

*Performance Evaluation of Procurement System in ICT
Industry: A Case Study.*

by
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August, 2018

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The thesis submitted to Department of Industrial and Production Engineering, Bangladesh University of Engineering and Technology (BUET), Dhaka, Bangladesh, in partial fulfilment of the requirements for the degree of Master of Industrial & Production Engineering.



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Certificate of Approval

The thesis titled “*Performance Evaluation of Procurement System in ICT Industry: A Case Study.*” submitted by Md. Delower Hossain, Roll Number: 0412082011, Session: April, 2012 has been accepted as satisfactory in partial fulfillment of the requirements for the degree of Master of Industrial & Production Engineering on 6 August 2018.

Board of Examiners

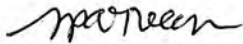


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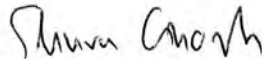


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It is hereby declared that this thesis or any part of it has not been submitted elsewhere for the award of any degree or diploma.

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Abstract

In integrated Supply Chain Management Procurement is one of the most important stages and has been the subject of extensive research in the recent literature. If procurement process runs smoothly then other process of Supply Chain will run smoothly. To monitor procurement process of a company, it is necessary to measure performance of it. And if it is observed performance time to time, then whole supply chain will be efficient and responsive as well. There are some key performance indicator (KPI) for measuring performance of procurement. In this paper, discussed performance evaluation of procurement in a typical ICT based company using some KPI, which can be beneficial to monitor and improve procurement performance.

A structural framework consists of three phases was designed to cover the study of ICT sector in Bangladesh, Sorting, selecting & ranked the KPI & finally evaluating the procurement performance against the KPI for a case study. The first phase was the study of ICT sector of Bangladesh through literature review. The second phase was an exploratory survey to select the KPI and the other phases were case study. In the second phase KPI selected through the implementation of Analytical Hierarchy Process of a case and the last phase offered a guideline to evaluate the procurement performance through a case study.

The designed framework consists of seven selected KPI (Key Performance Indicator) which came out after surveying among different companies engaged with the ICT business, with which we may able to measure procurement performance of a ICT company. Moreover after the evaluation of the performance of procurement against the important KPI, it may be ranked and analysed them by Design of Experiments (DOE).

As the key factors for KPI selection were geographically limited to one company and one country, implementing these to other geographical areas and industries may not be possible. But with a cross-validation of the framework would widen its applicability to other areas. The paper provides a framework that allows other researchers to manage upstream of any supply chains.

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Chapter-1

Introduction

Bangladesh has already entered into the information age where information regulates all types of activities and Information Communication Technology (ICT) industry is playing vital roles in that case (Kabir, 2012). These industries are characterized by volatile markets, short product life cycles and high product variety (Ferne, 2004). Sourcing finished goods and dispatching the right product in the right place at the right time is very difficult to maintain due to involvement of many different parties and the short lead time to supply & installation of networking products (Ferne, 2004). In integrated Supply Chain Management, Procurement is one of the most important stages (Van Wheel, 2005). And if it is observed performance time to time, then whole supply chain will be efficient responsive, and progress towards its predetermined objectives, identifies areas of strengths and weaknesses and decides on future initiatives (Amaratunga, 2002). Until an organization measures procurement performance, they will never know how well they are performing and why they should measure procurement performance.

In this study, the procurement performance evaluation through some Key Performance Indicator has focused as the success of a supply chain is highly dependent on procurement performance. In this aspect, the study firstly focused on the decision criteria that mean KPI selection (Batenburg, 2006). Secondly the performance of procurement has evaluated against the important KPI and ranked and analyzed them by Design of Experiments (DOE) (Hasin, 2007). Finally, a case study has done in ICT industries of Bangladesh for evaluating procurement performance.

1.1. Background and Rationale of the Study

Technology is the systematic application of scientific and other organized knowledge towards solving practical tasks (Azim, 2002). Digital Bangladesh is a political motto of the present government and it refers to a knowledge based and ICT-integrated country system, where people have access to information to get the desired public services in a swift and simple manner. An ICT integrated system, known as E governance, help to promote Good Governance in all sphere of life, which include effective, efficient, participatory, consensus, accountable, transparent, responsive, equitable, inclusive, and having effective law and order situation. ICT

supported service delivery system takes less time and people can get the services from anywhere of the country. It also seems like a form of decentralization.

Likewise, vision 2021 is a comprehensive plan where Bangladesh has been estimated as a mid income country by promoting of equitable, environment friendly, inclusive and socially sustainable pro-poor accelerated growth along with establishing a knowledge-based society. In accordance with this plan, the country people are expected to have excess to all types of public facilities within 2021, the year of the golden Jubilee of country's independence. The government has targeted ICT as the major driving force in this regard to create a SMART (simple, measurable, accountable, responsive and transparent) 'Digital Bangladesh'.

It is assumed that by 2021 Bangladesh will have a countrywide ICT network that will operate to ensure high speed information flow between the decision- centers where from instructions will be transmitted electronically to the action centers to make the intended actions happen. The goal is to accelerate a national decision-making process and to implement the decisions, monitor the performance of the government functionaries at all levels. But due to lack of practices of supply chain management strategies, more specifically procurement processes, there is a huge gap for integration between suppliers and buyers.

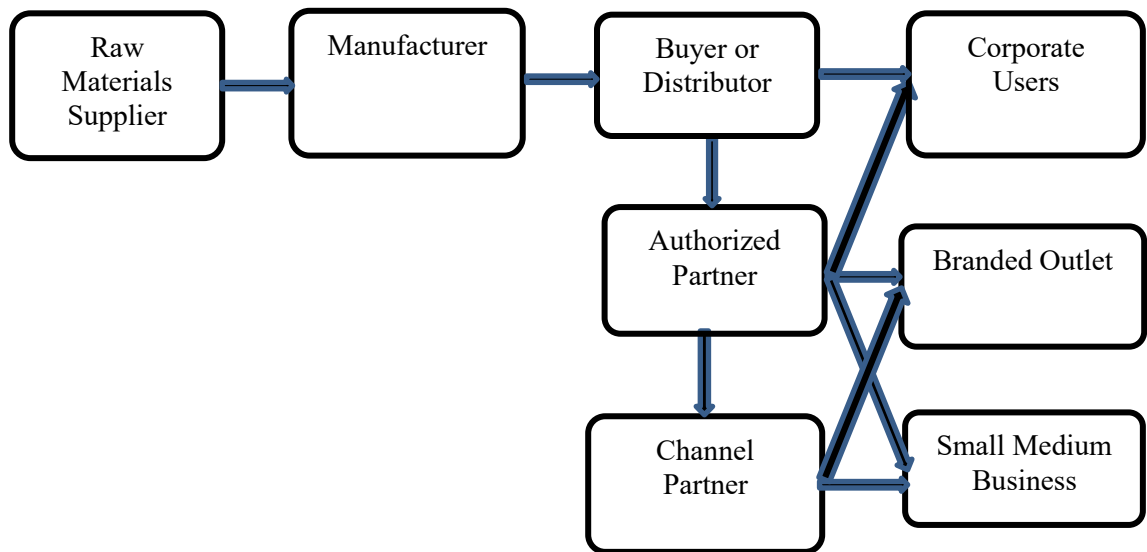


Figure -1: ICT Industries of Bangladesh in supply chain

The study focused on the performance of procurement of ICT industries of Bangladesh and trying to improve that performances by measuring those through some KPI considered and ranked them through survey.

