lodgment, e-Evaluation, e-Contract award System; Procurement Management Information System (PROMIS); Workflow management System; e-Contract Management System (e-CMS); e-Payment System; System and Security Administration; Handling Errors and Exceptions; and Application Usability & Help etc.

The progress of e-GP in Bangladesh as on January 2015, the Registered Tenderers and Consultants are 13060, 1468 Procuring Entity offices, 31 Banks with 1444 users, so the total Registered Users are over 16000 (Source: National e-GP Portal of Bangladesh).

Table-1: Bangladesh e-GP Activity Summary

Period	# Registered Bidders	# Bids invited	Value of bids (US\$ M)
June -2012	294	14	3
December -2012	525	144	18
June -2013	1,067	498	62
December-2013	7,459	4,548	319
March-2014	8,353	6,558	506
January 2015*	13,144	17,398	--

Source: CPTU (2014d) Delivering Procurement Performance: Success Stories Bangladesh, a power point presentation for Second South Asia Region Public Procurement Conference held in Islamabad, Pakistan.

**Bangladesh e-GP Portal @ <http://115.127.40.33/> accessed on 23 January 2015*

All the stakeholders, including Bidders/Tenderers / Applicants / Consultants (National and International), PEs, procurement related Committees, payment service providers, Development Partners (DPs), media, Operation, Maintenance and Management Entity (OMME), e-GP system administrators, auditors and general public have access to e-GP system and information (CPTU 2014a).

Among the public sector agencies, LGED operates e-GP at a great deal in range (48.4% of all PEs) and scale (62.8%) and finalized 62.6%. RHD also shows a great efficiency in operating on e-GP system (20.5%) and already finalized 12.8 tenders per PE (Table-2).

Table-2: e-GP Operation Among Agencies

e-GP Active Agencies	PE	Tenders/Proposals Published		Tenders/Proposals being Processed		Tenders/Proposals Finalized	
		Number	per PE	Number	per PE	Number	per PE
LGED	726	10932	15.1	3034	4.2	6273	8.6
RHD	167	3574	21.4	1089	6.5	2130	12.8
BWDB	124	2218	17.9	677	5.5	1295	10.4
REB	19	189	9.9	97	5.1	91	4.8
PGCB	49	120	2.4	61	1.2	47	1.0
BPDB	204	288	1.4	117	0.6	155	0.8
All Agencies	1501	17398	11.6	5117	3.4	10017	6.7

Source: CPTU (2015) <http://115.127.40.33/RegistrationDetails.jsp>

BWDB (12.7%), BPDB (1.7%) and REB (1.1%) also show a remarkable activity in this field. Among new organisations involved in e-GP, PGCB has been getting momentum in dealing with e-GP. The overall progress of e-GP implementation is encouraging and gaining momentum, however, the ground reality is that actual users are very few as compared to the registered number of users. This impediment might be caused due to many factors including fear of the systems, reliance on someone capable of dealing the system, non-participating in tendering process, also due to competing demand for other responsibilities of the e-GP users. There are concerns over the ability and readiness of its stakeholders that some key stakeholders may fail to come forward to carry out the process due to various reasons which is subject to investigation under this research work.

1.6 Literature Review

Many studies have been conducted since development of the concept of e-commerce around the globe, since 2000's. The flow of digitization touched Bangladesh on time and due to the growing concerns about efficiency in procurement processes in terms of fairness, transparency, better visibility, cost reduction, timeliness, accuracy, competitiveness etc. for private service and provision for level of service for public sector modernization of the procurement system and implement enhanced governance became prominent in this field. As far as governance in public procurement is concerned, along with improvement of efficiency in utilization of public financial resources, their effectiveness could also be enhanced through the reform in procurement systems and now leveraged it through the widespread use of informational and communication

technology (ICT); thus the electronic government procurement (e-GP) is being introduced in many countries.

Al-Hossienie and Barua (2013) recognised that available resources for e-Governance in Bangladesh are inadequate. He noted, however, the rapid growth of information technology development might overcome this barrier.

Alam, SR. (2012) cites at NAPM (2001), the main reasons behind this are the overall ineffectiveness of the business processes, the difficulties of integration with back-office systems and the lack of common standards. He stressed on perceiving ICT by public institutions as the only solution. He highlighted the remarks by Ontology.org that both public institutions and vendors would benefit from a common platform where the former can get the information to make a purchase decision and the later can reach potential customers more than usual.

Bhuiyan (2010) acknowledged lack of proper infrastructure and digital divide were the known major causes behind the failures of e-service implementation, however he noted that e-government applications have been growing in Bangladesh. Again he viewed the prospects of mobile phone based e-service development, and public private partnership (PPP), but also recognised the challenges of frequent power interruption, lack of techno-savvy people in public organizations to look after the systems, etc. He noticed the increased number of e-services reflecting the progress of the country.

Hoque (n.d.) recognized the procurement law in Bangladesh as modern, but he expressed concern about the level of accountability, transparency and efficiency in public

procurements were far from satisfactory. Taking the experience of some Southeast Asian nations, he noted from Jones (2007) some common problems with public procurement systems - fragmented procurement procedures; lack of professional procurement expertise; absence of open, competitive tendering, especially for foreign suppliers; widespread corruption; and the lack of transparency.

Cascapera (2007) recognized e-procurement through which the buyer achieves the target set out during the sourcing project which leads to lower transaction and processing costs and increases efficiency due to increased choice and competition. He pointed out that efficiency is obtained not just via reduced printing and transportation costs, but also via reduced process cycle time in e-procurement. According to him, e-procurement changes the role of buyers in the purchasing function by removing administrative tasks e.g. placing orders and reconciling deliveries and invoices with purchase orders, buyers can spend more time on value-adding activities.

Vanjoki (n.d.) referred the researches he found in the literature (Kalakota and Robinson 2001; Attaran & Attaran 2002; de Boer et al. 2002; Davila et al. 2003; Croom and Brandon-Jones 2005) that the benefits of adopting e-procurement technologies had been widely. The companies primarily adopted e-procurement solutions for cost reductions and process efficiencies. He cites research by Quesada et al. (2010) proposes that e-Procurement technologies affected positively to company's procurement practices and procurement performance. Another research by Davila et al. (2003), he found to identify that companies used e-Procurement gain additional control over maverick spending and can reduce the headcount supporting purchasing transactions. He also quote from Croom

and Johnston (2003) that e-procurement can have a major impact on compliance on many different levels of the procurement process, such as managerial budgetary control; reduced data entry failures; greater transparency and accessibility to corporate level spending; improved system reliability; and improved access to information.

Foroughi (n.d.) noted from Reese (2003) that e-Procurement enables companies to make better decisions related to rationalizing their supplier base by providing a broad overview of the market. He cited from Bedell (2002) that e-Procurement provided new levels of visibility about what the company was buying and from whom; but there were problems with integration to backend systems, which might be incompatible platforms, and were a stumbling block to many e-Procurement efforts. The e-Procurement enabled companies to have better control of enterprise spending by aggregating spend of different groups within an organization. From Moore (2007) he highlighted e-Procurement that enabled companies to maintain lean inventory levels. It was recognized that inconsistencies in nomenclature for parts, between companies and even within different departments or sites of the same enterprise, often led to costly delays and errors. Aisbett, Lasch, and Pires (2005) also referred where e-Procurement could reduce material and service costs... .. Since e-Procurement systems are a self-service tool, end users sometimes resist using it and effectiveness depends, ultimately, on its being adopted and regularly used by employees (Bedell, 2002). By Singer (2003) he mentioned that many suppliers, especially smaller ones, do not have the technological capability to integrate with e-Procurement platforms. Also from Foster (2000) he noted that e-Procurement created a new set of responsibilities for purchasing departments.

Jönsson et al. (2010) summarized the key factors as defining an e-procurement strategy, change management and training and education which affect all. And the secondary factors were well defined steering group and communication that would affect some companies which they must take them into their perspective depending on situation. benefits are compliance savings, reduced supplier base and lowered administrative costs. CIPS Knowledge (2014) notes from Preite (2004) '...the data that feeds into the procurement system is accurate'.

Vinter and Papaux (2013) warned that even if potential benefits of e-procurement were obvious, theoretical and practical results clearly indicate that e-procurement for public markets was still the exception rather than the rule. They commented that the aim of a well integrated internal market for public procurement led far behind the EU's stated goals.

Veit, Parasie and Huntgeburth (2011) evaluated that in spite of high potentials and sophisticated goals set by the federal governments, municipalities were reluctant to move procurement to the Internet.

Leipold (2007) appraised that effective e-GP program could offer the opportunity of adding value to the relationship between government buyers and private businesses through delivering a broad range of benefits to taxpayers, the economy and the community generally. And the online technology provided the potential to significantly reform the accountabilities and performance of public procurement systems. An e-GP system could automate the procurement procedures and implement control the processes in which neither purchasing agencies nor bidders to deviate from the public

procurement process. Thus e-GP helped governments to reduce the opportunities for corruptive, fraudulent, collusive, and even coercive practices. Moreover, the bad practices (attacking bidders on their way to the bid submission, manipulating access to procurement notices, submitting overpriced bids, bypassing mandatory public procurement procedures, colluding with competitors, or bribing public procurement officials etc.) could be prevented by using e-GP systems. However, he considered e-GP as not the guarantor for improved governance and reduced corruption. He mentioned the need for strong political will, leadership, and management to design and implement appropriate e-GP systems which would ensure a maximum of transparency and compliance. He also mentioned about the efficiency gains (reduced costs and time) as the key benefits of e-GP; the technologies provide a high level of security through encryption and digital signatures. Further, the introduction of e-GP in a country activates the majority of suppliers to get ready and connected for the web-based government businesses. In doing so, public procurement laws provide support to e-Procurement a basis for policies and procedures as part of legislation up to more comprehensive and prescriptive way.

Arzu (2008) reflected from Pant et al. (2003) that the benefits of forming an e-supply chain were streamlining both internal and external operations; ability to provide real-time response to market conditions; ability to provide real-time response to customer queries; ability to undertake real-time, joint demand planning. He quoted from Rehan (2006), greatest advantages mentioned were to obtain cost savings through integration of the supply chain; overall reduction in the inventory levels throughout the supply chain;

reduction in procurement costs; improved vendor management; cycle time reduction; improved profitability.

Koseva (2012) cited from Eakin (2002), the hard benefits were those that can be directly measured as price savings and process cost reductions, and the soft benefits were those that affect cash flows directly but cannot be quantified easily such as the saving of individuals' time that can be spent more efficiently. Intangibles were all benefits that were not directly measurable in financial terms e.g. cultural change, high visibility of supplier performance, new e-platforms, financial approval for all spending.

He also noted from Cole (2004) who identified that in most of the cases the internal barriers were resulted from of factors such as lack of ownership of the project; diminishing of the quality or prestige of the current role, after the introduction of the new system; lack of knowledge of the subject; political reasons; insufficient time and opportunity for the involvement; personal conflicts; lack of needed knowledge about technology and IT projects; loss of supplier contacts or control. He highlighted that people found electronic payment transactions are still risky, because they are relatively new (Kheng and Al-Hawamdeh 2002). Waarts and Everdingen (2005) consider that culture is affecting the adoption status. Vaidya et al. (2006) defined end users' uptake and training as one of eleven key success factors.

Vaidya et. al. (2004) emphasized that implementing e-Procurement initiatives required the public sector agencies to have the organizational and management ability and flexibility to learn and share the lessons in regards to the new systems and technology and adjust themselves to new procurement practices and processes in a timely fashion.

He also referred S&A (2003) who regarded change management and training as the most important implementation issue and concluded that most other issues are also related to change management.

The problems of implementation and integration of existing infrastructure, according to Parida and Sophonthummapharn (2010), were holding back companies from implementing e-procurement; but benefits were overpowering the risks and companies were moving toward more aggressive strategic approach of implementing e-procurement.

Kaliannan and Awang (2009) pointed out that the suppliers had positive perception about information technology and the use of Internet to do their business transactions; thus they were ready to use the e-Procurement system. They noted that there were many problems and challenges faced by both the buyer community i.e. government, and seller community i.e. suppliers, even a certain level of acceptance and usage show positive development of e-Procurement.

Tonkin (2003) explored that public sector undertook e-procurement initiatives to achieve certain cost reductions and benefits including those related to public policy imperatives.

The role of trust in e-government success using the updated DeLone and McLean IS success model is tested via a survey of 214 Singapore e-government Web site users. Teo, Srivastava and Jiang (2014) found that there were trust in government, but not trust in technology which is positively related to trust in e-government web sites; subsequently to information quality, system quality, and service quality.

Anonymous (2009) research cited that e-procurement led to considerable improvements interaction & communication; also change from standard procurement to e-procurement was not easy to adopt, but beneficial to Kuwait Maastricht Business School (KNPC) and its suppliers.

The findings indicate significant relationships existed between individual factor, organisational factor, environmental factor, technological factor and e-procurement system use. There were also evidences of dynamic capability as a mediator to the organisational factor and system use relationship (Kassim 2011).

Puschmann and Alt (2005) recognized that in the successful practices the redesigning of the procurement process is focused on - reduction or elimination of authorization stages; regulation of exceptions to a limited degree in the beginning; elimination of paper; integration of suppliers in the entire process chain; and consideration of the complete process from searching for goods through to invoicing.

