

# **Practices and Challenges in the Procurement of Goods of Bangladesh Railway: A Case Study on Locomotive Spare-parts Procurement**

A dissertation in partial fulfilment of the requirements  
for the Degree of  
Masters in Procurement and Supply Management (MPSM)

by  
Engr. Md. Anwarul Islam  
MPSM, Fall-2014  
Student ID No. 14282008

**Masters in Procurement and Supply Management**  
February, 2015



BRAC Institute of Governance and Development (BIGD)  
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Submitted to:  
**Mr. Zahurul Islam, PhD**  
Academic Coordinator  
BIGD, BRAC University  
Mohakhali, Dhaka.

by  
**Engr. Md. Anwarul Islam**  
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BRAC Institute of Governance and Development (BIGD)  
**BRAC University, Dhaka.**

**21 March 2015**

To

**Mr. Zahurul Islam, PhD**  
Academic Coordinator  
BIGD, BRAC University  
Mohakhali, Dhaka.

Subject: **Submission of Final Dissertation Report.**

Dear Sir,

I have the great pleasure to submit a full and final Dissertation Report on '**Practices and Challenges in the Procurement of Goods of Bangladesh Railway: A Case Study on Locomotive Spare-parts Procurement**' as partial fulfillment of the requirements for the degree of **Masters in procurement and Supply Management (MPSM)** for your kind consideration.

Following materials are enclosed to this letter:

- (i) 2 copies of original report.
- (ii) Soft copy of the report in 2 CDs.

I would like to mention that this dissertation has been supervised by Mr. Md. Reaz Akter Mullick, PhD, Associate Professor, Department of Civil Engineering, Chittagong University of Engineering & Technology (CUET), Chittagong.

May I, therefore, pray and hope that you would be kind enough to accept my dissertation report and do the needful for awarding me the degree of MPSM

Sincerely yours,



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# DEDICATION

Dedicated to my wife whose constant inspiration and love enlighten me.

# DECLARATION

I hereby declare that I'm the sole author of this thesis. I confirm that this report has not been accepted for any degree and is not currently submitted in candidature of any degree.

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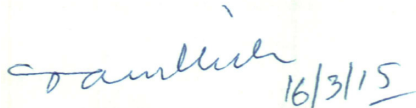
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## CERTIFICATION

This is my pleasure to certify that the dissertation entitled " **Practices and Challenges in the Procurement of Goods of Bangladesh Railway: A Case Study on Locomotive Spare-parts Procurement**" is an original work from Mr. Md. Anwarul Islam and it is completed under my direct guidance and supervision. I also certify that I have gone through the dissertation and found it satisfactory for submission to the BRAC Institute of Governance and Development (BIGD), BRAC University in partial fulfilment of the requirements for the degree of Masters in Procurement and Supply Management.



**(Dr. Md. Reaz Akter Mullick)**  
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Department of Civil Engineering  
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Chittagong, Bangladesh.

# ACKNOWLEDGEMENT

On the way of completion of this dissertation paper successfully I have got some people in favour of me, without their kind help and generous support it would have been difficult for me to complete this dissertation paper.

First and foremost, I would like to acknowledge my heartiest gratitude and indebtedness to my supervisor Dr. Md. Reaz Akter Mullick, Associate Professor, Department of Civil Engineering, Chittagong University of Engineering & Technology (CUET), Chittagong for his guidance, supervision and help in all stages of carrying out my work and also in preparation of the manuscript.

I would like to express my sincere thanks and profound gratitude to Dr. Zahurul Islam, Academic Co-ordinator, BRAC Institute of Governance and Development (BIGD) for giving me much of his valuable time in spite of his busy schedule for reviewing my script very patiently.

I would also like to express my heartfelt thanks to my colleagues of Bangladesh Railway who helped me on the way of giving their valuable comments, feedback, and suggestions during data collection and interview.