1.2. Objectives of the study

The specific objectives of this study are:

- a) To select the Key Performance Indicator (KPI) for procurement performance evaluation with respect to ICT Industry.
- b) To evaluate procurement performance through a case study

The major possible outcome of this study is selecting the KPI which eventually evaluate the performance of procurement in ICT Industry.

1.3. Data

The study has done with the help of primary data and secondary data. Data those have been collected from the original source for a specific purpose are referred as primary data for that purpose. Data those have been collected for another purpose and being reused for a different specific purpose are referred as secondary data for that purpose. Both primary and secondary data can be either qualitative or quantitative. Qualitative data describe the characteristics, attributes, properties, qualities, etc. of an event or item. On the other hand the quantitative data are those, which can be numerically expressed or articulated attributes of an event or item. Both qualitative data and quantitative data are important for any research as they play complimentary role for each other. Such as trustworthiness of qualitative data supported by quantitative data and again quantitative data were explained by qualitative data.

1.3.1. Primary Data Source

The source of primary data is the concerned population and collection techniques are face to face interviews or discussions, phone interviews, radio communication, email exchange, and direct observation with members of the concerned sample of the population by the data collection team. The sequence of this study primarily focused on the secondary data and based on the secondary data the primary data were collected through the survey, interviews and expert opinions and these data treated as primary data this study.

1.3.2. Secondary Data Source

The source of Secondary data can encompass published research, internet materials, media reports, academic research, an agency or sector specific monitoring reports etc. The preliminary sources of secondary data for this study were a wide range of articles and proceedings paper from different internationally reputed journals. The secondary data of the study was mainly covered the different KPI selection criteria, their importance for the process.

Chapter-2

Literature Review

2.1. ICT Sector of Bangladesh

ICT is the backbone of any digital initiative. ICT covers the vast area of information technology, communication technology and the telecommunication technology. ICT is also a combination of physical backbone and intellect. Computer systems, network machineries, software, wire and wireless connectivity systems, broadcast hardware and many other hardware and accessories are the physical backbone. The trained human behind the backbone are the intellect. Digital Bangladesh is an Idea that includes the IT use for management, administration and governance to ensure transparency, accountability and answer-ability at all levels of society and state. To materialize the idea of digital Bangladesh, development of countrywide backbone and expected number of human re-courses are the basic needs.

Despite having 50 years of history the government has only from 1997 started the process of developing a national ICT strategy. In 2002 Bangladesh identified ICT as a "thrust sector" as it represents potential for quick wins in reforms, job creation, industry growth, improving governance and facilitating inclusion, and it has high spillover effects to other sectors. Today, in Bangladesh, the overall IT/ITES sector is valued at USD 650 million, with export claiming 39% (\$250 million) of that value. The overall IT/ITES industry has enjoyed a high growth rate of 40% over the last five (5) years and this trend is expected to continue.

Recognizing the economic advantages of this sector the government is formulating policies to utilize information technology innovations. The ICT sector has motivated entrepreneurs to gravitate towards this industry which provides better employment opportunities, opens new trade horizons and embarks on track of success through education and awareness.

IT companies have created a sizeable market space in service industries like telecommunications, retail and wholesale business, healthcare, education, publishing and real estate. The growth in the software industry has been driven by this growing IT automation demand in the domestic market. The impressive trends in software exports in recent years played a deterministic role as well. Bangladesh has made major strides in laying the groundwork for a diverse and successful outsourcing market, particularly in 2010 and 2011.

A new trend is the individual/group-based outsourcing, also known as freelancing. These are informal initiatives taken by young IT professionals and students to acquire clients through various on-line marketing channels.

Bangladesh's ICT sector is a glimmering example of what can be achieved if government's goodwill and a skilled workforce work together. Rapid development in the ICT sector also reflects a rapid growth of skilled manpower which ultimately accelerates the economic growth. Despite many challenges such as political instability, financial crisis and power shortages, many large and ambitious projects are going on to achieve digital Bangladesh. If the government functions at the current pace, we would like to hope that within a few years the ICT sector will be the largest revenue earner for Bangladesh.

2.2. Procurement Process

The term Procurement Process is used in this paper to describe the process required to supply equipment, materials and other resources required to carry out a project. This process usually involves sub-processes such as acquisition, purchasing, logistics, monitoring, quality assurance and contract administration (Stuckhart, 1995).

Currently there is a tendency to manage projects in an ICT based company using a fast-track approach in an effort to reduce project schedule. To be able to serve the needs of these projects, the Procurement Process is subject to important pressures to be carried out in the most expedite and fluid possible manner. According to the analysis of interviews and surveys carried out during the study of the Procurement Process described in this paper (Rivas, 1998), some aspects can express the relevance of Procurement:

- a) Schedule pressures: the need of the project to be operative within the less possible time, avoiding excessive financial costs, minimizing project management costs, and other indirect costs.
- b) High relative value: when the supplies managed by procurement represents 50%, 60%, and up to 70% of the total cost for the project, it is imperious to have a strict and permanent control of the acquisitions, having in mind the financial approach being represented by such situation.
- c) Relevance of the process equipment being supplied for the performance of the project. The equipment can be of such relevance, that the operation of the project depends on its adequate

performance.

d) Potential criticality of the supplies: due to precedence relationships and interrelation between different areas of the project.

In terms of cycle view of supply chain, procurement cycle occurred between supplier and manufacturer/buyer (Sunil Chopra, Peter Meindl)

Procurement process involves some stages, which are given below,

2.3. Steps in a Procurement Cycle

1. The Need

First step is generating need of a specific product or materials.

2. Specify

Now need to decide how much and when the products or services wish to delivered.

3. Requisition or Order

This is when you write the purchase order or requisition order.

4. Financial Authority

Before the order can be placed, it usually requires some kind of authority for its purchase. With some purchase orders, this is reasonably automatic. With a large order that will be put out to tender it could be multi staged.

5. Research Suppliers

Repetitive orders usually have set suppliers, although it does no harm to review the options sometimes. Other orders will either need to go out to tender or there will be a choice of suppliers.

6. Choose Supplier

The supplier is now chosen.

7. Establish Price and Terms

In a company like ICT based, many suppliers will be contracted with a Master Agreement where prices and terms are set for a defined period. For other orders, now is the time to negotiate terms and prices.

8. Place Order

At this stage in the purchasing cycle, the order is placed and this becomes a contract between the business and the supplier.

9. Order Received and Inspected

The goods are delivered, checked in the warehouse and entered into the. Shortages and breakages are reported to the supplier for the appropriate credits to be supplied.

10. Approval And Payment

Usually within 30 days, the invoices are received and paid.

11. Update Of Records

The purchasing ledger and stock records are updated.

2.4. Link between Procurement Process, Efficiency, Effectiveness and Performance

Knudsen, (1999) suggested that procurement performance starts from purchasing efficiency and effectiveness in the procurement function in order to change from being reactive to being proactive to attain set performance levels in an entity. According to Van Weele (2006) purchasing performance is considered to be the result of two elements: purchasing effectiveness and purchasing efficiency. Performance provides the basis for an organization to assess how well it is progressing towards its predetermined objectives, identifies areas of strengths and weaknesses and decides on future initiatives with the goal of how to initiate performance improvements. This means that purchasing performance is not an end in itself but a means to effective and efficient control and monitoring of the purchasing function (Lardenoije, Van Raaij, & Van Weele, 2005). Purchasing efficiency and purchasing effectiveness represent different competencies and capabilities for the purchasing function. CIPS Australia (2005) presents the differences between efficiency and effectiveness. Efficiency reflects that the organization is “doing things right” whereas effectiveness relates to the organization “doing the right thing”. This means an organisation can be effective and fail to be efficient, the challenge being to balance between the two. For any organization to change its focus and become more competitive

Amaratunga & Baldry (2002) suggest that performance is a key driver to improving quality of services while its absence or use of inappropriate means can act as a barrier to change and may lead to deterioration of the purchasing function.