Angeles and Nath (2007) identified three important challenges to e-Procurement implementation - lack of system integration and standardization issues; immaturity of e-procurement-based market services and end user resistance; maverick buying and difficulty in integrating e-procurement with other systems.

Vanjoki (n.d.) observed that lack of system integration and standardization issues were related to the fact that e-Procurement was still relatively new business application and it was not unusual to find a lack of benchmarkable reference models. Other challenges he found to be software immaturity, immaturity of providers of e-procurement services, lack

of supplier preparation, resistance of solutions by end users, difficulty of changing purchasing-related behavior by company's employees.

Mibenge and Okoye (2007) explored that the significance of e-procurement was an important instrument to improve Internal Customer Service and thus external customer satisfaction had also been achieved. They stressed to remember that e-procurement might not be right for all types of organisations depending on their business operations and level of technological development.

Alam (2012) suggested in educating parties for both long-term and short-term benefits that would encourage the application of e-GP. He also mentioned some critical success factors including adequate financial support, availability of interoperability and standards of communication systems, top management support and commitment, understanding the priorities of the company, and having suitable security systems.

Vinter and Papaux (2013) studied e-Government and found the key benefits of fairness and non-discrimination among tenderers that were potential to increase SME and cross-country participation in EU. Savings due to lower price for procurement as well as E-tendering, e-notices etc. administrative burden were also reduced when compared to paper based procurements. They recognized the challenges of persuading stakeholders to embrace new electronic tools and to make sure that the systems put in place facilitate wider access to those valuable markets across the EU. Overcoming structural inertia and fear was also the main reason that companies avoid e-procurement. Moreover language was a barrier to encourage practical participation by foreign companies; and until then e-procurement was not totally developed.

Neupane et. al. (n.d.) noted from Gupta, Jha and Gupta (2009) that e-Procurement centralize data in order to improve audit and analysis. He also referred Ndou (2004) that e-Procurement eliminated the direct human interaction on bidding and other work and services, corruption was decreased significantly, and internal efficiency was increased in government departments. The other benefits they mentioned that from an e-procurement system, government could monitor all the works and services more easily and efficiently (Aman & Kasimin 2011; Kaliannan & Awang 2009); e-Procurement system provided better status monitoring and tracking of applications; increased transparency in works and services and improves better interaction between supplier, vendors and citizens through online system (Adebiyi, Ayo & Adebiyi Marion, 2010); online bidding system automatically reduces the cartel, collusion and riggings among the bidders (Pathak et al., 2006); and also improved transparency and efficiency, reduce cost, better decision-making, supplier performance monitoring, quality of service and so on.

GeBIZ (2005) reported that e-Procurement technology performance of countries like Bahrain, Norway, Italy, Singapore, Turkey, India, and Malaysia indicate it helped them to increase competition among bidders in public work and services evidenced by eighteen countries' governments were obtaining best quality and price ratio after implementing public e-procurement technology. Peru, Pakistan, New Zealand, Italy, Fiji, and Hong Kong (China) also obtained best quality of governance by implementing e-procurement in government level. Singapore government using GeBIZ on-stop e-procurement portal which enhance transparency in government procurement, easy access to information, increase procurement efficiency, global reach among the bidders and suppliers, and

increase more competition among bidders. The main implementation benefits of this system were to make more consistency in procurement process, more visibility into procurement process, and secure document transmission (Guadamuz and Jiménez 2009). Fifteen countries' focus on e-Procurement helped increase efficiency in document transmission and reduce more chances of corruption. Nine countries' government e-procurement implementation benefits result indicated that e-procurement helped to reduce human interference in bidding process and avoided unnecessary physical threat to the other bidders in tendering process (Neupane, Soar, Vaidya and Yong 2004).

Somasundaram wrote for ADB (2011), government departments in India those implement e-GP system reported the key benefits such as average number of bidders per tender were increased; tender premium had decreased by about 15%; and the cycle time taken to evaluate tenders was decreased.

Smart (2010) recorded the potential benefits of e-procurement mechanisms as increased order accuracy, transaction efficiency and greater integration between trading partners; ...it acted as an enabler to more effective management of the function; ... e-Procurement led to improvement in process and price for buying firms; e-Procurement was used by buyers and suppliers as a means to channel dominance; e-Procurement led to automation of process, not supply chain integration....however, procurement managers pursued functional targets rather than supply chain-level objectives. Furthermore, buying firms could use e-Procurement mechanisms inter alia to exploit market competition, improve processes, support supplier rationalisation programmes, enforce compliance and support a segmented approach to supply markets. Although e-procurement was an enabler of the

purchasing firm's supply strategy;integration with suppliers was not greatly enhanced by e-procurement deployment.

1.7 Rationale of the Study

The CPTU adopted a well managed strategy which is critical to the successful implementation of e-GP. However, the best practice e-procurement implementation should identify its barriers and opportunities so that they can be addressed in proactive manner, CPTU also to consider the same. The potential barriers might be specific to the procurement process, the organisation itself or existing communication channels and their elimination is important – to neutralize them is at threshold. For example, some government officials were unwilling to use e-GP as published in Bangladesh media such as the Daily Jugantor dated: 23 September 2014. On the other hand, it is required to exploit the potential favours of factors of e-GP and to enhance their utilization. A World Bank evaluation showed e-Tendering was seen effective to restrict coercive and collusive practices which was also published in Bangladesh media such as the Daily Janakantha, dated: 17 December 2014.

This a novel research and possibly the first of its kind in Bangladesh and it is expected that the results of the study would help a range of stakeholders, especially the e-GP users, it's planners, policy-makers and researchers to address the challenges of e-government applications in Bangladesh. Any future research could benefit by the outcomes of this study in quantifying the contribution of e-GP to the national account and gain through waste minimization and process efficiency.

1.8 Research Objectives

The research objectives of the study are to identify the factors of influence on electronic government procurement in Bangladesh that could affect it either positively or negatively. In this respect two counter acting sets of factors of e-GP would result from the study which would require considering some measures to minimise the effects of those counterproductive factors.

1.8.1 Broad Objectives

The broad objectives relate to the 'scope' of the research study which is suitable for its time horizon and considering the available resources. Thus the desired future of this research is to attempting to understand the factors influencing e-GP and identifying their core directions; grouping them into two counter acting sets those may act as key barriers and enablers by grading their influence in ranks to high, medium or low.

1.8.2 Specific Objectives

Stretching the above general objectives, the specific objectives of this research would look into the outcomes – they are:

- I. To give an overview of procurement system in Bangladesh;
- II. To identify the factors affecting procurement system in Bangladesh;
- III. To identify the relationship of the factors influencing procurement system in Bangladesh with e-GP; and
- IV. To suggest some measures to increase the efficiency of e-GP in Bangladesh.

1.9 Research Questions

The research questions (what is to study) and research strategy (how to conduct the study) are very important as they influence the strategy that is employed in order to either provide answers to the questions or verify them. The research strategy to be used depends on the nature of the problem and formulation of research questions.

In present case, the research poses to look for responses to questions those are based on e-government procurement depending upon the level of understanding and capacity to react on proper course by the users, thus the questions are as follows:

- a) What are the elements of e-government procurement in Bangladesh and what does it would like to do?
- b) What are the factors of e-government procurement that influence it?
- c) What are the factors of e-government procurement favours the e-GP and what others challenge it?
- d) How to overcome those challenges?

1.10 Structure of the Document

The structure has a sequence with an introduction followed by methodology, a brief of related theories, data analysis, discussion on results highlighting the factors of influence and identifying those factors as supportive or offensive to e-GP; and finally a concluding chapter.

The first chapter gives an introduction of the study focusing the rationale of the research and review of literature. It provides objectives of the study and formulates the research questions based on those objectives.

The second chapter discusses about the methodology covering data, sampling the population, discussion on target population, data analysis covering descriptive and inferential statistics, model concept and appropriateness, goodness of fit, correlation issues etc.

The third chapter includes data organisation, analysis and interpretation of results. The fourth chapter highlights both empirical and statistical results of factors of e-GP those influence it, ranks and summarize them.

The final chapter covers the conclusions of the work and put few recommendations; then admits some limitations of the study.

Chapter Two: Methodology

2.1 Main Methodologies

The history of e-governance study reveals that there are various methods of analysis adopted by the researchers such as Case Study, Comparative Analysis, Content Analysis, Correlation Analysis, Factorial Analysis, Life History Method, Variance Analysis etc. Keeping these approaches in mind, efforts were made in this research work to utilize appropriate methods in understanding of issues as expected and meet the objectives.

Since 2012 e-GP has been operational in Bangladesh and the level of its use has been spreading in both dimensions of concentrations and wider aspects of users. The number of users is increasing with the increase of implementing agencies, from four target agencies to 22 agencies at present. Not only e-Tendering, e-management of contracts is also gaining momentum, the use of e-CMS for example.

In these courses of practicing e-GP, experiences show some adverse factors from both external and internal to the organisations, the public agencies, challenging the proper functioning of the system. Literatures also show evidences of the difficulties to implement e-GP worldwide including Bangladesh. Attempts have been made to explore the potential factors of influences on e-GP on the basis of experience, discussion and dialogue with its users to be termed here as primary source; also by searching the current literatures to be termed as secondary sources.

Both types of factors were screened through mirroring the broad factors underlying in the theories of environmental scanning and conflicting situations, using the frameworks such

as PESTLE, Porter's five forces, Force-Field analysis etc. A consolidated set of influencing factors were drawn and attempted to test them with the e-GP users either in public sector or of general public. They are basically the Bidders/Tenderers/Applicants /Consultants (National and International), Procuring Entities, Procurement related Committee members, Payment service providers at banks, Development Partners (DPs), media, Operation, Maintenance and Management Entity (OMME), e-GP System Administrators, Auditors and the general public. It was emphasized to have reflection of regular users, such as the Tenderers/Consultants, Procuring Entities, Approving Authorities, Procurement related Committee members, Payment service providers at banks etc. during the survey.

2.2 Scope of the Work

The scope of research work with e-GP is very wide that could account to the quantifying its overall impacts on economy as a whole. However, the prevalent factors, such as available time, finance resources, human factor and requirement of the university for Masters Study governs the boundary of the work. The scope of the work was kept limited to determination of 'for' and 'against' metrics around e-GP in Bangladesh based on their level of influence from user perspectives so that it becomes attainable. This work could contribute to some extent for further research in this field.

The available time also limits access to academic resources and interact professional personnel about the subject matter. Also there are very few research works in Bangladesh context and so advances yet to make in this field.

2.3 Data Source

The findings of the previous studies are important sources for the research. As this study aims to work on factors influencing e-GP existing literature have already identified many of those factors. However, the context and environment of the e-GP system are obviously different, it also varies in course of time; so these elements needs to be checked to recommend in present context. A number of factors of influence as identified in the previous literature were considered for this research.

Experience study is another source of information where skillful users of the public procurement personnel can point out some distinctive information. This valuable resource was also attempted to utilize in contextualizing the related aspects that available studies may not cover.

The flow chart below depicts the ways how above factors of influence was organized and tested under this research.

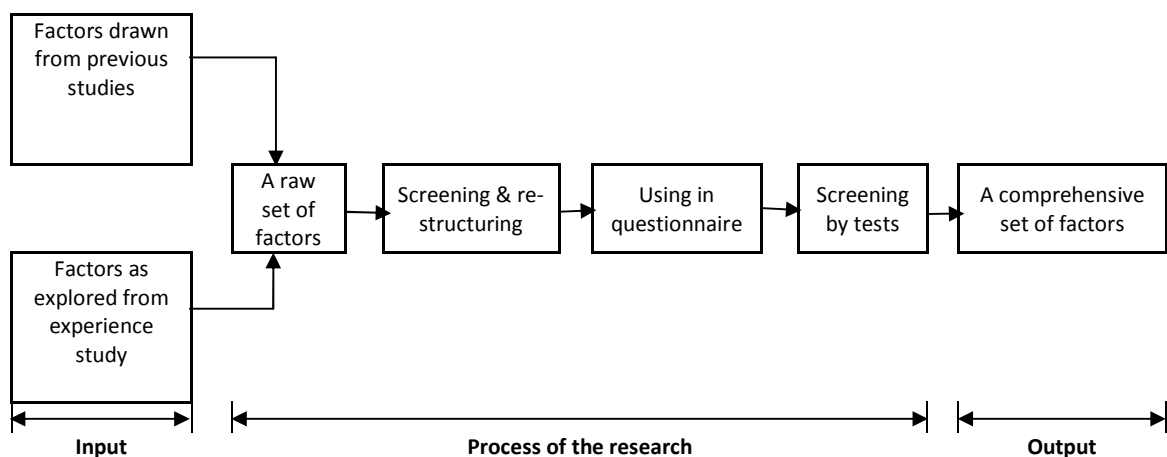


Figure-4: Process of Determining the Factors of Influence of e-GP

2.4 Tools and Frameworks

The variant factors of electronic procurement can be identified through the use of various techniques including direct understanding based on the facts of and the use of previous literature. Frameworks like PESTLE, SWOT analysis, the force-field analysis, the Porter's five forces, etc. could help to understand the environmental factors and simulate the situations around a project or function such as e-GP. As a public sector business, e-GP contributes to enhanced governance to its service environment which is susceptible to be effected by many environmental factors and thus above frameworks are much useful.