I am thankful to Mr. Engr. Salim Mohammad, the Chief Controller of Stores, Bangladesh Railway, Pahartali, Chittagong and his office who have aided me with confidential and valuable information. Specially, I would like to express my deep sense of gratitude to Mr. Ruhul Quader Azad, Director Inventory Control, Bangladesh Railway, CRB, Chittagong for his cooperation in getting inventory data. I am also thankful to Engr. Md. Burhan Uddin, Works Manager, Diesel Locomotive Workshop, Pahartali, Chittagong and Mr. Engr. Md. Rashedul Amin, District Controller of Stores (Purchase-2), Pahartali and Mr. Engr. Md. Rahid Hossain, Assistant Controller of Stores, Diesel Stores Depot, Pahartali and his staffs for giving me continuous support to carry out the study; otherwise it would have not been possible for me to complete it on time.

Last but not the least, I also express my heartiest thanks and gratefulness to the university authority including BIGD, the member of staff, faculty members, class mates for their continued help and valuable suggestions to complete this dissertation paper.

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## EXECUTIVE SUMMERY

Bangladesh Railway (BR), a principle transportation agency of the country, is a Government-owned and Government-managed organization. It operates and maintains the entire railway network of the country. The vision of BR is to provide safe, reliable, cost-effective, and time-efficient rail transport service in the country through modernizing, expanding, & maintaining rail system in a manner which supports government strategies for economic, social, & environmental development. To support the vision, BR has to procure goods to maintain & upgrade locomotives, coaches & other rolling stocks.

There are about 242 locomotives in the locomotive fleet of BR. To maintain these locomotives BR has four locomotive workshops: One central locomotive workshop at Parbatipur for overhauling locomotives as heavy schedule maintenance and three diesel workshops at Dhaka, Chittagong and Parbatipur for medium schedule maintenance. To provide necessary materials and spares required for the daily maintenance works in the workshops, BR has a centralized procurement system under the Stores Department headed by the Chief Controller of Stores (CCS). The Stores Department is responsible for maintaining the whole supply chain of BR as it is solely responsible for the procurement of all goods (production materials as well as MRO supplies) required by the different user departments of BR. BR has to manage a inventory of more than 30,000 items, of which more than 26000 items are for locomotive spare-parts. A considerable percentage of the locomotives have passed its economic service life. Non availability of the spare-parts is a major issue in the locomotive maintenance works. That is why the procurement of locomotive spare-parts is crucial and challenging for the Stores Department of Bangladesh Railway. And this dissertation was focused only to the procurement of locomotive spare-parts, by the Chief Controller of Stores, Bangladesh Railway, required for the Pahartali Diesel Locomotive Workshop.

The specific objectives of the study were to identify current practices of procurement, challenges faced in procuring diesel locomotive spare-parts, understanding the current consumers satisfaction level in terms of 'on time in-full (OTIF)' delivery and finally to suggest ways to improve the performance of procurement function and enhance the consumers satisfaction.

The objectives of the study were achieved through three approaches; the first one was questionnaires that were obtained from respondents' of the procurement office (CCS office), the consumers (Diesel Workshops) and experienced officials of BR who have worked in the procurement of loco-spares and maintenance of locomotives. The second one was studying some practical procurement cases of CCS office. The third one was key informant interviews



of procurement officers and staffs of CCS office as well as executives of consuming departments.

Questionnaires were prepared to know the general perception and attitude regarding inventory management, to evaluate the strategic factors affecting the demand of spares, choice of procurement method and strategy, the impact of regulations on public procurement (The Public Procurement Rules, 2008), category management and to evaluate the use of information and Communication Technology at central procurement office and to determine the level of satisfaction in terms of spars availability and so on.

After getting the response from the respondents' from questionnaires, practical experience and key informant interview, they are analysed in light of the objectives of the study and then the study recommends some of the key areas for improvement of procurement management. The researcher recommends a number of possible ways for improving areas to procurement management like organization and management, portfolio segmentation, sourcing, introducing sustainable tender and contract terms supplier base optimisation, relationships development and management with key suppliers, personnel management, introduction of ICT, contract management and Business Process Reengineering (BPR). The researcher believes that if BR considers and implements those recommendations in procurement management, certainly, the delivery performance will be improved considerably, and thereby, consumers' satisfaction will also be increased.