Measuring the performance of the purchasing function yields benefits to organizations such as

cost reduction, enhanced profitability, assured supplies, quality improvements and competitive advantage as was noted by Batenburg & Versendaal (2006).

Until an organization measures purchasing performance they will never know how well they are performing and why they should measure purchasing performance. Department of Public Works, Queensland Government (2006) identified four reasons for measuring purchasing performance:

- i) It provides feedback on the extent to which the planned outcomes for purchasing are being achieved in the organization.
- ii) It provides information for analysis and decision making.
- iii) It provides information to executive management about the effectiveness, efficiency, value and contributes to the recognition of the procurement function.
- iv) It provides focus and motivation for purchasing staff.

2.5. Procurement Performance

Measurement of procurement performance has been a hot topic of the centuries and it still is. Like several other functions, such as marketing, procurement needs to increase its accountability in order to strengthen its position at the management. It is the process of quantifying the efficiency and effectiveness of the systems by the set of KPI's. Procurement performance evaluation to be established to support the achievement of goals with the intent to motivate guide and improve an individual's decision.

2.6. KPI Selection Process

KPI selection process is multi-stepped decision making process. Generally the steps are i) realization the need for KPI selection or new KPI, ii) determination and formulation of decision criteria, iii) pre-qualification, iv) final KPI selection and v) monitoring of selected KPI's (i.e. continuous or periodic evaluation and assessment)

2.7. Improving Performance in Procurement Using Key Performance Indicators

The responsibilities of the procurement process span across several internal department (warehousing, logistics, sales and finance) as well as external organizations including suppliers, carriers and other third party support organizations. Some external organization work can be monitored by checklists or other simple data collection and analysis activities.

The value of measuring the performance of external suppliers, distributors etc. is well known; understanding current performance, comparisons of performance over time and using data to better understand areas for performance improvement are benefits of developing as assessing KPIs. In addition to the performance of individual suppliers, the procurement process as a whole can be monitored to assess the extent to which the end-to-end process is optimum in terms of time, quality and value for money.

Key performance indicators (KPIs) can be used to analyses data based on performance objectives and set actionable goals for improvement. KPIs are SMART (specific, measurable, attainable, realistic and time based) criteria developed in conjunction with suppliers and others used to measure the essential elements of the process. These measures can be developed at any time, but are often agreed at the beginning of a contract. It is important to agree measures which can be assess easily, in terms of the availability of the data as well as the data itself being objective and beyond dispute of either party. The KPI's used will differ from organization to organization, but the following are some of the commonly used indicators, based on quality and cost data.

S/N	KPI Name	How It Can Improve Performance	Description	Performance Category
1	Product Price Variation	Prices paid for focus goods are in alignment with international prices	Percentage price variance between contract unit price and international unit price for focus products	Cost

2	Effective Contract Utilization	Efficient procurement mechanisms are being used	Percentage by value of purchases made under simple purchase orders, annual contracts, and multi-year contracts	Cost
3	Supplier Performance	A) Supplier delivers the correct goods	Percentage of orders in compliance with contract criteria	Quality
		B) Supplier delivers goods on time	Percentage of orders delivered on time	Timeliness
4	Procurement Cycle Time	There are no delays in executing procurements	Percentage of procurements completed (placed) within standard time guidelines	Timeliness
5	Payment Processing Time	There are no delays in processing payments to suppliers	Percentage of supplier payments made within the payment period called for in the contract	Timeliness
6	Emergency Procurement	Good supply planning practices are being used	Percentage, by value and number, of purchase orders or contracts issued as emergency orders	Systems Productivity
7	Procurement Cost	Level of efficiency of operations in procurement unit	Ratio of annual procurement unit cost-to-value of annual purchases	Systems Productivity

Literature shows that the studies and some proposed ways on this issue were with partial solutions and some were specifically academic hypotheses [94]. However the order allocation to suppliers varies industry to industry and organization to organization as well.

Chapter-3

Methodology

3.1. Research Methodology

A research method is a systematic plan for conducting research. Specialists draw on a variety of both qualitative and quantitative research methods, including experiments, survey research, participant observation, and secondary data. Quantitative methods aim to classify features, count them, and create statistical models to test hypotheses and explain observations. Qualitative methods aim for a complete, detailed description of observations, including the context of events and circumstances.

The proposed methodology was implemented in the following way-

3.1.1. Study of ICT sector in Bangladesh

Technology is the systematic application of scientific and other organized knowledge towards solving practical tasks (Azim, 2002). At present, knowledge is available in the form of information which is used to get various expected outputs with the support of modern technologies. The total efforts are known as Information Technology (IT). IT is a broad term covering technologies developed for collecting, organizing, analyzing, sharing and presenting information in different forms (Rahman, 2007). Information Technology, when integrated with any communication device, system and/or media, which enable users to access, store, transmit, and manipulate information, is known as Information & Communication Technology (ICT). ICT helps to transform the traditional society into a modern knowledge based society, also known as information society, in terms of better access to information, job creation and income distribution, getting education and health care facilities, providing effective public service delivery through efficient governance and the diversification of economic opportunities for further development. People who have the means to partake in this form of society are sometimes called digital citizens.

Digital Bangladesh is a political motto of the present government and it refers to a knowledge-based and ICT-integrated country system, where people have access to information to get the desired public services in a swift and simple manner. An ICT integrated system, known as E-

governance, help to promote Good Governance in all sphere of life, which include effective, efficient, participatory, consensus, accountable, transparent, responsive, equitable, inclusive, and having effective law and order situation. ICT supported service delivery system takes less time and people can get the services from anywhere of the country. It also seems like a form of decentralization.

3.1.2. Gathering and sorting key performance indicator (KPI)

A survey was made to gather and sort following key performance indicator (KPI) from expert opinion and extensive literature review as primary and secondary data respectively. I requested them provide their opinion in the scale of 5 to 1 (very high important, very important, important, low important, very low important) and for their convenience the definitions of criteria are kept along with the scale.

Sl	Criteria	Definitions	Very high Important (Must)	Very Important	Important	Low Important	Very low Important (Negligible)
1	Product Price Variation	Percentage price variation between contract unit price and international unit price for focus products	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2	Effective Contract Utilization	Percentage by value of purchases made under simple purchase orders, annual contracts, and multi-year contracts	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3	Supplier Performance	Percentage of orders in compliance with contract criteria & Percentage of orders delivered on time	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4	Procurement Cycle Time	Percentage of procurements completed (placed) within standard time guidelines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5	Payment Processing Time	Percentage of supplier payments made within the payment period called for in the contract	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6	Emergency Procurement	Percentage, by value and number, of purchase orders or contracts issued as emergency orders	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7	Procurement Cost	Ratio of annual procurement unit cost-to-value of annual purchases	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

3.1.3. Selecting and Ranked the KPI

After making extensive survey and from some expert opinion we select and ranked the key performance indicator as per following result,