2.4.1 PESTLE Factors

The PESTLE factors are useful to understand environmental drivers and constraints which are very relevant to this study. There are variant macro-environmental aspects that impact the operation of electronic procurement can be judged in terms of PESTLE framework that stands for Political, Economic, Social and Technological analysis. It describes a framework of macro-environmental factors used in the environmental scanning component of strategic management. Some analysts added the Legal factor and rearranged the mnemonic to SLEPT; inserting Environmental factors it was expanded to PESTEL or PESTLE. The model has been further extended to STEEPLE and STEEPLED, by adding Ethics and Demographic factors. It is also a useful strategic tool for understanding market growth or decline, business position, potential and direction for operations. Another similar framework STEER analysis systematically considers Socio-cultural, Technological, Economic, Ecological, and Regulatory factors.

In particular to Bangladesh e-GP, the range of social factors including psychographic nature of human; technological innovations along with shorter lifecycle equipments and techniques; economic issues of cost matters, availability and speed of service; governmental legislations, fast changing market conditions (i.e. public demand for better and better services) and political preferences can largely affect.

2.4.2 SWOT of e-GP

A SWOT analysis includes analyzing a business's strengths, flaws, possibilities, and risks. It can help to uncover the opportunities that are beneficial to exploit. And by understanding the weaknesses, one can manage and eliminate threats that would otherwise affect unawares.

The PESTLE factors, combined with external micro-environmental factors and internal drivers when applied to e-GP systems, can be classified as opportunities and threats in a SWOT analysis. Moreover, by looking at competitive environment using the SWOT framework, a strategy can be developed based on the influencing factors of e-GP which could help to distinguish it from traditional paper based system and be able to sustain.

A thematic diagram of SWOT of e-GP has been developed as below:

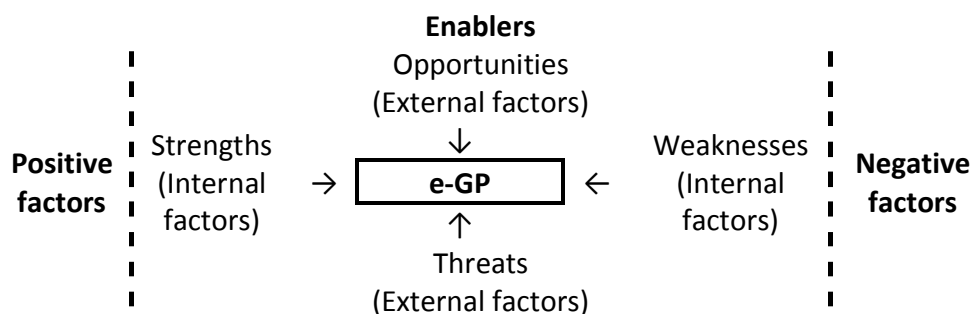


Figure-5: SWOT of e-GP

For this study SWOT, as a tool, is quite relevant and the factors available in the literature as well as judged by the experience and learning could be framed by it. In fact the objectives of this study demand identifying proactive and counter-active factors. The positive factors might include supportive elements that can boost strengths and opportunities of e-GP while the negative factors could include offensive elements that can restrain it and damage the benefits.

2.4.3 Force-Field Analysis

The force-field analysis model was developed by Kurt Lewin. This model is based on the idea that in a given organisational situation there is an interplay of restraining and driving forces which keeps things in equilibrium such an equilibrium may vary over time and depending on situations. It aims to chart the forces that are pushing in the desired direction and those that push in other directions to maintain status quo. Once this has been done, it is possible to focus on the resisting forces and either to overcome or at least to reduce them.

The e-GP system also faces the pressure by its competing environment. The system is still to implement in many government entities although it has been spreading steadily. By this time only 22 agencies have come under e-GP implementation; but the four target organisations practice it widely.

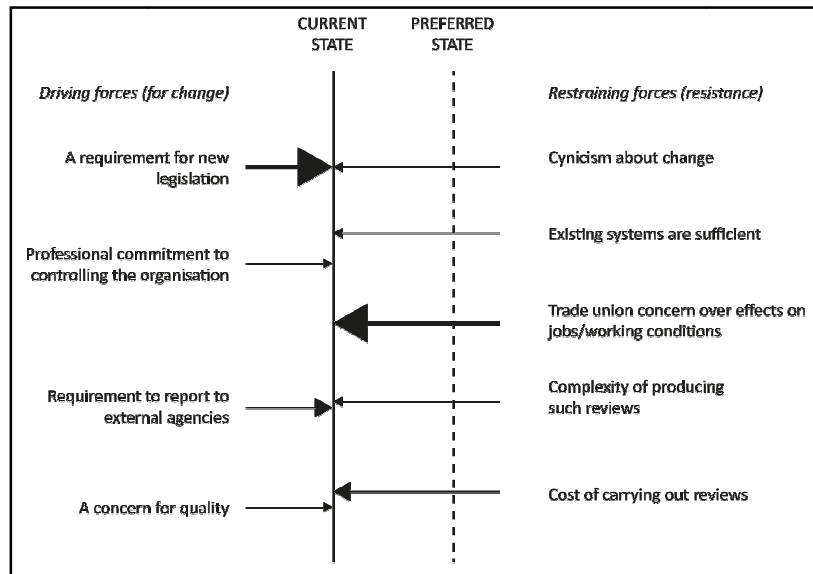


Figure-6: A Typical of Force-Field Method

2.4.4 Porter's Five Forces

The Porter's five forces framework is another tool that helps to understand industry attractiveness and competitive forces. It could be useful to understand the influencing factors of competitive environment around the e-GP. The five forces are competitors; the power of buyers; the power of suppliers; the threat of new entrants; and the threat of substitute products. In research context of e-GP, the external stakeholders are media, development partners, and general public. The factors such as benefits of e-GP service delivery i.e. efficiency, timeliness, shorter procurement cycle, transparency etc. could be considered as buyers and the organisational users such as procuring entities, committee members could be considered as suppliers side. However, this technique applies for a particular point of time and in a specific context.

2.5 Sample Design

In statistics, sampling is the selection of a subset of individuals from within a statistical population to estimate characteristics of the whole population. The sampling process in any research work comprises several stages – defining the population, specifying a set of items to measure, specifying a sampling method for selecting items, determining the sample size, implementing the sampling plan, and data collection. This study followed the same principle in designing the sample.

2.5.1 Sample Size Criteria

Main aspects of determining the size of a sample are the purpose of the study, population size, sampling error (the level of precision), the confidence level, and the degree of variability in the main measured attributes (Polonia 2013). However, later three criteria usually needs to be specified to determine the appropriate sample size – these are reviewed below (Glenn 2013):

The Level of Precision

The *level of precision* (also *sampling error*) is the range in which the true value of the population is to be estimated. This range is often expressed in percentages (say, ± 10 percent). Thus, if 60% of the population in the sample has adopted a recommended practice with a precision rate of $\pm 10\%$, then conclusion results between 50% and 70% of the population have adopted the practice.

The level of Confidence

The *confidence or risk level* is based on ideas encompassed under the Central Limit Theorem. The basic concept of the Central Limit Theorem is that when a population is repeatedly sampled, the average value of the attribute obtained by those samples is equal to the true population value. Also the values obtained by these samples are distributed normally about the true value, with some samples having a higher value and some obtaining a lower score than the true population value. In a normal distribution, approximately 85-95% of the sample values are found within two standard deviations of the true population value such as mean.

The Degree of Variability

The third criterion, the *degree of variability* in the attributes being measured, refers to the distribution of attributes in the population. The more heterogeneous a population, the larger the sample size required to obtain a given level of precision. The less variable (more homogeneous) a population, the smaller the sample size will be. For example, a proportion of 50% indicates a greater level of variability than either 20% or 80%. This is because 20% and 80% indicate that a large majority do not or do, respectively, have the attribute of interest. Because a proportion of 0.5 indicates the maximum variability in a population, it is often used in determining a more conservative sample size, that is, the sample size may be larger than if the true variability of the population attribute were used.

The common ways of determining the sample size are:

- by using or conducting a census survey;

- transfer a sample size from a similar study;
- using published tables; and
- applying of formulas to calculate a sample size.

2.5.2 Sample Bias

When a sample is collected in such a way that some members of the intended population are less likely to be included than others, this is termed as sample bias in statistics (Wikipedia 2014 online). It is a non-random sample that a biased sample of a population results in which all individuals were not equally likely to have been selected. If this is not taken into account, the analysis can result erroneously attributed under study rather than to the method of sampling.

2.5.3 Sample Size Determination

For populations that are large, Cochran (1963) developed the Equation 1 to yield a representative sample for proportions.

$$n_0 = \frac{Z^2 pq}{e^2} \dots\dots\dots \text{Equation 1}$$

which is valid where n_0 is the sample size, Z^2 is the abscissa of the normal curve that cuts off an area α at the tails ($1 - \alpha$ equals the desired confidence level, e.g., 95%), e is the desired level of precision, p is the estimated proportion of an attribute that is present in the population, and q is $1-p$. The value for Z is found in statistical tables which contain the area under the normal curve.

Finite population correction for proportions is given in Equation 2:

$$n = \frac{n_0}{1 + \frac{(n_0 - 1)}{N}} \dots\dots\dots\text{Equation 2}$$

where n_0 - the initial sample size, n - adjusted sample size, N - the population size.

A simplified formula for proportions, developed by Taro Yamane (1967):

$$n = \frac{N}{1 + N * (e)^2} \dots\dots\dots\text{Equation 3}$$

where n - the sample size, N - the population size, e - the acceptable sampling error. (Say 95% confidence level and $p = 0.5$ are assumed)

According to Yamane formula (1967), Potential error limit

$$e^2 = [z^2 p (1- p)/ n_0] - [z^2 p (1- p)/N] \dots\dots\dots \text{Equation 4}$$

2.5.4 Sample Size for the Survey Work

The e-GP user in Bangladesh includes government users as the system allows – Heads of the Procuring Entities, Approving Authorities, Procuring Entities, Tender/Proposal Opening Committee, Tender/Proposal Evaluation Committee, System administrators (at CPTU and at organisation level), Tenderer/Consultants, Bank users, Development Partners, Media personnel etc. Considering the e-GP users in Bangladesh as registered by 2012, the total number was 13,609 in 2012. The registration details page of the e-GP web portal supports this statistics. As there were potential to rise in number of registered users, current figure may be assumed to be around 15,000.

As the sample size and effective sample size have moderate impact on quality measures, it is necessary to consider the possibility of increasing sample size. Present work would

use the simpler form of estimating the sample size using Taro Yamane's formula which is based on the level of precision.

Table-4: Estimating Sample Size

Population (N)	level of precision (e)	Sample size, $n = \frac{N}{1 + N * (e)^2}$	Response rate	Critical value (z)	Potential error limit, $e^2 = [z^2 p (1- p)/ n_0] - [z^2 p (1- p)/N]$
15,000	20%	25	0.166%	1.28	1.04%
15,000	15%	44	0.295%	1.44	1.17%
15,000	63	0.420%
15,000	10%	99	0.662%	1.64	1.33%
15,000	5%	390	2.597%	1.96	1.54%
15,000	2%	2,143	14.286%	2.33	1.38%
15,000	1%	6,000	40%	2.58	-

According to Table-4, given a response rate of 0.295% (derived from 44 responses out of 15,000) the e-GP survey therefore has an 85% confidence level with 1.17% of potential error. Similarly, 0.662% (99 responses) gives a 90% confidence level with 1.33% of error. Hussey and Hussey (1997) noted that no survey can ever be deemed to be free from error or provide 100% surety; so error limits having below 10% with confidence levels of 85 ~90% is acceptable. For the purpose of this research work, a sample size of 99 was targeted, but the responses received were 63 (0.42% of the population).

The experience shows wide variations in level of use of e-GP by the registered users. As there are legal requirements for e-GP user registration, and the number of users are about 15,000; but the ground scenario reveals the number of actual users is far below than that. For example, a Procuring Entity may require at least 10/15 users to participate in a tender processing cycle that includes committee members to open and evaluate the

tenders, participating tenders, bank users, an administrator, the approving authority or HOPE. But the active users are only a few where someone works for the others; for example, the study shows over 10% of registered users do not use e-GP in their own where as another 10% non-registered people use e-GP by themselves. It is revealed from experience study that some alternate people work for the users of e-GP to complete the tendering process. Private users were seen to depend on public sector users for support in operating e-GP. This practice is worse among tenderers whose share accounts to 61% of total registered users (Table-6). Thus ultimate populations for e-GP users are far less than estimated (or assumed); in fact, determination of a reliable population size is a complex matter.

2.5.5 Description of the Sampled Population

The respondents were targeted from the government organisations and their related players of the e-GP systems such as the Head of the Procuring Entity, approving authority, Procuring Entity, opening and evaluation Committee members, Tenderers, Applicants, Bank users, System administrators etc.

The four governmental organisations – Bangladesh Water Development Board (BWDB), Local Government Engineering Department (LGED), Roads and Highways Department (RHD) and Rural Electrification Board (REB) mainly were targeted for the survey. The contact persons of these organisations (www.eprocure.gov.bd/contactUs.jsp; date: 11 October 2014) were contacted through e-mail requesting them to communicate it to respective officials so that they consider it authentic and respond accordingly. The responses show that the respondents were from approving authority, Procuring Entity,

opening and evaluation Committee members, Tenderers, Applicants, Trainers, and System administrators.