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## **ABBREVIATIONS AND ACRONYMS**

ACOS	:	Assistant Controller of Stores
ADG	:	Additional Director General
AMC	:	Average Monthly Consumption
APP	:	Annual Procurement Plan
BCP	:	Business Continuity Plan
BDT	:	Bangladesh Taka
BG	:	Broad Gauge
BIGD	:	BRAC Institute of Governance and Development
BOM	:	Bills of Materials
BPR	:	Business Process Reengineering
BR	:	Bangladesh Railway
BRA	:	Bangladesh Railway Authority
BRASS	:	Bangladesh Railway Automated Support System
C&W	:	Carriage And Wagon
CCS	:	Chief Controller of Stores
CFR	:	Cost and Freight (Incoterm 2010)
CIPS	:	The Chartered Institute of Procurement and Supply
CLW	:	Central Locomotive Workshop
CME	:	Chief Mechanical Engineer
ComEx	:	Commodity Exchange
CPTU	:	Central Procurement Technical Institute
CTG	:	Chittagong
DCOS	:	District Controller of Stores
DD	:	Deputy Director
DG	:	Director General
DIR	:	Director
DL	:	Diesel Locomotive
DLW	:	Diesel Locomotive Workshop
DPM	:	Direct Procurement Method
DRP	:	Disaster Recovery Plan
EOQ	:	Economic Order Quantity
ERP	:	Enterprise Resource planning
F&C	:	Fraud and Corruption
FC	:	Foreign Currency
FY	:	Fiscal Year
GOH	:	General Overhauling
HOPE	:	Head of Procuring Entity
HRM	:	Human Resources Management



ICC	: Inventory Control Cell
ICT	: Information and Communication Technology
IFT	: Invitation for Tender
ISO	: Organisation for International Standard
JIT	: Just in Time
KPI	: Key Performance Indicator
L/C	: Letter of Credit
L/D	: Liquidated damage
LT	: Lead Time
LTM	: Limited Tendering Method
MDM	: Manuscript Memorandum of Differences
MG	: Meter Gauge
MIS	: Management Information System
MOQ	: Minimum Order Quantity
MPS	: Master Production Schedule
MPSM	: Masters in Procurement and Supply Management
MRO	: Maintenance, Repair and Operation
MRP	: Material Requirement Planning
MRP-II	: Manufacturing Resource Planning-II
NL	: Numerical ledger
NOA	: Notification of Award
NymEX	: New York Mineral Exchange
OECD	: Organization for Economic Co-operation and Development
OEM	: <b>○</b> Original Equipment Manufacturer
OTIF	: <b>○</b> On Time in Full
PE	: Procuring Entity
PHT	: Pahartali
PI	: Purchase Indent
PO	: Purchase Order
PP&C	: Production Planning & Control
PP&C	: Progress, Planning and Coordination
PPR	: The Public Procurement Rules, 2008
PSI	: Pre-shipment Inspection
PXC	: Paksey
R&R	: Repair and Return
R. Note	: Receipt Note
RITES	: Rail India technical and Economic Service
RNB	: Railway Nirapatta Bahini
RS	: Rolling Stock
SR	: Stock Recoupmnt

TCO	:	Total Cost of Ownership
TEC	:	Tender Evaluation Committee
TER	:	Tender evaluation Report
TNA	:	Training Need Analysis
TOC	:	Tender opening Committee
TQM	:	Total Quality Management
VMI	:	Vendor Managed Inventory
WB	:	World Bank
WIP	:	Work in Progress
WLC	:	Whole Life Costing
WM	:	Works Manager

# CHAPTER 1

## INTRODUCTION

---

### 1.1 Background:

Bangladesh Railway (BR), a principle transportation agency of the country, is a Government-owned and Government-managed organization. As railway is a very important mode of inland transport, linking the entire length and breadth of the country, its healthy grow naturally contributes to the economic development of the country.