Sl	Criteria	Definitions	Rank
1	Product Price Variation	Percentage price variation between contract unit price and international unit price for focus products	1
2	Effective Contract Utilization	Percentage by value of purchases made under simple purchase orders, annual contracts, and multi-year contracts	7
3	Supplier Performance	Percentage of orders in compliance with contract criteria & Percentage of orders delivered on time	2
4	Procurement Cycle Time	Percentage of procurements completed (placed) within standard time guidelines	6
5	Payment Processing Time	Percentage of supplier payments made within the payment period called for in the contract	5
6	Emergency Procurement	Percentage, by value and number, of purchase orders or contracts issued as emergency orders	4
7	Procurement Cost	Ratio of annual procurement unit cost-to-value of annual purchases	3

SL	Company	Product Price Variation	Effective Contract Utilization	Supplier Performance	Procurement Cycle Time	Payment Processing Time	Emergency Procurement	Procurement Cost
1	Link3	4	3	5	4	3	3	4
2	Flora Ltd.	5	2	4	3	3	3	3
3	Computer Source Ltd.	5	3	3	3	3	3	3
4	Data Edge Ltd.	4	2	3	4	4	4	4
5	Agni Systems	5	2	4	3	3	3	5
6	SkyLink International	4	3	3	2	3	3	4
7	Express Systems Ltd.	5	3	3	2	3	4	5
8	Impress Technologies Ltd.	4	3	4	2	3	5	5
9	Shark Ltd.	4	4	5	3	3	3	5
10	Smart Technologies Ltd.	4	3	3	3	3	3	4
11	Techvally Networks Ltd.	5	3	3	4	3	3	4
12	Amra Technologies Ltd.	3	2	4	4	4	4	3
13	RM Systems	3	3	4	3	3	3	3
14	Thakral Information Systems Pte. Ltd.	4	3	4	2	2	3	4
15	Global Brand Pvt. Ltd.	5	2	5	2	3	2	3
16	Information Systems Ltd.	4	3	5	2	3	3	3
17	Rasa Technologies Ltd.	5	4	5	3	3	3	4
18	Ara Technologies Ltd.	5	3	5	3	3	2	4
19	I Tech Solutions	5	2	4	4	2	3	3
20	Tech 360	4	3	4	3	3	4	2
21	IT Services	4	2	4	4	2	3	2
22	Base Technologies Ltd.	3	3	3	3	3	3	2
23	Techvally	3	2	4	4	3	4	3

	Solutions Ltd.							
24	Computer Services Ltd.	4	3	5	3	3	3	3
25	Ngen IT	4	2	4	2	3	4	4
26	Technocraft	5	2	3	3	4	3	3
27	Aftab It Ltd.	5	3	4	2	3	2	4
28	Pathway Technology	5	4	4	3	3	3	4
29	South Bangla Computers	4	4	4	3	3	3	4
Average		4.28	2.79	3.97	2.97	3.0	3.17	3.59
Rank		1	7	2	6	5	4	3
Weightage		0.18	0.12	0.17	0.12	0.13	0.13	0.15

Chapter-4

A Case Study

Phase-2 of the study was basically a Case Study. In this phase the overall performances of procurement were evaluated against the selected key performance indicator (KPI) in the first phase-1.

4.1. Profile of the Company

Company Name	: Network Hardware Solutions Limited.
E-mail	: info@nhs.com.bd, intikhab.c@nhs.com.bd
Factory address	: House-31, Road-17, Banani C/A, Dhaka-1213.
Tele phone no	: +880-2-9821278-9
Establishment year	: 2008
Contract persons	: Capt. Intikhab Ahmed Chowdhury Mobile no. 01711720755.
Main Business	: Supply of network products & Networking services.
Payment term	: L/C at sight/ Account Payee Check (for Local payment).
Total workers	: 45
Product	: Cisco, Allied Telesis, RAD, Netgear, Planet, Linkbasic, Allot, Edimax

4.2. Problem Statement

An important aspect in supply chain performance evaluation is the establishment of an appropriate performance measures of procurement systems. A performance measure or the set of performance measure is used to determine the efficiency and/or the effectiveness of an existing systems or to compare competing alternate systems. Performance measure are also used to design proposed systems by determining the values of the decision variables that yield the most desirable levels of performance. Performance measurement reflects the need for improvement in operational areas which are found poor in the performance measures. Lack of adequate performance measurement has been identified as one of the major obstacles to efficient supply chain management. It is an established fact that in order to improve supply chain effectiveness and realize a smooth flow of resources within it, there is a need to measure its performance.

Measurement of performance will also reveal whether there is need for an organizations continuation in its current method or adopting re-engineering in its system to affect the areas which are found deficient.

Performance measurement describe the feedback on operations which are geared towards customer satisfaction, strategic decision and objectives. We have to measure efficiency of procurement due to fulfil our performance evaluation of procurement systems in the ICT sector. To measure efficiency of procurement some key performance indicators (KPI) are used here.

4.3. Probable Solutions

There are many probable ways to overcome the aforesaid problem and few are listed below-

1. To evaluate the procurement performance of the ICT company in the certain time interval.
2. To monitor and expedite the effective job of procurement systems.

The aforementioned ways were discussed and evaluated considering the company and market status in a discussion table with the company Decision Makers and Expert. The first way may be the best and will provide the maximum benefits.

4.4. Data collection and analysis

The data were collected against each and every key performance indicator considered for the performance evaluation of procurement in the ICT Company. A weight-age has been determined for each KPI's to calculate the overall efficiency. The KPI's were ranked on the basis of their weights through a widespread survey (in Likert scale) and then analysed them by Design of Experiments (DOE) (Hasin, 2007).

Chapter-5

5.1. Data Analysis

An endeavor has carried out to analyses relevant data from Network Hardware Solutions Ltd., such as following

- I. Product Price Variation
- II. Effective Contract Utilization
- III. Supplier Performance
- IV. Procurement Cycle Time
- V. Payment Processing Time
- VI. Emergency Procurement
- VII. Procurement Cost

5.1.1. Product Price Variation

This indicator measures the percentage price variation between the contract unit price and the international reference unit price for focus products, over the annual spend of time.

Target is Less than (<) or equal to (=) 100%

Sl	Description	(a) Price Paid (USD)	(b) International ref. Price (USD)	Product price Variation [a/b (%)]
1	Dell Notebook (Intel Core i3, 500GB HDD, 14" Monitor)	458.60	380	121%
2	Samsung 40" Television	662.42	670	99%
3	Mikrotik CCR1036-12G-4S-EM Router	738.85	750	99%
4	Mikrotik RB951G-2HnD Router	73.89	75	99%
5	Linkbasic CAT 6 Cable/Box	70.00	100	70%
6	Linkbasic CAT 5 Cable/Box	52.00	70	74%
7	Linkbasic 42U Cabinet	450.00	500	90%
8	Linkbasic 22U Cabinet	132.00	150	88%
9	Cisco 2900 Series Integrated Services Router	1,261.15	1265	100%
10	IP Phone	71.34	70	102%

Average product price variation is 94%

5.1.2. Effective Contract Utilization

This indicator measures the percentage, by value, of three categories of purchases (purchase order, annual contract, and multi—year contract) to assess the procurement entity’s use of efficient contracting mechanisms. The use of annual contracts and multi—year contracts has been shown to provide procuring entities with cost savings through better product pricing from suppliers, economies of scale achieved by a more efficient procurement process (fewer bidding exercises), and fewer contracts and suppliers to manage. The overall goal is to create a culture and process where the periodic review of purchased commodities is conducted to evaluate opportunities for improving purchasing through more efficient contract utilization.