2.6 Design of the Questionnaire

The initial point of research is to look for the questions to be answered. The questionnaire is to focus the experience and feeling of users with e-GP with respect to how far they are 'friendly' with the system to use and to know if they feel difficulties to deal with it.

Surveys often contain questions with a set of possible responses. For example, Likert-type scales use fixed choice response formats that are designed to measure attitudes or opinions (Bowling 1997; Burns & Grove 1997). These ordinal scales measure levels of agreement/disagreement. This survey also used similar set of given responses in five point scale such as 1 = oppose strongly, 2 = oppose, 3 = neutral, 4 = supports, and 5 = supports strongly. The questionnaire also covered the user's personal attributes; their personal settings of procurement orientation; their personal involvement with e-GP system.

The factors of influences of e-GP were identified based on available literature as well as experience study. Most of them were short listed and re-structured such that the respondents find easy to understand the issue and react accordingly. The dialogue with e-GP users i.e. experienced people, and having feedback on a draft questionnaire contributed to develop the survey. At the outset a draft questionnaire was distributed to few experienced practitioners of e-GP, and their feedback were utilized to finalize its size.

The relationship between number of questions in a survey and the time required for answering them is not linear. The more questions to respond, the less time the respondents wish to spend in answering each question. If the respondents begin satisficing (aiming to achieve only satisfactory results) or speeding through a survey then the quality and reliability of data may suffer. The respondents take just over a minute to answer the first question in a survey (including the time to reading any survey introductions) and spend about 5 minutes in total, answering a 10 question survey. However, respondents take more time per question when responding to shorter surveys compared to longer surveys (Brent 2011).

Considering above, the length of the questionnaire was maintained such that the users do not get exhausted while answering it and the time would require about 10 to 15 minutes, thus achieve expected level of response.

While the questionnaire contains the potential factors of influences on electronic government procurement (e-GP), it also have some personal attributes of the respondents covering their age, experience, registration status to the e-GP system and respective role, and background knowledge on procurement and the e-GP (Appendix-1). The reliability statistics having alpha value 0.893 confirms that the questionnaire (Table-5) can reliably explain the prediction which seems quite reasonable. It is noteworthy that Nunnally (1978) suggested the alpha value as a rule of thumb to be 0.70; however, recent expectations of alpha value are a minimum 0.80.

Table-5: Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	No. of Items
0.877	0.893	38

2.7 Data Collection Technique

Various instruments are available for facilitating the data collection process. These include interviews, questionnaires, document analysis, observations, Focus Group Discussions (FGD), etc. (Lancaster 2005). However, the choice of data collection instruments is determined by the nature of the information needs intended to achieve the objective of the study and data sources (ibid.). In other words, each instrument is known to best facilitate the collection a particular kind of data (Yonazi 2010). The questionnaire survey could be face to face interview or remote; video based; web based; and predesigned cards of alternative sets of choice, photographs or a stated scenario may also be used.

In this study, an internet based survey techniques were used based on a structured questionnaire, lodged on 'surveymonkey' platform (<https://www.surveymonkey.com/NQHMQ8Q>). The respondents were contacted via e-mail by giving them this web link to take the survey. The responses were logged to the 'surveymonkey' system and individual responses were extracted for analysis.

2.8 Data Analysis Tool and Outcomes

Statistical Package for the Social Sciences (SPSS) was used for data analysis. This tool is a widely used program for data analysis in social sciences. It is also used by market researchers, health researchers, survey companies, government, education researchers, marketing organizations, data miners, and others. The original SPSS manual (Nie, Bent and Hull, 1970) has been described as one of "sociology's most influential books" for

allowing ordinary researchers to do their own statistical analysis. In addition to statistical analysis, data management (case selection, creating derived data) and data documentation are the features of the base software. SPSS datasets have a two-dimensional table structure, where the rows typically represent cases (such as individuals) and the columns represent measurements (such as age, sex etc.). Only two data types are defined: numeric and text (or "string"). All data processing occurs sequentially case-by-case through the file. Files can be matched one-to-one and one-to-many, but not many-to-many (Wikipedia 2014 online).

2.8.1 Descriptive Statistics

Descriptive statistics are useful to understand the features of a set of data. These are numerical measures which do not allow reaching conclusions regarding any hypotheses made. Descriptive statistics enables to present the data in a meaningful way and allows interpretation such as the distribution and pattern of data and their spread. These are the summarizing of data using measure of the center (average, mean, median, mode or mid range), spread of a dataset (range or standard deviation), skewness and kurtosis, correlations between data, and presentation of statistical results using a combination of tables, graphs and charts and discussion of the results. SPSS is quite useful in this respect; its 19th version was used for analysis.

2.8.2 Inferential Statistics

Inferential statistics use samples representing its populations and help to come to a conclusion about the population from which the sample was drawn. As it is not feasible to study each member of the population individually, a representative subset of the

population (i.e. sample) is chosen. Inferential statistics examines the statistical sample, and thus can say something about the population. There are two main divisions of inferential statistics – a confidence interval that gives a range of values for an unknown parameter of the population (the level of significance due to some uncertainty); and the tests of significance by analyzing the sample.

2.9 Model Form and Appropriateness

It was aimed to identify and rank the factors affecting Electronic Government Procurement (e-GP) in this research. A model covering these factors could result an overall impact which may take the form as a model relationship (Equation 5).

$$y = f(p, q, r, s, \dots + c) \dots \dots \dots \text{Equation 5}$$

Where, y represents overall impacts on e-GP; and p, q, r, s represent factors affecting i.e. benefits and enablers, challenges and barriers of e-GP and c is a constant representing unobserved elements and errors.

Above relationship represents that an overall impact on e-GP as a dependent variable which is influenced by a number of independent variables of its attractions having perceived benefits due to the presence of several enablers; also influenced by the threats of challenges and due to numerous barriers available.

It is quite a simple relationship among factors of influences and is very generic. The form of relationship is in question could be thought to be one among additive, multiplicative or exponential; however, available literatures do not have indication of any types of relationship in this field of work. The mathematical concept of logarithmic application in

multiplication or exponentials can modify the relationships in simpler additive form which is quite useful.

The other issue of this relationship comes up regarding co-efficient of the individual factors in the relationship to establish the nature and trend. There could be some errors, unobserved elements, specific preference or deterrent to the relationship present which also needs to be taken into account.

Based on the nature of those factors, they influence the e-GP as these are mostly of human factors and largely socio-psychological having no simple form and scale, the relationship in Equation 5 is expected to be variable in different forms based on situation and time; and so is complex.

2.9.1 Goodness of Fit

The goodness of fit statistics helps to determine whether a model adequately describes the data. Measures of goodness of fit typically summarize the discrepancy between observed values and the values expected under the model in question. Such measures can be used in statistical hypothesis testing whether outcome frequencies follow a specified distribution (Wikipedia 2014 online).

A model fits the data well if the differences between the observed values and the model's predicted values are small and unbiased. R-squared is a statistical measure of how close the data are fitted to the regression line. It is also known as the coefficient of (multiple) determinations for (multiple) regressions. The model with the largest R-squared statistic is expected according to this measure.

The R-squared is defined as the percentage of the response variable variation that is explained by a linear model, i.e. $R\text{-squared} = \text{Explained variation} / \text{Total variation}$. The value of R-squared is a continuum between 0 and 100% in which the lowest end 0% indicates that the model do not explain any variability of the response data around its mean; while the highest end 100% indicates that the model explains all the variability of the response data around its mean. In general, the higher the R-squared, the better the model fits your data. The R-squared at upper middle, say 50~70% are regarded as satisfactory fit as it accommodates the expected variations in the e-GP user community. However, R-squared does not indicate whether a regression model is adequate or not; because a low R-squared value for a good model or a high R-squared value for a model that does not fit the data are also possible. A negative R-squared is impossible and such one could be adjusted or predicted, not in case of a regular R-squared (Frost 2013). This study reveals a good R-squared which reveals that the model could explain approximately 73.5% of the prediction.

2.9.2 Correlation of Factors

Correlation refers to dependence of two or more random variables. It measures the relationship between two mathematical variables or measured data values. There are several correlation coefficients, measuring the degree of relationship; the most common is the Pearson correlation coefficient, which is sensitive to a linear relationship between two variables. Other correlation coefficients, more robust than the Pearson correlation are also available which are more sensitive to nonlinear relationships. The correlation coefficient defines the dependence structure only in very particular cases, for

example when the distribution is a multivariate normal distribution. The correlation matrix is symmetric due to the correlation between X_i and X_j is reciprocal and same as the correlation between X_j and X_i for example.

If a data-set having more than two variables, partial correlation coefficient is useful - this measures the degree of dependence between a pair of variables. Partial correlation resolves the two associated linear regression problems, get the residuals, and calculate the correlation between them.

The correlations without any control variables are zero-order correlations; it gives correlation between the transformed predictor and the transformed response. This is useful for this research work.

2.9.3 Multicollinearity Among Variables

Multicollinearity is a statistical phenomenon having two or more predictor variables in a multiple regression model are highly correlated, which means one can be linearly predicted from the others with a reasonable degree of accuracy. One of the features of multicollinearity is that the standard errors of the affected coefficients tend to be large. It is expected that the predictor variables correlate highly with the dependent (outcome) variable, and correlate at minimum with each other (among independent variables) in the relationship. It increases the standard errors of the coefficients which mean the coefficients for some independent variables may be found to be around 0, whereas if no multicollinearity and have lower standard errors, these same coefficients might be significant. Thus multicollinearity misleads and inflates the standard errors and makes some variables statistically insignificant.

Multicollinearity can be identified in a model by observing large changes in the estimated regression coefficients when predictor variables are added or deleted. Variance inflation factors (VIF) is a tool to measure the variance of the estimated coefficients for this purpose. If two variables are not correlated, then all the VIFs will be 1.0. If VIF of a variable is 5 or more, then there is the presence of collinearity with that variable. To overcome this problem, one of such variables should be removed from the regression model.

Chapter Three: Data Analysis

3.1 Data Organisation

Statistical techniques include both compilation procedures and adjustments to be made to raw data by ensuring that errors are minimized; also estimating of missing observations. The task of data compilation covers the extraction of data from collections of questionnaire responses made online by the respondents. Extraction of data collected requires the knowledge of analysis platform to be used, in this case the SPSS, and the coding procedures. Both the tasks of storing and manipulating data and assessment of data quality critically are most valuable in this stage. Compilation requires sound judgment on responses based on the background of the respondents and planned estimation methods.

The extracted data were entered directly to the IBM® SPSS® Statistics data file which is organized by cases (rows) and variables (columns). In this data file, cases represent individual respondents to a survey and variables represent responses to each question in the survey. Defining descriptive variable labels and value labels for variable names and data values are essential as they are used in statistical reports and charts. Variables could be of different types, including numbers, strings, currency, and dates.

There are other options for organizing the data which use spreadsheet applications (Microsoft Excel), database applications (Microsoft Access) and text files.

3.2 Analytical Techniques

To understand the data gives message about the population are reflected by descriptive statistics (Frequencies, Descriptives, Cross tabulation, etc.) and bivariate statistics (Means, t-test, Correlation) which are quite versatile. However, descriptive statistics as well as inferential statistics were utilized to accomplish the conclusion and have a fair understanding of the research issues.

At outset, checking the presence of any missing data in the database is the prime job to ensure all relevant information is taken into account for analysis. The presence of data as unexpected and beyond the general perception is also important as such a case may influence the result and could yield a surprise.

The respondent's attributes including age, experience, knowledge base, and relevance with procurement and e-GP systems are initial subjects of investigation. At secondary level, their attitude to the factors of influence as listed in the questionnaire and their level of perception about individual factors are the matter of interest. Then selecting a compromised set of factors according to their ranks depending on choice and statistical justifications those favour the e-GP or do not.

For the purpose of identifying factors justifiably influence the e-GP, a linear relationship of the factors was assumed based on which regression model to be estimated. The linear regression model assumes that there is a linear, or "straight line," relationship between the dependent variable and each predictor. The form of relationship between variables within the model should keep linear as far as possible and it was taken care of through

necessary transformations. The better the value of statistical significance, the variables are more likely to be mutually independent.

Finally, a common set of factors influencing the e-GP would have been developed from those recognised as perceived by the respondents and those factors identified by the regression work.

3.3 Characteristics of the Respondents

The respondents, almost all are from procurement environment, thus the expectation of the survey work meets satisfactorily. As mentioned, the targeted respondents were from e-GP environment such as the Head of the Procuring Entity, approving authority, Procuring Entity, opening and evaluation Committee members, Tenderers, Applicants, Bank users, System administrators etc.

A total of 63 responses were received of which 71.4% were from registered users of e-GP and one did not answer (Table-6), however more than the registered users (93.7%) were trained in procurement (Table-7) and 84.1% got training on e-GP (Table-8).

The most proportion of the users (44.3%) was 'Procuring Entity' and 29.5% were TEC/PEC members; this is significant due to the fact that they actually drive the procurement process and play the major role. A significant proportion of the users do not use e-GP by themselves which reflect against the spirit of decision making in tendering process and potential to abuse of the system. The length of experience of the e-GP users shows a fair distribution (Table-9). Table-10 shows that the users (77.4%) were matured enough being 30~50 years old and their behaviour about use of e-GP reflects some lack of governance in the system.