The sum of the percentages of the three purchase categories must equal 100%

5.1.3. Supplier Performance

These indicators measure a supplier’s compliance with the product and performance criteria identified in the purchase order or contract. By monitoring and documenting supplier performance, procurement personnel are in a stronger position to require corrective action from suppliers when they are not in compliance with order/contract requirements. Supplier performance monitoring also provides historical information to help inform the supplier evaluation and selection process for future tenders.

AREAS OF ASSESSMENT	A = EXCELLENT (Above 80 points)	B = HIGH (Between 71 – 80 points)	C = AVERAGE (Between 60 – 70 points)	D = BELOW AVERAGE (Less Than 60 points)
1. Quality of product/ service Meets contractual requirements, accuracy of reports, appropriateness of personnel, technical excellence.	Demonstrated exceptional performance level.	There are no quality problems.	Non-conformances do not impact achievement of contract requirements.	Non-conformances compromise the achievement of contract requirements or require company’s resources to ensure achievement of contract requirements.
2. Cost Control* Within budget, current, accurate and complete billings, relationship of negated costs to	Demonstrated exceptional performance level.	There are no cost issues.	Cost issues do not impact achievement of contract requirements.	Cost issues compromise the achievement of contract requirements or require company’s resources to ensure the achievement of contract requirements.

actual, cost efficiencies, change order issue.				
3. Timeliness of Performance Meet interim milestones, reliable and responsive to technical directions, completed on time, including wrap-up and contract administration, no liquidated damages assessed.	Demonstrated exceptional performance level.	There are no delays.	Delays do not impact achievement of contract requirements.	Delays compromise the achievement of contract requirements or require company's resources to ensure the achievement of contract requirements.
4. Compliance Legal and regulatory, safety and environment control, company's policies.	Demonstrated exceptional performance level.	There are no non-compliance issues.	Non-compliance issues do not impact achievement of contract requirements.	Non-compliance issues compromise the achievement of contract requirements or require company's resources to ensure the achievement of contract requirements.
5. Business Relations Effective management, businesslike correspondence, pro-active and responsive to contract requirements, prompt notification of contract problems, flexible, reasonable/ cooperative, effective recommended solutions.	Demonstrated exceptional performance level.	Responses to inquiries, technical/ service/ administrative issues are effective and responsive.	Responses to inquiries, technical/ service/ administrative issues are usually effective and responsive.	Responses to inquiries, technical/ service/ administrative issues are marginally or not effective and responsive.

This indicator is measured for an individual supplier.

SN	Date Awarded	Vendor Name	Description of Goods/Services	Contract Days	Actual Delivery (Days)	No. of Delay	Q1 Points	Q2 Points	Q3 Points	Q4 Points	Q5 Points	Total
1	14-Feb-14	Redington Distribution Pte Ltd	Cisco Switch, router, access point, etc	60	66	6	90	80	68	90	89	83%
2	21-Mar-14	Redington Distribution Pte Ltd	Cisco Switch, router, access point, etc	60	59	0	90	80	87	90	89	87%
3	6-Mar-14	Redington Distribution Pte Ltd	Cisco Router & Access Point	60	62	2	90	80	65	90	88	83%

Average performance for this specific supplier is 83%

5.1.4. Procurement Cycle Time

This indicator measures the average length of the procurement cycle and the percentage of procurements that were completed within a standard procurement cycle time guideline. The procurement cycle time is measured for contracts and purchase orders using historical data. It measures the number of days required to complete the procurement cycle, beginning with the date a requisition is submitted until the date the contract or the purchase order is issued to the selected vendor.

SL	Supplier	Details	Requisition Date	PO Date	Actual Time (Days)	Standard Guideline (Days)	Difference (Days)
1	Flora Ltd.	Notebook	22-Feb-2014	1-Mar-2014	7.00	10	-3
2	Link3 Technologies Ltd.	IP Phone	24-Feb-2014	1-Mar-2014	5.00	10	-5
3	Computer Source Ltd.	Networking cable	24-Feb-2014	6-Mar-2014	10.00	10	0
4	Redington Distribution Pte Ltd	Cisco Switch, router,	4-Feb-2014	14-Feb-2014	10.00	10	0

		access point, etc					
5	Redington Distribution Pte Ltd	Cisco Switch, router, access point, etc	10-Mar-2014	21-Mar-2014	11.00	10	1
6	Suzhou Linkbasic Information Technology Co.,Ltd.	Cable, Cabinet & Accessories	24-Feb-2014	6-Mar-2014	10.00	10	0
7	Redington Distribution Pte Ltd	Cisco Router & Access Point	22-Feb-2014	6-Mar-2014	12.00	10	2
8	Suzhou Linkbasic Information Technology Co.,Ltd.	Cable, Cabinet & Accessories	8-Mar-2014	16-Mar-2014	8.00	10	-2
9	Compuage Infocom Pte Ltd.	Cisco Switch, router, access point, etc	10-Mar-2014	20-Mar-2014	10.00	10	0
10	Information Solutions Ltd.	Dell Laptop	10-Mar-2014	16-Mar-2014	6.00	10	-4
11	Ara Technologies Ltd.	Fiber Cable, Cable Tie, Media Converter	13-Jan-2014	17-Jan-2014	4.00	10	-6
12	Rasa Technologies Ltd.	Microtik Router	4-Feb-2014	15-Feb-2014	11.00	10	1
13	Impress Technologies Ltd.	Online UPS	13-Jan-2014	20-Jan-2014	7.00	10	-3
14	NGen It	REdHut Linux Software	4-Feb-2014	11-Feb-2014	7.00	10	-3
15	South Bangla Computers	Cisco Router	13-Jan-2014	20-Jan-2014	7.00	10	-3
16	IT Services	Off Line UPS	25-Dec-2013	3-Jan-2014	9.00	10	-1
17	EDIMAX TECHNOLOGY CO., LTD.	Switch, Router, AP, MC	4-Feb-2014	10-Feb-2014	6.00	10	-4

		etc					
18	Shark Limited	Fiber Cable, Network Cable & accessories	21-Apr-2014	4-May-2014	13.00	10	3
19	Tania Electronics	Television	13-Jan-2014	21-Jan-2014	8.00	10	-2
20	Ara Technologies Ltd.	Media Converter, Patch Cable	13-Jan-2014	21-Jan-2014	8.00	10	-2

Number of purchase orders or contracts completed within the procurement cycle time guideline:

16

Total number of purchase orders or contracts awarded: 20

Performance of procurement cycle time: 80%

5.1.5. Payment Processing Time

This indicator measures the percentage of supplier payments that were made within the payment period called for in the contract. By paying suppliers on time, procurement units can better plan and control spending, and they may be able to negotiate more favourable price agreements or payment terms. Followings are some data collected for payment processing time

SL	Supplier	Details	Date of Invoice	Due Date for payment	Date of Payment	Remarks
1	Flora Ltd.	Notebook	14-Mar-2014	4-Apr-2014	21-Apr-2014	Delay
2	Link3 Technologies Ltd.	IP Phone	16-Mar-2014	15-Apr-2014	21-Apr-2014	Delay
3	Computer Source Ltd.	Networking cable	16-Mar-2014	15-Apr-2014	21-Apr-2014	Delay
4	Redington Distribution Pte Ltd	Cisco Switch, router, access point, etc	24-Feb-2014	24-Feb-2014	24-Feb-2014	Okay
5	Redington Distribution Pte Ltd	Cisco Switch, router, access	31-Mar-2014	31-Mar-2014	31-Mar-2014	Okay

		point, etc				
6	Suzhou Linkbasic Information Technology Co.,Ltd.	Cable, Cabinet & Accessories	16-Mar-2014	16-Mar-2014	16-Mar-2014	Okay
7	Redington Distribution Pte Ltd	Cisco Router & Access Point	14-Mar-2014	14-Mar-2014	14-Mar-2014	Okay
8	Suzhou Linkbasic Information Technology Co.,Ltd.	Cable, Cabinet & Accessories	28-Mar-2014	28-Mar-2014	28-Mar-2014	Okay
9	Compuage Infocom Pte Ltd.	Cisco Switch, router, access point, etc	31-Mar-2014	31-Mar-2014	31-Mar-2014	Okay
10	Information Solutions Ltd.	Dell Laptop	31-Mar-2014	30-Apr-2014	30-Apr-2014	Okay
11	Ara Technologies Ltd.	Fiber Cable, Cable Tie, Media Converter	2-Feb-2014	4-Mar-2014	31-Mar-2014	Delay
12	Rasa Technologies Ltd.	Microtik Router	24-Feb-2014	26-Mar-2014	31-Mar-2014	Delay
13	Impress Technologies Ltd.	Online UPS	2-Feb-2014	4-Mar-2014	31-Mar-2014	Delay
14	NGen It	REdHut Linux Software	24-Feb-2014	3-Mar-2014	3-Mar-2014	Okay
15	South Bangla Computers	Cisco Router	2-Feb-2014	4-Mar-2014	4-Mar-2014	Okay
16	IT	Off Line	14-Jan-	13-Feb-	14-Feb-	Okay

	Services	UPS	2014	2014	2014	
17	EDIMAX TECHNOLOGY CO., LTD.	Switch, Router, AP, MC etc	24-Feb-2014	24-Feb-2014	24-Feb-2014	Okay
18	Shark Limited	Fiber Cable, Network Cable & accessories	12-May-2014	11-Jun-2014	30-Jun-2014	Okay
19	Tania Electronics	Televisions	2-Feb-2014	4-Mar-2014	4-Mar-2014	Okay
20	Ara Technologies Ltd.	Media Converter, Patch Cable	2-Feb-2014	4-Mar-2014	13-Apr-2014	Delay

Number of Supplier Invoice Paid on Time = 13

Total number of supplier invoices paid = 20

Performance of payment processing time = 65%

5.1.6. Emergency Procurement

This indicator measures the percentage of purchase orders or contracts that are issued as emergency orders, out of the total purchase orders or contracts placed during a defined period of time. This indicator can be expressed as a percentage of the value of orders or of the number of orders.

SL	Supplier	Details	Remarks
1	Flora Ltd.	Notebook	Normal
2	Link3 Technologies Ltd.	IP Phone	Emergency
3	Computer Source Ltd.	Networking cable	Normal
4	Redington Distribution Pte Ltd	Cisco Switch, router, access point, etc	Normal
5	Redington Distribution Pte Ltd	Cisco Switch, router, access point, etc	Normal
6	Suzhou Linkbasic Information Technology Co.,Ltd.	Cable, Cabinet & Accessories	Emergency
7	Redington Distribution Pte Ltd	Cisco Router &	Normal

		Access Point	
8	Suzhou Linkbasic Information Technology Co.,Ltd.	Cable, Cabinet & Accessories	Emergency
9	Compuage Infocom Pte Ltd.	Cisco Switch, router, access point, etc	Normal
10	Information Solutions Ltd.	Dell Laptop	Normal
11	Ara Technologies Ltd.	Fiber Cable, Cable Tie, Media Converter	Emergency
12	Rasa Technologies Ltd.	Microtik Router	Normal
13	Impress Technologies Ltd.	Online UPS	Normal
14	NGen It	REdHut Linux Software	Normal
15	South Bangla Computers	Cisco Router	Normal
16	IT Services	Off Line UPS	Emergency
17	EDIMAX TECHNOLOGY CO., LTD.	Switch, Router, AP, MC etc	Normal
18	Shark Limited	Fiber Cable, Network Cable & accessories	Normal
19	Tania Electronics	Television	Emergency
20	Ara Technologies Ltd.	Media Converter, Patch Cable	Normal

Number of emergency order placed in due time: 6

Total number of emergency order placed: 6

Performance of the Emergency Procurement: 100%

5.1.7. Procurement Cost

This indicator measures the average cost associated with procuring goods against the total value of goods purchased within a designated period of time. The cost of procurement can also be measured against the total number of orders processed during the designated period; this number would be the average cost to process one order.

One of the major distribution products of Network Hardware Solutions Ltd. Is Linkbasic branded goods. Annual target was to procure 1000k USD valued goods, considering sales forecast they procured around 600K USD goods throughout the year.

The performance of the procurement cost would be 60% based on sales demand.

We can calculate the overall efficiency of procurement performance using following equation,

$$y = 0.18X_1 + 0.17X_2 + 0.15X_3 + 0.13X_4 + 0.13X_5 + 0.12X_6 + 0.12X_7 \dots\dots\dots(i)$$

X₁ = Product Price Variation

X₂ = Supplier Performance

X₃ = Procurement Cost

X₄ = Emergency Procurement

X₅ = Payment Processing Time

X₆ = Procurement Cycle Time

X₇ = Effective Contract Utilization

Using equation (i) we get,

$$y = 0.18 \times 94\% + 0.17 \times 83\% + 0.15 \times 60\% + 0.13 \times 100\% + 0.13 \times 65\% + 0.12 \times 80\% + 0.12 \times 100\%$$

Overall performance of procurement, y= 83.18%

An endeavor is carried out to rank and analyzed by DOE for those KPI's

StdOrder	Run Order	CenterPt	Blocks	A	B	C	D	E	F	G	Efficiency
32	1	1	1	1	1	1	1	1	1	1	70.91
20	2	1	1	1	1	-1	-1	1	1	-1	59.52
4	3	1	1	1	1	-1	-1	-1	1	1	57.73
14	4	1	1	1	-1	1	1	-1	-1	1	64.32
9	5	1	1	-1	-1	-1	1	-1	-1	-1	54.86
31	6	1	1	-1	1	1	1	1	-1	-1	63.66
30	7	1	1	1	-1	1	1	1	-1	-1	64.23
10	8	1	1	1	-1	-1	1	-1	1	1	62.10
25	9	1	1	-1	-1	-1	1	1	-1	1	58.51
23	10	1	1	-1	1	1	-1	1	1	1	63.58
21	11	1	1	-1	-1	1	-1	1	-1	-1	56.90
28	12	1	1	1	1	-1	1	1	-1	1	63.34
27	13	1	1	-1	1	-1	1	1	1	-1	61.44
3	14	1	1	-1	1	-1	-1	-1	-1	-1	52.36
1	15	1	1	-1	-1	-1	-1	-1	1	1	54.77
5	16	1	1	-1	-1	1	-1	-1	-1	1	56.99
19	17	1	1	-1	1	-1	-1	1	-1	1	56.02
15	18	1	1	-1	1	1	1	-1	-1	1	63.76
18	19	1	1	1	-1	-1	-1	1	-1	1	56.58
26	20	1	1	1	-1	-1	1	1	1	-1	62.01
6	21	1	1	1	-1	1	-1	-1	1	-1	60.49
29	22	1	1	-1	-1	1	1	1	1	1	66.08