Table-6: Registered e-GP Users Among Respondents

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	45	71.4	72.6	72.6
	No	17	27.0	27.4	100.0
	Total	62	98.4	100.0	
Missing	System	1	1.6		
Total		63	100.0		

Table-7: Respondents Got Training on Procurement

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	59	93.7	96.7	96.7
	No	2	3.2	3.3	100.0
	Total	61	96.8	100.0	
Missing	System	2	3.2		
Total		63	100.0		

Table-8: Respondents Got Training on e-GP

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	53	84.1	84.1	84.1
	No	10	15.9	15.9	100.0
	Total	63	100.0	100.0	

Table-9: Experience in Public Procurement

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	> 20 years	17	27.0	27.4	27.4
	15 ~ 20 years	13	20.6	21.0	48.4
	10 ~ 15 years	4	6.3	6.5	54.8
	5 ~ 10 years	14	22.2	22.6	77.4
	< 5 years	14	22.2	22.6	100.0
	Total	62	98.4	100.0	
Missing	System	1	1.6		
Total		62	63	100.0	

Table-10: Age Band of Respondents

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid				
50 ~ 60 years	7	11.1	11.3	11.3
40 ~ 50 years	27	42.9	43.5	54.8
30 ~ 40 years	21	33.3	33.9	88.7
< 30 years	7	11.1	11.3	100.0
Total	62	98.4	100.0	
Missing System	1	1.6		
Total	63	100.0		

The respondent's pattern with respect to experience, age and knowledge shows prospective to the objectives to this study. The composition of respondents was from a distributed type of varying experience in procurement functions where 40% were with less than 10 years, while 54% were with 15 years or more (Table-9), thus allowed a balance in feedback to the questionnaire. 74% of them are at their middle of the age - around 40 years (Table-10) reflecting psycho-physical maturity and potentially have ability to brainstorm properly.

Although 77.6% of the respondents were registered with e-GP, more than 10% of them were lacking to use e-GP themselves, they allowed others to use in favour of them. This is alarming due to the risks that the other users might misuse of the delegation they got from the authorized users which could cause litigation as well as indiscipline in the procurement process.

One-fifth of the users were not registered however they use e-GP which could be as authorized by registered users or they use training suit of the system, one of the respondents was trainer of e-GP for example.

3.4 Involvement of Respondents in Procurement and e-GP

The targeted population for the survey was among those in procurement and concerned with e-GP. The survey result shows about 98% of them were trained on procurement (Table-7) and 86% got e-GP training (Table-8). It is clear that private sector do not have much facilities for training on procurement, even the academic curriculum do not reflect it in depth. So the contractors, applicants or suppliers, although they are essential parts of procurement (also e-GP), are lacking to have formal training in this regard. The public sector also struggling to disseminate the technology to its human resources. In spite of limited scope of training, this activity is seen a value adding to governance processes.

According to role in procurement systems, the majority of respondents are procuring entities (43%) and committee members (37%); while the Registered Contractor/Supplier/Consultants were only 6.5% (Table-11); and unfortunately no HOPE took part in the survey. Among 'non-registered' and 'other' categories, the respondents were trainer of procurement, system administrator, authorized user and procurement specialists.

Table-11: Role/Function of Respondents in e-GP

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Other	3	4.8	4.8	4.8
Registered Contractor/ Supplier/ Consultant	4	6.3	6.5	11.3
TEC/PEC member	19	30.2	30.6	41.9
TOC/POC member	4	6.3	6.5	48.4
Procuring Entity	27	42.9	43.5	91.9
HOPE/Approving authority	5	7.9	8.1	100.0
Total	62	98.4	100.0	
Missing System	1	1.6		
Total	63	100.0		

Table-12: Cross-Tabulation of Registered vs. Actual User of e-GP

			Actual user e-GP					Total
			Self	Subordinate officers	Other office	Committee member	Other	
Registered user of e-GP	Yes	Count	39	4	1	0	1	45
		%	67.2%	6.9%	1.7%	.0%	1.7%	77.6%
	No	Count	6	0	3	1	3	13
		%	10.3%	.0%	5.2%	1.7%	5.2%	22.4%
Total		Count	45	4	4	1	4	58
		% of Total	77.6%	6.9%	6.9%	1.7%	6.9%	100.0%

Although most of the respondents use e-GP in their own (requiring a security password), a significant proportion - 14% of them depends on others to deliver the responsibilities in e-GP (Table-12). It is a cause of concern that there is a possibility to a significant misuse of the system and subsequent hazards could be in the operational procedures such as administration and control.

3.5 Response to the Factors of Influence

The response to the question seeking the level of overall impact due to the presence of influencing factors of e-GP were found to be positive which meets the expectations. The result shows the factors mentioned in the questionnaire have a medium to high impact on e-GP according to 76% of the respondents (Table-13). This is due to the collective impacts of those factors as individuals could perceive in the survey. This relationship satisfies Equation 5 mentioned in Section 3.5 and can be modified as below:

$$\text{Overall impact} = \int \text{Presence of Supporting \& Opposing factors} + \text{Unobserved factors}$$

..... Equation 6

Table-13: Level of Overall Impact Due to Influencing Factors of e-GP

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Moderate impact	7	11.1	11.3	11.3
	Medium impact	19	30.2	30.6	41.9
	High impact	28	44.4	45.2	87.1
	Heavy impact	8	12.7	12.9	100.0
	Total	62	98.4	100.0	
Missing	System	1	1.6		
	Total	63	100.0		

3.6 Perceived Factors and Their Ranking

The rating of the factors of influences results in identifying those favours or opposes the e-GP. A number of factors were ranked in a varying degree to favour ranging from 49% to 86% of respondents choose them as supportive when accounted the votes of both 'supports' and 'supports strongly' categories.

The factors such as Decision making, Efficiency in procurement, Good governance, Data reliability & accuracy, Transparency & equal treatment, Regulation & support by CPTU, Knowledge, experience & skill, Secure and interoperable platform, Access to e-GP free and unrestricted, Performance monitoring, Government legislation, Telecommunication and internet, and Reporting capability won over 70% of votes. However, for Performance monitoring, Government legislation and Reporting capability 20% of the respondents in each case kept them neutral. Considering this significance, these factors are ranked to medium influence category and the remaining factors mentioned are categorized to have high influence. Another factor 'Potential for mobile phone e-GP' which relates the possibility of mobile phone use for e-GP operation suggests having influence to medium

category as it gained 67% supports. For three factors Level of visibility (67%), Document transmission (67%) and Infrastructure with appropriate hardware and software (60%), 20% of the respondents were seen neutral in each case. Therefore they are categorized to have some influence.

A vast number of respondents (25% to 34%) did not vote keeping them neutral for other factors - Provision for training, Available time to use e-GP, Top management support, Nature of organisation or procurement, Length of procurement cycle, Control over budget & purchasing, and Software updating. These are considered as dubious to their direction of influence the e-GP and dropped from the influence list.

Several factors were found to be reactive to e-GP, among those Cash transaction, Influence of vested interests, Leakage/disclosure of information, Cartel, corruption, fraudulent, collusion or coercive activity, End user resistance, and Fear and inertia of organisation were supported by 56% to 65% respondents as they oppose e-GP. These are categorized to have medium influence. However, the factors such as Leakage/disclosure of information, Cartel, corruption, fraudulent, collusion or coercive activity, End user resistance might create serious consequences to procurement operations and so procurement professionals should be very careful of these factors.

Human intervention and Digital divide were opposed by 58% and 47% respondents respectively, but 23% of respondents for earlier factor and 20% of respondents for later factor were neutral. Due to this uncertain condition, they are ranked to have lower influence.

Other factors used in the questionnaire such as Manager pursue functional targets, Power interruption & failure, Supplier integration, and Supplier number were identified as they oppose the e-GP, but many respondents (up to 55%) were neutral. This significance drove them out of the decision regarding their position. However, if manager pursue functional targets or incidence to power interruption & failure occur, then e-GP operation must suffer seriously. So influence of these factors should not be ignored.

Two contesting sets of factors among which one is active in favour and the other is working against e-GP in Bangladesh are summarized. Figure-7 shows these counteracting factors of e-GP with their degree of influence. It shows that factors such as Leakage/disclosure of information, Influence of vested interests, Cash transaction, and Cartel corruption fraudulent collusion or coercive activities are most detrimental to the e-GP process.

Table-14: Set of Factors For and Against e-GP

Factors in Favour	Factors Against
Decision making Level of visibility Good governance Reporting capability Government legislation Document transmission Performance monitoring Efficiency in procurement Data reliability & accuracy Execution of law and order Knowledge, experience & skill Regulation & support by CPTU Potential for mobile phone e-GP Transparency & equal treatment Telecommunication and internet Secure and interoperable platform Access to e-GP free and unrestricted Infrastructure with appropriate hardware and software	Digital divide Cash transaction End user resistance Human intervention Influence of vested interests Fear and inertia of organisation Leakage/disclosure of information Cartel, corruption, fraudulent, collusion or coercive activity

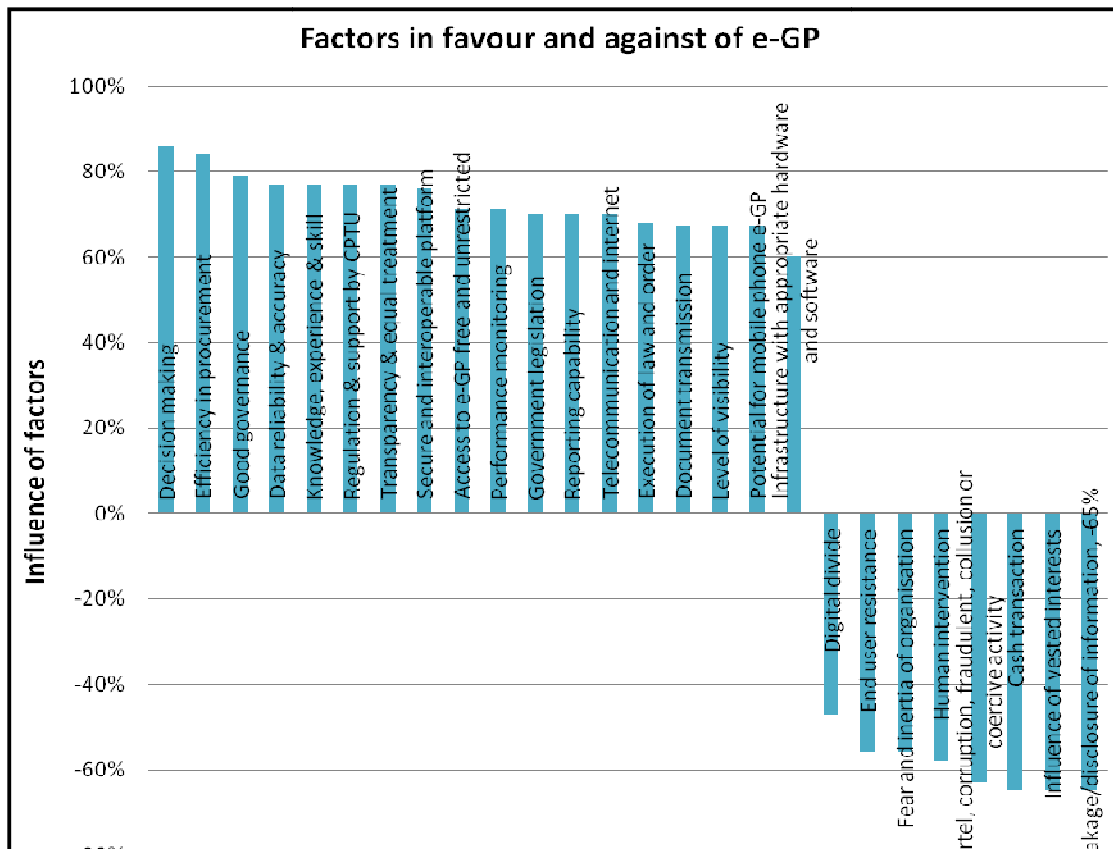


Figure-7: Factors in favour and against of e-GP

3.7 Regression Modeling

The regression of original model summary showed a good fit and 73.5% of the variations in factors of influences on e-GP could be explained by this model. However, a negative adjusted R Square indicates the presence of some problems in the model. Also the analysis of variance reported a low level of F statistic, indicating that the variance were by chance. The coefficients indicated that there were a number of predictors in the model. There were several variables with significant coefficients, indicating that those variables contribute much to the model. The standardized coefficients could help to determine the relative importance of the significant predictors. Among the predictors,

Influence of vested interests, Supplier number, Secure and interoperable platform, Infrastructure with appropriate hardware and software, Execution of law and order, Cash transaction, Access to e-GP free and unrestricted, Manager pursue functional targets, Transparency & equal treatment, End user resistance, Fear and inertia of organisation, Data reliability & accuracy, Human intervention, and Software updating contribute to the model significantly because of their larger absolute standardized coefficients.

For many predictors, the values of the partial and part correlations were dropped significantly from the zero-order correlation which means that much of the variance in one predictor is explained by multiple variables. Thus the coefficients show that there are the possibilities of multicollinearity problem. Moreover, the small tolerances show that about 90% of the variance in a predictor can be explained by the other predictors. With small tolerances, there were high multicollinearity and the standard error of the regression coefficients could be inflated. As variance inflation factor (VIF) greater than 2 is usually considered problematic and the smallest VIF in the table is 5.513 the data set required further treatment.

Moreover, coefficient table contained the collinearity diagnostics which reflect considerable problems with multicollinearity in the model relationship. As there were many eigenvalues of very low, the predictors indicate highly inter-correlated in which small changes in the data values may lead to big changes in the estimates of the coefficients. Almost 90% of the condition indices were greater than 15 (serious problem

when greater than 30); thus model dimensions were found problematic in terms of collinearity.

Z scores treatment of the independent variables gave the eigenvalues improved relative by two-third of the factors to the original model; the problems of condition indices were almost eliminated. However, the collinearity statistics reported in the coefficients table remained similar as before. This can be explained by the fact that the z-score transformations do not change the correlation between two variables, where z scores are standardized values of the variables.

Using the Factor Analysis, a set of uncorrelated independent variables that fits the dependent variable and original independent variables can be created. Factor Analysis is used for data reduction or structure detection. The purpose of data reduction is to remove highly correlated variables from the data file; and structure detection examines the underlying relationships between the variables.

Using the factor scores, a linear regression on factor component scores resulted a far better model fit (Tables-15 & 16) than that of original predictors. The collinearity statistics also became better and the factor scores were uncorrelated (Table-25). Analysis of variance shows that the factors of e-GP significantly influence it.

Table-15: ANOVA (Dependent Variable: LogOverall) Factor Score

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	3.316	20	0.166	26.038	0.000
Residual	0.178	28	0.006		
Total	3.494	48			

Table-16: Model Summary (Dependent Variable: LogOverall) Factor Score

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.974	0.949	0.913	0.07980

Stepwise methods are also convenient to focus on a smaller subset of predictors. It selects models based solely upon statistical merit; however it may choose predictors that have no practical significance. Thus the new model explained the predictors more favorably compared to that of the previous model. The adjusted R-square statistics became nearly identical in just 6 iterations (Table-17). Almost 93% of the variations in the factors of influences on e-GP now are explained by this model.

Table-17: Model Summary (Dependent Variable: LogOverall) Iterations

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.887 ^a	0.787	0.783	0.12579
2	0.933 ^b	0.871	0.866	0.09895
3	0.949 ^c	0.900	0.894	0.08803
4	0.957 ^d	0.916	0.909	0.08154
5	0.964 ^e	0.929	0.921	0.07592
6	0.967 ^f	0.936	0.927	0.07304

The stepwise algorithm chose the factor scores 15, 1, 3, 9, 2, and 7 as predictors (Table-29 in Annexure-3). The rotated component matrix in the Factor Analysis output (Table-30 in Annexure-3) gives results below:

- The fifteenth component (factor scores) loads more to Potential for mobile phone e-GP. Since the regression coefficient is positive for factor score 15, the mobile application of e-GP is potential to its higher use.
- The first component (factor scores) loads strongly on eight negative factors such as Influence of vested interests, Digital divide, End user resistance, Human intervention, Fear and inertia of organisation, Leakage/disclosure of information, Power interruption & failure, Manager pursue functional targets, and Cash transaction. Since

the regression coefficient is positive for factor score 1, the higher influences of these factors can lead to lower uses of e-GP.

- The third component loads most strongly on Supplier number, Supplier integration, Software updating, and Top management support. The positive coefficient for factor score 3 suggests that Suppliers motivation and involvement are expected to have higher e-GP usage.
- The ninth component loads most strongly on Efficiency in procurement and Document transmission. Since the regression coefficient is positive for factor score 9, this suggests that greater efficiency in procurement are expected to have higher use of e-GP.
- The second component loads most to seven factors i.e. Good governance, Performance monitoring, Transparency & equal treatment, Decision making, Secure and interoperable platform, Government legislation, Top management support, Potential for mobile phone e-GP, and Infrastructure with appropriate hardware and software. Since the regression coefficient is positive for factor score 2, suggesting overall governance in governmental procurement systems are expected to have higher use of e-GP.
- The seventh component loads most strongly on Regulation & support by CPTU along with Decision making and Data reliability & accuracy; the component loading combined with the negative coefficient for factor score 7 suggests that regulations are understood as deterrent, public sector decision making and data reliability is also poor. However, supportive regulation, prompt decision making and reliable data flow can impact positively.

Table-18: Coefficients of Factor Components

Factor scores	Factors	Co-efficient	t	Significance
15	Potential for mobile phone e-GP	0.748	13.754	.000
1	Influence of vested interests, Digital divide, End user resistance, Human intervention, Fear and inertia of organisation, Leakage/disclosure of information, Power interruption & failure, Manager pursue functional targets, and Cash transaction	0.291	7.453	.000
3	Supplier number, Supplier integration, Software updating, and Top management support	0.154	3.903	.000
9	Efficiency in procurement and Document transmission	0.189	3.480	.001
2	Good governance, Performance monitoring, Transparency & equal treatment, Decision making , Secure and interoperable platform, Government legislation, Top management support , Potential for mobile phone e-GP , and Infrastructure with appropriate hardware and software	0.114	2.901	.006
7	Regulation & support by CPTU, Decision making , and Data reliability & accuracy	-0.083	-2.111	.041

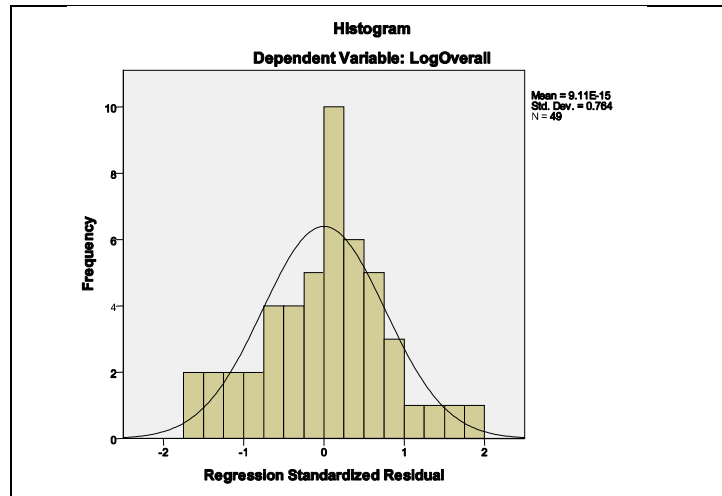


Figure-8: Histogram of Dependent Variables (Modified data)

The histogram of modified data implies acceptance of the hypothesis of normality.

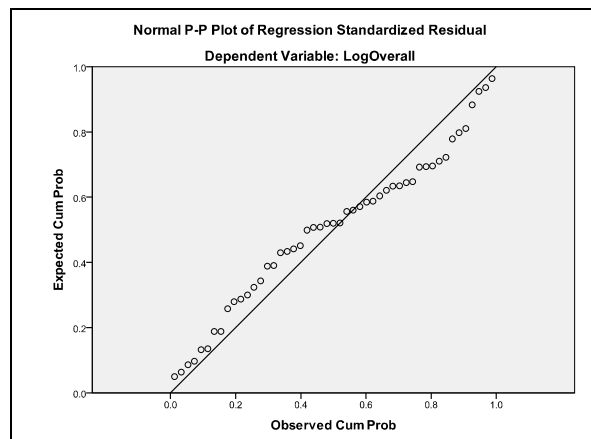
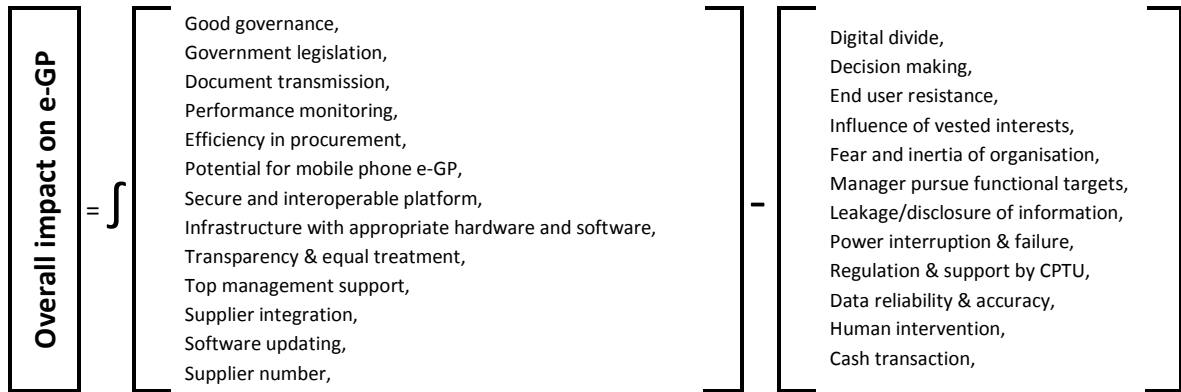


Figure-9: Normal P-P Plot with Modified Data

The model combined by the matrix of factors in which 13 were found prominent in favour of, and 12 were against the e-GP stands in the following figure.



Chapter Four: Discussion on Results

4.1 Empirical Results

Due to functional presence of the respondents in a procurement environment they possess a good knowledge of practicing procurements and had skills in e-GP. They took about 14 minutes time to respond the questionnaire and spent 18.5 seconds for each choice which reflects the length and complexity of the questionnaire design was reasonable and suitable.

The respondents formed a good sample and their inputs were quite useful. Bangladesh government intends to expand practicing e-GP and simultaneously giving training to the users. Some respondents were seen to use e-GP even they did not get relevant trainings. This shows an influence of the e-GP that developed around government procurement environment and attracts the interests of users. Their proactive role to capture the knowledge of e-GP undoubtedly helps the progressing of paperless tendering.

Within the e-Tendering process, procurement legislation in Bangladesh allows more roles to the procuring entity and committee members. According to the results of the research work, about three-fourth of the respondents were from procuring entities and committee members which show a fair quality of responses although few responses were seen lack of knowledge or proper concentration in making responses. The questionnaire did not ask for the level education or background of the respondents; so this remains a grey to justify the reasons of such responses.

Although most of the respondents were registered with e-GP (72.6%), some of them were lacking in use of e-GP themselves, rather they let others to use in favour of them. This poses the risks of misuse of the system due to unauthorized access which could cause litigation as well as indiscipline in the procurement process. So this is contradictory to the government's intention to fair service delivery and governance.

Some respondents use e-GP even though they were not registered with the system; part of them was users of e-GP training suit – one respondent was the trainer of e-GP for example. There is an argument in favour of accessing e-GP for others is that some organisations deal with a huge number of procurements, say RHD and LGED. The role of HOPE in such case is usually performed by delegation as 'Approving Authority' however the HOPE needs to carry out some critical role which sometimes may require to allow the others for using e-GP to accelerate the service delivery process, however, such attempt requires a higher degree of control.

Statistical results give a clear indication that the listed factors have a great influence on e-GP. So it became essential to look for the factors which were active to favour or oppose the system. Based on the perceived choice of the respondents a clear set of counteracting factors was developed considering the level of choice and silence as they could influence the result if the choice was otherwise.

The factors of influence such as Decision making, Efficiency in procurement, Good governance, Data reliability & accuracy, Transparency & equal treatment, Regulation & support by CPTU, Knowledge, experience & skill, and Secure and interoperable platform were most supportive their efficient utilization requires dealing them careful and wisely in

order to maximise the benefits of e-GP. Provision for training, motivating and incorporating relevant factors in the policy and practice, also reinforcing by the senior officials can maximise the benefits.

As the factors such as Leakage and disclosure of information, Influence of vested interests, Cash transaction, and Cartel corruption fraudulent collusion or coercive activities have damaging role to e-GP, they need careful deals in minimise the harm. This also needs training and motivating with strong defense by the authority. The control measure against leakage and disclosure of information is considered under Section 64 of PPA 2006 and Rule 127 of PPR 2008, but only legal provision may not suffice and it requires something more role from the appropriate authority. A strict provision of technology is essential which would prevent accessing tendering information before deadline of public disclosure, opening the tenders for example. Incidence investigation and sharing, internal policing, whistle blowing also can help to safeguard the system and benefit all. Influence of vested interests can be counteracted by the active support from outside the organisation structure; political consensus can be a backing for example. Minimizing cash transaction using secured online banking and tracking any cartel, corruption, fraudulent, collusion or coercive activities can help e-GP a lot. The procuring entity, committee members and HOPE have a great role in this respect.

Implementing good governance in the organisation, using supportive human resource and ensuring anti-corruption and social safeguard policy could promote a favourable environment for e-procurement especially in public sector of Bangladesh.

4.2 Statistical Analysis

R Square value of the original regression model 0.735 agrees that the model fit, however the F-statistic was low. The coefficients of the model produced significant coefficients of a number of predictors and several variables, thus these variables were found to have considerable influence on e-GP. The standardized coefficients show the relative importance of significant predictors. Many predictors had larger absolute standardized coefficients and so contribute the model more. There were the issues of correlations and multicollinearity but various techniques such as factor analysis, especially the stepped one resolves to a distinctive outcome by giving better model fit (R-squared 0.949), a good F statistic (26.038) and other indices.

Evidence shows that use of mobile phone has potential for e-GP (Table-19) and found to be the main factor. The mobile phone based e-GP would gain more acceptance of the system and increase the speed of operation. The users might find it easy to use by accessing from anywhere. Mobile phone apps for e-GP could make the difference.