7	23	1	1	-1	1	1	-1	-1	1	-1	59.93
24	24	1	1	1	1	1	-1	1	-1	-1	61.74
16	25	1	1	1	1	1	1	-1	1	-1	67.25
17	26	1	1	-1	-1	-1	-1	1	1	-1	54.68
13	27	1	1	-1	-1	1	1	-1	1	-1	62.42
8	28	1	1	1	1	1	-1	-1	-1	1	61.83
2	29	1	1	1	-1	-1	-1	-1	-1	-1	52.93
22	30	1	1	1	-1	1	-1	1	1	1	64.15

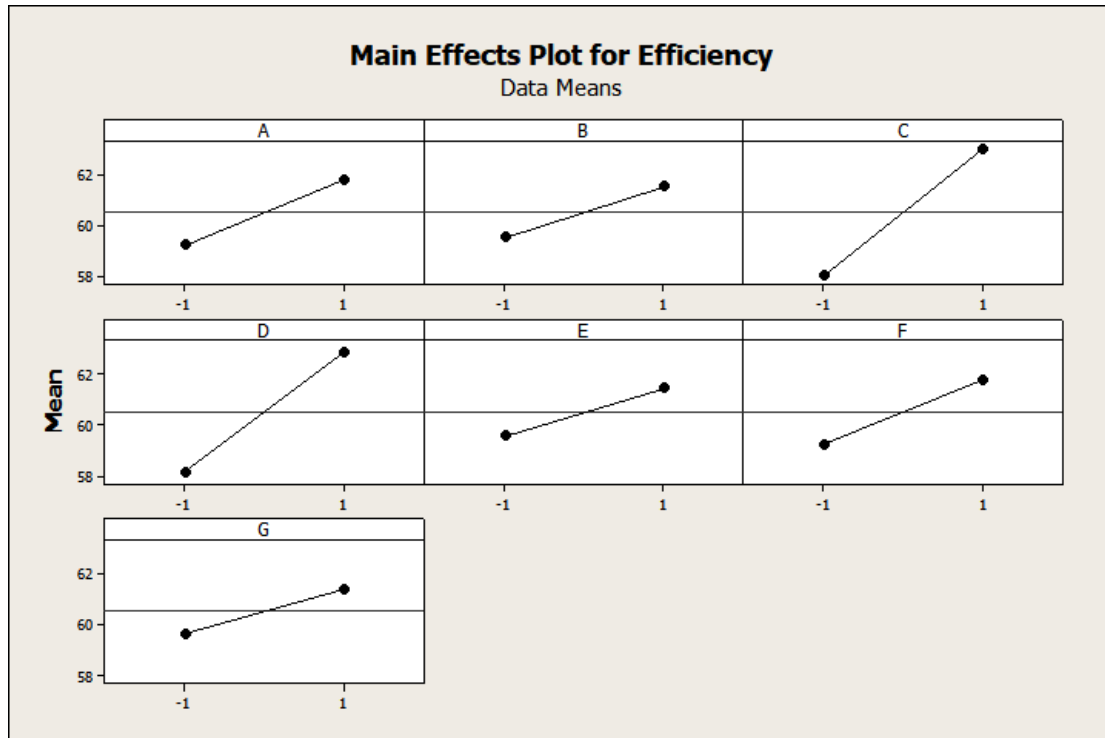


Fig-2: Main effects of the KPI

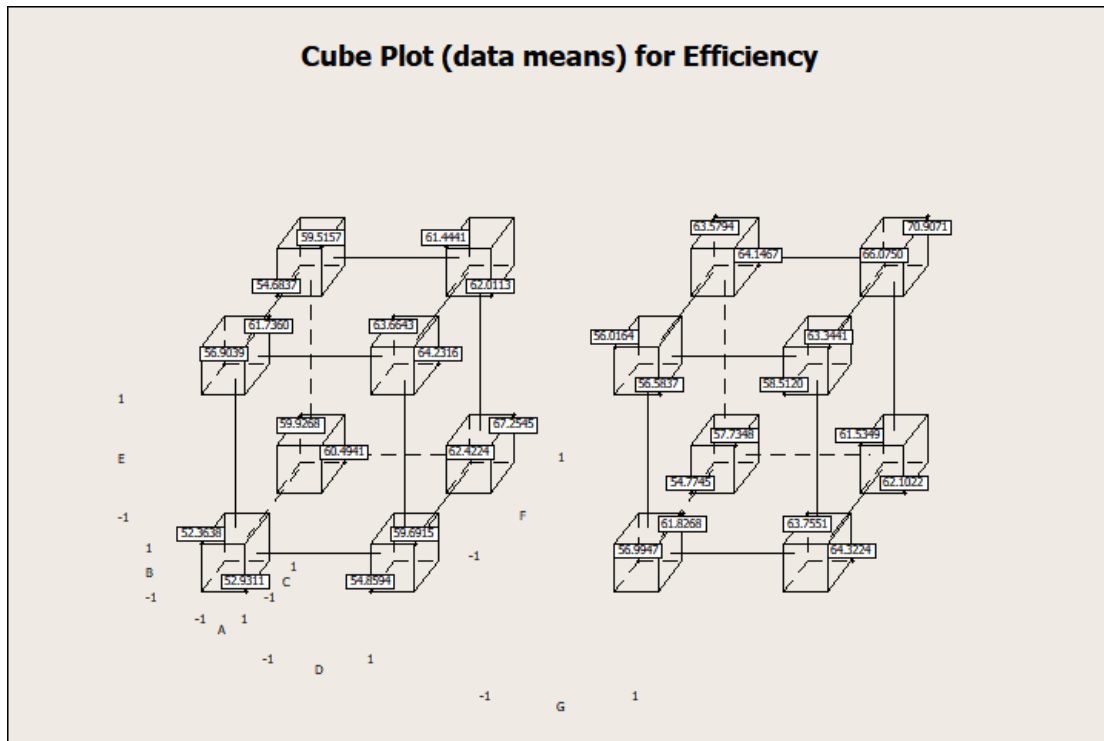


Fig-3: Cube plot for efficiency

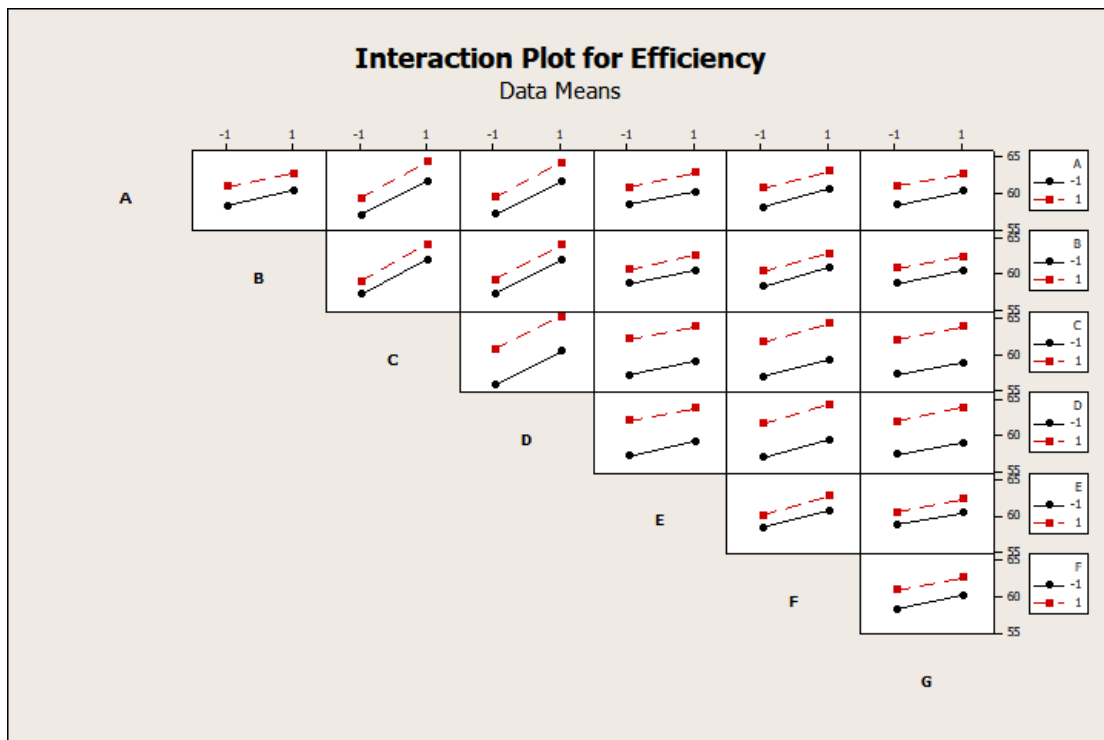


Fig-4: Interaction Effect of the KPI

One-way ANOVA: A, B, C, D, E, F, G, Efficiency Method

Null hypothesis All means are equal
 Alternative hypothesis Not all means are equal
 Significance level $\alpha = 0.05$

Equal variances were assumed for the analysis.

Factor Information

Factor	Levels	Values
Factor	8	A, B, C, D, E, F, G, Efficiency

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Factor	7	102523	14646.2	4546.34	0.000
Error	248	799	3.2		
Total	255	103322			

Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
1.79486	99.23%	99.20%	99.18%

Means

Factor	N	Mean	StDev	95% CI
A	32	0.000	1.016	(-0.625, 0.625)
B	32	0.000	1.016	(-0.625, 0.625)
C	32	0.000	1.016	(-0.625, 0.625)
D	32	0.000	1.016	(-0.625, 0.625)
E	32	0.000	1.016	(-0.625, 0.625)
F	32	0.000	1.016	(-0.625, 0.625)
G	32	0.000	1.016	(-0.625, 0.625)
Efficiency	32	60.511	4.307	(59.886, 61.136)

Pooled StDev = 1.79486

One-way ANOVA: A, B, C, D, E, F, G Method

Null hypothesis All means are equal
 Alternative hypothesis Not all means are equal
 Significance level $\alpha = 0.05$

Equal variances were assumed for the analysis.

Factor Information

Factor	Levels	Values			
Factor	7	A, B, C, D, E, F, G			
Analysis of Variance					
Source	DF	Adj SS	Adj MS	F-Value	P-Value
Factor	6	0.000	0.00000	0.00	1.000
Error	217	224.000	1.03226		
Total	223	224.000			
Model Summary					
		S	R-sq	R-sq(adj)	R-sq(pred)
		1.01600	0.00%	0.00%	0.00%
Means					
Factor	N	Mean	StDev	95% CI	
A	32	0.000	1.016	(-0.354, 0.354)	
B	32	0.000	1.016	(-0.354, 0.354)	
C	32	0.000	1.016	(-0.354, 0.354)	
D	32	0.000	1.016	(-0.354, 0.354)	
E	32	0.000	1.016	(-0.354, 0.354)	
F	32	0.000	1.016	(-0.354, 0.354)	
G	32	0.000	1.016	(-0.354, 0.354)	
Pooled StDev = 1.01600					

One-way ANOVA: RunOrder, Efficiency
Method

Null hypothesis All means are equal

Alternative hypothesis Not all means are equal

Significance level $\alpha = 0.05$

Equal variances were assumed for the analysis.

Factor Information

Factor	Levels	Values			
Factor	2	RunOrder, Efficiency			
Analysis of Variance					
Source	DF	Adj SS	Adj MS	F-Value	P-Value
Factor	1	30991	30991.1	581.74	0.000
Error	62	3303	53.3		
Total	63	34294			

Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
7.29885	90.37%	90.21%	89.74%

Means

Factor	N	Mean	StDev	95% CI
RunOrder	32	16.50	9.38	(13.92, 19.08)
Efficiency	32	60.511	4.307	(57.932, 63.090)

Pooled StDev = 7.29885

Chapter-6

Conclusion

6.1. Recommendations

1. The Key criteria of procurement performance evaluation should be reviewed by decision makers of the case as it may vary organization to organization. This review by decision makers may meet the company strategy, company policy, customer/supplier's strategy and special issues such as material shortages or new environmental regulations etc. If possible periodic review of survey for key criteria should be done.
2. Evaluating of procurement performance should be carried out periodically and respective course of action should be taken to strengthen the efficiency of Supply chain of ICT company.

6.2. Conclusion