Table-19: Mobile Phone based e-GP

SN	Variables	Factor loading
1	Potential for mobile phone e-GP	0.484

Some opposing factors have serious impacts on e-GP (Table-20). These appear to be the second most influencing factors of e-GP. Vested interests such as politicians, bureaucracy and local elites generally wish to drive the system in their line of interests whatever be the provisions in legal term; e-GP is not the different one. Digital divide is supposed to be a major cause behind the failures of e-service implementation in public sector which can

be minimised through encouraging technology education and making easy access to the electronic wide area network system. End user resistance, Human intervention, and Fear and inertia of organisation are closely related human factors that generally hinder the system to operate smoothly.

Table-20: Vested interests, Digital divide, Attitude of individuals, Organisational culture, Ethical values and Energy infrastructure

SN	Variables	Factor loading
1	Influence of vested interests	0.886
2	Digital divide	0.839
3	End user resistance	0.811
4	Human intervention	0.803
5	Fear and inertia of organisation	0.798
6	Leakage/ disclosure of information	0.718
7	Power interruption & failure	0.718
8	Manager pursue functional targets	0.668
9	Cash transaction	0.442

The most detrimental element is the leakage and disclosure of information, the others are managers pursue for their functional targets, and intention to make transactions in cash which can also be characterized as poor human quality. Power interruption & failure is another factor that also hinders the e-GP system which can be improved by better service delivery in the power sector.

Table-21: Suppliers, Systems Support and Top Management Role

SN	Variables	Factor loading
1	Supplier number	0.933
2	Supplier integration	0.858
3	Software updating	0.489
4	Top management support	0.432

Table-21 shows the third group of influencing factors that depicts Supplier is the key to source the requirements that needed for any system to operate. The more suppliers the e-GP could attract, the procuring entity would be able to source by switching the supplier and e-GP would get more vibrant. However, having the quality suppliers and retaining them is important. Updating the systems software, and Top management support also influence the e-GP positively.

Table-22: Efficient System Development

SN	Variables	Factor loading
1	Efficiency in procurement	0.857
2	Document transmission	0.511

As the e-GP system gets efficient and document transmission becomes secured and easy, use of e-GP could potentially be wider and speedier. So the e-GP provider organization CPTU should play appropriate role to ensure the operational efficiency and faster transmission of documents.

Table-23: Good Governance and Transparency with Support from Management and Technology

SN	Variables	Factor loading
1	Good governance	0.830
2	Performance monitoring	0.754
3	Transparency & equal treatment	0.734
4	Decision making	0.692
5	Secure and interoperable platform	0.687
6	Government legislation	0.650
7	Top management support	0.550
8	Potential for mobile phone e-GP	0.428
9	Infrastructure with appropriate hardware and software	0.401

Ensuring good governance and transparency (Table-23) could benefit e-GP as expected. Nonetheless support from top management and availability of a good operational infrastructure also could accelerate the higher use of e-GP. Government has a vital role in this respect. Political, business and social climate as a whole are also important.

Table-24: Red Tape Regulation and System Security

SN	Variables	Factor loading
1	Regulation & support by CPTU	0.831
2	Decision making	0.476
3	Data reliability & accuracy	0.471

The factors regulation is not expected in general; however, a soft regulation, prompt decision making and data reliability may influence in favouring e-GP.

4.3 Summary of the Results

From the results above, a comprehensive set of driving and restraining factors was developed which can be seen below.

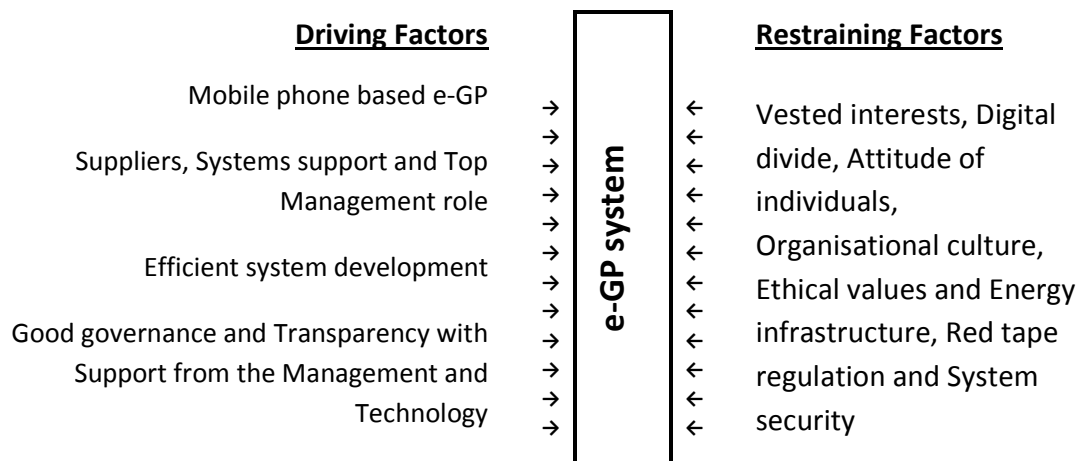


Figure-10: The Comprehensive Set of Factors For and Against e-GP

Above result supports great influences of a number of factors of e-GP. Among them, mobile phone based e-GP (for example, mobile phone apps) along with secure and

interoperable platform might offer 'touch and play' benefits to its users and could boost the use of e-GP in Bangladesh.

Suppliers are the valuable player in this system that requires to develop by facilitating and getting them involved. Systems support by software updating and network maintenance has a great role to run the e-GP system; without this the users may go back to paper-based system and e-GP might lose reliability. Top management's role can make the difference in promoting e-GP usage. LGED is an example of e-GP operation considering the scale of usage that has 716 PEs, most of them at upazila level, and achieved publishing 10,932 (62.8%) and finalizing 6,273 (62.6%) e-Tenders/Proposals. Thus performance of e-GP largely depends on the performance of LGED. This could happen mostly due to the strong backing by its top management.

Efficient system development is possible as e-GP is based on electronic technology. With immense development and expansion of ICT globally, e-GP has the opportunity to utilize it and prove itself as efficient in procurement service delivery. This study supports the proposition.

Good governance and transparency is at forefront of the procurement reform and establishment of e-GP system. With Support from management and having technological provisions this goal can be achieved easily. Supportive bureaucracy and system security is another factor that also helpful to boost up the e-GP.

Concern about ethical breach by leakage and disclosure of bidding information is addressed by the PPA 2006 Section 64 and PPR 2008 Rule 128. However, there is chance of offense by the parties involved as a result of the study which supports the argument

that only regulatory provisions are not sufficient to tackle such behaviour. Along with ethical declaration, some other provisions must be considered such as investigation, sharing the incidence, punishment and reward, whistle blowing, technological provision so that none can access the bidding information before deadline of submission of tenders.

Digital divide is a barrier to economic opportunities, especially for least developing countries like Bangladesh which needs to bridge as soon as possible. ICT sector is believed to have tremendous potential for poverty eradication and socioeconomic advancement. Bangladesh has remarkable progress in accessing ICT and their application, however, broadband deployment not kept pace with the world so made the progress, resulting in continuing gap in digital access. As the appeal of smart phones grows in Bangladesh, people can access the Internet more through mobile devices that call for greater focus on wider use and the full involvement of the Government, subsidizing the sector for example. However, there are challenges in promoting ICT as an enabler for promoting development.

Understanding the need and potential benefit of e-GP system can reduce fear and inertia of the user organisations. Communicating clear vision to every stages of the organization can help in this regard. Motivation by the superior executives, also by the members of the board through inclusion the vision in policy documents and using it as a slogan of the organization can overcome such fear and inertia.

Media news shows that Public Works Department official in Khulna (Annexure-5) was unwilling to use e-GP which is an example of end user resistance that is experienced as

changes in traditional method. Change leader has a great role to overcome such reactions. Advance information that demands loyalty of the officials to comply with the requirements of e-GP implementation is in place. However, provision of motivation and extensive training as well as involving the users well ahead and getting feedback can improve such resistances.

The vested interests (politicians, bureaucrats and local elites for example) in least developed countries are seen to be prominent and against implementation of a reform, even there are legal provisions. E-GP is also influenced by those as which is another output of the research that needs to address properly so that those do not hinder the e-GP process to function effectively. Involvement of politicians, bureaucrats and local elites with e-GP process and attempting to motivate them and a strong policy leadership can help to countervail the problem.

In terms of research questions, section 1.5 responds the first question; section 4.3 gives solution of the last question and the other questions regarding the factors of influence are the main work of this research which is covered mainly by the Chapter Three.

Chapter Five: Conclusion and Recommendations

5.1 Conclusions

This research reveals that e-GP is greatly influenced by facilitating through technology and infrastructure in place, maintaining of efficient system management, having support from top management, availability of supportive bureaucracy and overall ensuring good governance and transparency. The tenderers/ suppliers are important parties in influencing the system that needs to develop and maintain for better outcome of the procurement.

It is also highly influenced by the vested interests, digital divide in the society, individual's attitude to the system, organisational culture, ethical values and efficient energy infrastructure. However, strong control of ethical malpractice such as leakage and disclosure of bidding information, minimizing digital divide, removing fear and inertia of the user organisations, assuring the end users, and managing the influence of vested interests are essential for a well functioning e-GP. The counter acting forces must be managed in order to reap the benefits of enhanced governance and maintain a sustainable procurement system.

Government of Bangladesh, especially CPTU has a considerable role to enhance the promotional factors of e-GP as well as to treat the counteracting issues such as dealing with the vested interests and ensuring the demand management in power supply so that e-GP can be operational and be uninterrupted.

The evidences found as a result of the study could help better understanding and prediction of procurements issues. The findings are expected to be useful to the planners and policy-makers of the country to improve the e-government procurement processes by adopting appropriate measure and ensure collaborative and win-win business environment in ongoing and future e-government applications in Bangladesh. As the socio-political and economical conditions challenge the public procurement environment continuously, assessments of factors of influence on e-GP should also be reviewed and updated on a regular basis to ensure its incremental effectiveness.

Finally, the research outcome shows that it responds the research questions appropriately and meets the requirements of the objectives sufficiently.

5.2 Recommendations

A good management strategy is critical to success of e-GP. As the best practice e-procurement system, e-GP must identify the barriers and opportunities. The barriers may be specific to procurement process, in the organisation itself or in existing communication channels. The presence of favoring factors as well as counteracting factors of e-GP demands the enhancement of potentials of favoring factors and managing the odds.

Based on this research, following actions are recommended to further step forward the e-GP system:

- Develop mobile phone based apps and offer user friendly operation for its users;
- Mechanisms are developed that suppliers get encouraged more to use the system;

- Top executive in the organisations play a lead role to keep pace of growth in transforming procurement system to paperless electronic option;
- Continued systems support and ensure system security so that e-GP operation are hindered; also keep the platform interoperable by providing a good infrastructure utilizing skilled personnel; the technology should keep pace of global changes;
- Ensure good governance and transparency in procurement environment; also make support from the top management available; and bureaucracy should be supportive to need of the system flexibly;
- Effective control of leakage and disclosure of bidding information through technological provision as well as proper administration and ethical practice;
- Implementation of a communication plan for stakeholders to remove fear and inertia of the user organisations and assure the end users;
- Managing the influence of vested interests by involving them in steering committees and by communicating and educating;
- Promote digital society and thus minimize the digital division;
- Review and update the set of factors of influence on e-GP to ensure its incremental effectiveness;
- Future studies may consider inclusion of more personal attributes such as education, sex etc.

The authority may consider above recommendations. While the role of leadership is vital in achieving the goals and bringing about collective commitment, management should ensure availability of implementation plan, training program, stakeholder management,

dealing with the barriers to e-GP and several other organizational aspects as mentioned. Without this, governance in procurement especially the e-GP might suffer.

5.3 Limitations

Scope of the research work on e-GP is very wide that could carry activities to the quantifying its overall impacts on economy as a whole. However, the prevalent factors, such as available time, finance resources, human factor and requirement of the degree governs the boundary of the work. Thus scope of the work was limited to determination of for and against metrics around e-GP in Bangladesh based on their level of influence from user perspectives. The shorter period of time also limits access to appropriate resources and to interact wider range of stakeholders about the subject matter. Also there are only a few research works on e-GP in Bangladesh context and so advances in this field are yet to make.

Another limitation is the survey itself – the respondents were mainly the e-GP users; wider range of stakeholder opinion could result a greater variation in outcome. Moreover, the method of survey was electronic, the understanding of the respondents could not be realized well which is possible in face to face interview; also the queries of the respondents could not be clarified and hence few responses in the survey might be inappropriate. The questionnaire was limited to choice in its main part, the explanations or reasons of respondent's choice were not explained; even the potential factors were not elaborated. If these shortcomings could overcome, this research work could give a clear guidance to its readers especially the policy makers, researchers and practitioners.

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Appendices

Appendix-1: The Questionnaire

Factors Influencing Electronic Government Procurement (e -GP) in Bangladesh

1. Are you a registered user of e-GP in Bangladesh?

Yes

No

Other (please specify)

2. Which one is your role or function in e-GP? Mention your main role.

HOPE

Approving authority

Procuring entity

Bank official

TOC/POC member

TEC/PEC member

Contractor

Consultant

Other (please specify)

3. Have you got training on procurement?

Yes

No

If yes, duration (days):

4. Have you got training on e-GP?

Have you got training on e-GP? Yes

No

If yes, duration (days):

5. Who do use e-GP for you?

Myself

- My office staff
- Tender inviting office
- Committee member
- Officers under me
- Other (please specify)

6. What is the level of overall impact due to the presence of influencing factors of e-GP in Bangladesh? (List available below Q.9)

<input type="checkbox"/> No impact	<input type="checkbox"/> Moderate impact	<input type="checkbox"/> Medium impact	<input type="checkbox"/> High impact	<input type="checkbox"/> Heavy impact
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7. How long experience do you have in public procurement?

- Less than 5 years
- 5 to 10 years
- 10 to 15 years
- 15 to 20 years
- Above 20 years

8. Please indicate your age band.

- Please indicate your age band. Less than 30 years
- 30 to 40 years
- 40 to 50 years
- 50 to 60 years
- Above 60 years

9. To what extent the factors of e-GP impact it's implementation in Bangladesh? Please RATE the factors according to their level of influence - supportive or not.

	Oppose strongly	Oppose	Neutral	Supports	Supports strongly
Access to e-GP systems is open, free, equal and unrestricted	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Available time to use e-GP	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cartel, corruption, fraudulent, collusion or coercive activity	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cash transaction	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Control over budget and purchase	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Regulation and support by CPTU	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Data reliability and accuracy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Decision making	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Digital divide	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Document transmission	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Efficiency in procurement	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
End user resistance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Execution of law and order	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fear and inertia of organization	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Government legislation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Good governance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Human intervention or interference	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Influence of vested interests	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Infrastructure with appropriate hardware and software	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Knowledge, experience and skills	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Leakage/ disclosure of information	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Length of procurement cycle	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Level of visibility	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Manager pursue functional targets	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Nature of procurement or organization	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Secure and interoperable platform	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Performance monitoring	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Potential for mobile phone e-GP	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Power interruption and failure	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Provision for training	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Reporting capability	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Software updating	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Supplier integration	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Supplier number	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Top management support	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Transparency and equal treatment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Telecommunication and internet	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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Appendix-2: Coding the Questionnaire

1. Are you a registered user of e-GP in Bangladesh? [1=Yes, 0=No]
2. Which one is your role/function in e-GP? [1= HOPE/Approving authority, 2= Procuring Entity, 3= Registered Bank user, 4=TOC/POC member, 5= TEC/PEC member, 6= Registered Contractor/ Supplier/ Consultant, 7= Other]
3. Have you got training on procurement? [1=Yes, 0=No] If yes, duration_days
4. Have you got training on e-GP? [1=Yes, 0=No] If yes, duration_days
5. Who do use e-GP for you? [1=Myself, 2=My office staff, 3=Officers under me, 4=Tender inviting office, 5= Committee member, 6= Other]
6. What is the level of overall impact due to the presence of influencing factors of e-GP in Bangladesh? [1= No impact, 2= Moderate impact, 3= Medium impact, 4= High impact, 5= Heavy impact]
7. How long experience do you have in public procurement? [1= < 5 years, 2= 5 ~ 10 years, 3= 10 ~ 15 years, 4= 15 ~ 20 years, 5= > 20 years]
8. Please indicate your age band: [1= < 30 years, 2= 30 ~ 40 years, 3= 40 ~ 50 years, 4= 50 ~ 60 years, 5= > 60 years]
9. To what extent the factors of e-GP impact its implementation in Bangladesh? Please RATE the factors below according to their level of influence. [1= Oppose strongly, 2= Oppose, 3= Neutral, 4= Supports, 5= Supports strongly]

Appendix-3: Tables

Table-25: Collinearity Diagnostics (Dependent Variable: Log Overall)

Model	Dimension	Eigenvalue	Condition index
1	1	35.073	1.000
	2	1.256	5.285
	3	.289	11.016
	4	.188	13.645
	5	.134	16.172
	6	.123	16.882
	7	.117	17.298
	8	.107	18.111
	9	.097	19.056
	10	.079	21.082

Table-26: Eigenvalue of the Model (z-scored)

Model	Dimension	Eigenvalue	Condition Index
1	1	11.632	1.000
	2	6.850	1.303
	3	2.635	2.101
	4	1.892	2.480
	5	1.745	2.582
	6	1.549	2.740
	7	1.258	3.041
	8	1.204	3.108
	9	.966	3.470
	10	.863	3.671
	11	.851	3.697
	12	.799	3.817
	13	.697	4.085
	14	.609	4.370
	15	.551	4.594
	16	.519	4.736

Table-27: Coefficients (Dependent Variable: LogOverall) Factor Score

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations			Collinearity Statistics		
	B	Std. Error	Beta			Zero-order	Partial	Part	Tolerance	VIF	
1 (Constant)	1.251	.011		109.748	.000						
REGR factor score 8 for analysis 3	-.021	.018	-.078	-1.198	.241	-.043	-.221	-.051	.430	2.325	
REGR factor score 11 for analysis 3	.028	.018	.103	1.562	.130	-.104	.283	.067	.423	2.367	
REGR factor score 18 for analysis 3	.000	.016	.000	-.008	.993	-.028	-.002	.000	.532	1.881	
REGR factor score 19 for analysis 3	-.018	.015	-.066	-1.156	.258	.037	-.213	-.049	.567	1.763	
REGR factor score 20 for analysis 3	.028	.013	.103	2.105	.044	.004	.370	.090	.754	1.327	
REGR factor score 1 for analysis 4	.075	.012	.276	6.186	.000	.287	.760	.264	.913	1.095	
REGR factor score 2 for analysis 4	.034	.012	.125	2.911	.007	.121	.482	.124	.982	1.019	
REGR factor score 3 for analysis 4	.037	.012	.137	3.098	.004	.174	.505	.132	.925	1.081	
REGR factor score 4 for analysis 4	-.004	.013	-.014	-.279	.782	-.001	-.053	-.012	.748	1.336	
REGR factor score 5 for analysis 4	-.018	.013	-.068	-1.373	.181	-.081	-.251	-.059	.751	1.331	
REGR factor score 6 for analysis 4	-.024	.013	-.089	-1.888	.069	-.086	-.336	-.081	.819	1.221	
REGR factor score 7 for analysis 4	.026	.013	.095	1.975	.058	.060	.350	.084	.788	1.269	
REGR factor score 8 for analysis 4	.027	.014	.099	1.920	.065	.055	.341	.082	.687	1.455	
REGR factor score 9 for analysis 4	.011	.012	.041	.920	.366	.071	.171	.039	.903	1.107	
REGR factor score 10 for analysis 4	.016	.012	.058	1.255	.220	.039	.231	.054	.851	1.175	
REGR factor score 11 for analysis 4	-.002	.013	-.006	-.127	.900	.034	-.024	-.005	.750	1.334	
REGR factor score 12 for analysis 4	.008	.012	.031	.678	.503	.032	.127	.029	.888	1.126	
REGR factor score 13 for analysis 4	.248	.012	.920	20.497	.000	.880	.968	.875	.904	1.106	
REGR factor score 14 for analysis 4	-.017	.016	-.063	-1.089	.286	.004	-.202	-.046	.540	1.853	
REGR factor score 15 for analysis 4	.002	.017	.008	.133	.895	-.003	.025	.006	.464	2.154	

Table-28: Coefficients (Dependent Variable: LogOverall) Stepwise

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	1.251	.018		69.621	.000
REGR factor score 15 for analysis 3	.239	.018	.887	13.185	.000
2 (Constant)	1.251	.014		88.507	.000
REGR factor score 15 for analysis 3	.240	.014	.888	16.778	.000
REGR factor score 1 for analysis 1	.078	.014	.290	5.473	.000
3 (Constant)	1.251	.013		99.480	.000
REGR factor score 15 for analysis 3	.240	.013	.888	18.858	.000
REGR factor score 1 for analysis 1	.079	.013	.292	6.197	.000
REGR factor score 3 for analysis 3	.046	.013	.171	3.621	.001
4 (Constant)	1.251	.012		107.407	.000
REGR factor score 15 for analysis 3	.207	.016	.767	12.691	.000
REGR factor score 1 for analysis 1	.079	.012	.291	6.679	.000
REGR factor score 3 for analysis 3	.043	.012	.158	3.592	.001
REGR factor score 9 for analysis 1	.048	.016	.176	2.908	.006
5 (Constant)	1.251	.011		115.360	.000
REGR factor score 15 for analysis 3	.204	.015	.757	13.442	.000
REGR factor score 1 for analysis 1	.079	.011	.291	7.170	.000
REGR factor score 3 for analysis 3	.041	.011	.151	3.698	.001
REGR factor score 9 for analysis 1	.049	.015	.183	3.242	.002
REGR factor score 2 for analysis 1	.031	.011	.113	2.785	.008
6 (Constant)	1.251	.010		119.909	.000
REGR factor score 15 for analysis 3	.202	.015	.748	13.754	.000
REGR factor score 1 for analysis 1	.079	.011	.291	7.453	.000
REGR factor score 3 for analysis 3	.041	.011	.154	3.903	.000
REGR factor score 9 for analysis 1	.051	.015	.189	3.480	.001
REGR factor score 2 for analysis 1	.031	.011	.114	2.901	.006
REGR factor score 7 for analysis 1	-.022	.011	-.083	-2.111	.041

Table-29: ANOVA (Dependent Variable: LogOverall) Stepwise

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2.751	1	2.751	173.832	.000 ^a
	Residual	.744	47	.016		
	Total	3.494	48			
2	Regression	3.044	2	1.522	155.448	.000 ^b
	Residual	.450	46	.010		
	Total	3.494	48			
3	Regression	3.146	3	1.049	135.292	.000 ^c
	Residual	.349	45	.008		
	Total	3.494	48			
4	Regression	3.202	4	.800	120.398	.000 ^d
	Residual	.293	44	.007		
	Total	3.494	48			
5	Regression	3.247	5	.649	112.662	.000 ^e
	Residual	.248	43	.006		
	Total	3.494	48			
6	Regression	3.270	6	.545	102.178	.000 ^f
	Residual	.224	42	.005		
	Total	3.494	48			

a. Predictors: (Constant), REGR factor score 15 for analysis 3

b. Predictors: (Constant), REGR factor score 15 for analysis 3, REGR factor score 1 for analysis 1

c. Predictors: (Constant), REGR factor score 15 for analysis 3, REGR factor score 1 for analysis 1, REGR factor score 3 for analysis 3

d. Predictors: (Constant), REGR factor score 15 for analysis 3, REGR factor score 1 for analysis 1, REGR factor score 3 for analysis 3, REGR factor score 9 for analysis 1

e. Predictors: (Constant), REGR factor score 15 for analysis 3, REGR factor score 1 for analysis 1, REGR factor score 3 for analysis 3, REGR factor score 9 for analysis 1, REGR factor score 2 for analysis 1

f. Predictors: (Constant), REGR factor score 15 for analysis 3, REGR factor score 1 for analysis 1, REGR factor score 3 for analysis 3, REGR factor score 9 for analysis 1, REGR factor score 2 for analysis 1, REGR factor score 7 for analysis 1

Table-30: Rotated Component Matrix (Factor Analysis)

	Component						
	1	2	3	5	7	9	15
Zscore: Cash transaction	.442	-.158	.119	.656	-.059	-.063	-.155
Zscore: Regulation & support by CPTU	-.308	.063	.115	-.117	.831	.117	-.009
Zscore: Decision making	.056	.692	-.048	.047	.476	.192	.075
Zscore: Digital divide	.839	.096	.197	.032	.115	.025	.023
Zscore: Document transmission	.182	.231	-.240	.279	.257	.511	.193
Zscore: Efficiency in procurement	.118	.281	.156	.022	.095	.857	-.030
Zscore: End user resistance	.811	.095	-.018	.130	.023	.135	-.050
Zscore: Fear and inertia of organisation	.798	-.055	-.087	.160	-.016	.050	.296
Zscore: Government legislation	-.066	.650	.381	-.134	.170	.200	.183
Zscore: Good governance	.060	.830	.091	-.040	-.173	-.010	.179
Zscore: Human intervention	.803	-.025	-.049	.071	-.413	.091	-.134
Zscore: Influence of vested interests	.886	-.079	-.176	-.022	-.273	.074	-.069
Zscore: Infrastructure with appropriate hardware and software	-.385	.401	.119	-.154	.232	.343	.141
Zscore: Leakage/ disclosure of information	.718	-.089	-.058	.338	.098	-.211	-.178
Zscore: Manager pursue functional targets	.668	.135	.162	.169	.048	-.052	-.110
Zscore: Performance monitoring	.049	.754	.193	.061	.018	.098	-.046
Zscore: Potential for mobile phone e-GP	-.272	.428	.212	-.316	-.001	.067	.484
Zscore: Power interruption & failure	.718	-.159	.047	.360	-.127	-.040	.269
Zscore: Software updating	-.325	.297	.489	-.320	.009	.119	-.026
Zscore: Supplier integration	-.014	.243	.858	.005	.030	.070	-.005
Zscore: Supplier number	.074	.114	.933	-.020	.049	.010	.030
Zscore: Top management support	-.194	.550	.432	.043	.181	.030	-.051
Zscore: Transparency & equal treatment	-.079	.734	.268	.058	.110	.157	-.244

Extraction Method: Principal Component Analysis.