As procurement is very crucial part of integrated supply chain, if any company can't manage effective procurement first then it can't be easy to manage effective or efficient supply chain. If someone can't deliver products at first stage of supply chain that is procurement, then all portion of supply chain will be delayed and lead time will increases. The results from this study suggested that purchasing performance could equally be measured using both financial and non-financial measures. As earlier indicated, having performance measures is not an end in itself but a means to effective and efficient control and monitoring of any function (Neely, 1999; Amaratunga & Baldry, 2002 and Waal, 2007). Therefore, organizations with established performance measures for their procedures, processes, and plans experience lower customer dissatisfaction. So described KPI of procurement, in this paper will be beneficial to monitor and improve performance of procurement of an ICT based company which turned into improvement of the company.

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Appendix-1



Opinion Poll for KPI Selection Criteria

For the fulfillment of the project on

Performance Evaluation of Procurement System in ICT Industry: A Case Study.

Prepared by:

Md. Delower Hossain

ID: 0412082011

Industrial & Production Engineering

Masters of Engineering

Department of Industrial Production Engineering

BUET.

General information of Participant

Name :

Organization :

Designation :

Contact number :

05 December, 2014

Dear Sir / Madam,

You are requested to participate in a research study by Md. Delower Hossain, student of Industrial Production Engineering, Masters in Engineering, Department of Industrial Production Engineering, BUET.

Please make available some time to complete this survey and provide your opinion against each criterion. Your response will be used for study and research purpose only and hence, this survey data will remain confidential.

We hope that you can find few minutes to complete this survey to help searching important criteria for KPI for the evaluation of procurement performance in ICT Industries in Bangladesh.

Please provide your opinion in the scale of 5 to 1 (very high important, very important, important, low important, very low important) and for your convenience the definitions of criteria are kept along with the scale.

I hope kind co-operations from your end.

Best Regards

Md. Delower Hossain

ID: 0412082011

Contact number: +880 173706686

E-mail: delower05.ipe@gmail.com

Dept. of IPE, BUET

Sl	Criteria	Definitions	Very high Important (Must)	Very Important	Important	Low Important	Very low Important (Negligible)
1	Product Price Variation	Percentage price variation between contract unit price and international unit price for focus products	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2	Effective Contract Utilization	Percentage by value of purchases made under simple purchase orders, annual contracts, and multi-year contracts	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3	Supplier Performance	Percentage of orders in compliance with contract criteria & Percentage of orders delivered on time	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4	Procurement Cycle Time	Percentage of procurements completed (placed) within standard time guidelines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5	Payment Processing Time	Percentage of supplier payments made within the payment period called for in the contract	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6	Emergency Procurement	Percentage, by value and number, of purchase orders or contracts issued as emergency orders	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7	Procurement Cost	Ratio of annual procurement unit cost-to-value of annual purchases	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>