It operates and maintains the entire railway network of the country. BR is controlled by the Directorate General (DG) of Bangladesh Railway under the Ministry of Railways along with Bangladesh Railway Authority (BRA) and which works for policy guidance of BR. BR is comprised of various specialized departments such as Engineering, Mechanical, Electrical, Signalling & Telecommunication, Transportation, Commercial, Stores, Personnel, Finance, Planning, Medical, RNB, Estate department, etc.

BR operates international, inter-city, and suburban rail systems on its multi-gauge network. BR has own workshops under mechanical department for repair and maintenance works of rolling stocks (locomotives, carriage and wagons). It also owns coach production facilities. The vision of BR is to provide safe, reliable, cost-effective, and time-efficient rail transport service in the country through modernizing, expanding & maintaining rail system in a manner which supports government strategies for economic, social & environmental development. To support the vision, there are several missions of BR and following two are related to procurement of goods:

- Maintain & upgrade locomotives, coaches & other rolling stocks.
- Maintain and procure modern technology related rolling stocks, Track materials & signalling systems suitable for Bangladesh Railway.
- Develop & maintain railway tracks & station infrastructures throughout the country.

There are about 258 locomotives out of which 242 Diesel Electric (70 BG & 172 MG) and 16 Diesel Hydraulic (3 BG & 13 MG) locomotives in the locomotive fleet of BR ([BR<sup>1</sup>, 2013](#)). To maintain the locomotives, BR has four locomotive workshops:

- Central Locomotive Workshop (CLW), Parbatipur, Dinajpur
- Diesel locomotive Workshop (DLW), Pahartali, Chittagong and
- Diesel locomotive Workshop (DLW), Dhaka
- Diesel locomotive Workshop (DLW), Parbatipur, Dinajpur

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<sup>1</sup> Bangladesh Railway Information Book, 2013

To provide necessary materials and spares required for the daily maintenance works in the workshops, BR has a centralized procurement system under the Stores Department headed by the Chief Controller of Stores at Pahartali, Chittagong. The Stores Department is responsible for maintaining the whole supply chain of BR as it is solely responsible for the procurement of all goods (production materials as well as MRO supplies) required by the different user departments of Bangladesh Railway. BR has to manage a huge inventory of more than 30,000 items of which more than 26,000 items are of locomotive spare-parts. That is why the procurement of locomotive spare-parts is crucial and challenging for the Stores Department of Bangladesh Railway.

## **1.2 PROBLEM STATEMENT**

The locomotives of Bangladesh Railway are very old. A major portion of the locomotives have passed their normal economic life-span. Locomotives and their spare-parts are manufactured by a few numbers of loco-builders and OEMs in the world. These goods are specified and determined by the manufacturer's part numbers. So, loco-spares are treated as goods of specialised nature.

The spare-parts are categorised as 'critical' to the production of workshops, as these are not available in the local/ home market. These are needed to be imported from abroad requiring considerably higher lead time and consequently a huge amount of inventory of spare-parts have to be held in the warehouse, at the expense of huge inventory costs. For the efficient and effective management of such a huge inventory, effective use of inventory management software, such as MRP or ERP, is essential to optimise inventory level. But BR is not using MRP or ERP at present. And that is why providing spare-parts, cost effectively, at the time of workshops need is a problem.

This study investigated into the current practice of procurement used by the Stores Department of BR , analysed the risks and challenges and finally suggested an applicable way to improve procurement performance as well as to enhance consumer satisfaction.

### **1.3 RESEARCH QUESTIONS**

Understanding the problem of management in the loco-spares procurement, the research questions were:

- Does the current practice used by the Stores Department of BR in the procurement of locomotive spare-parts meet the needs of the consumers (workshops) in terms of availability of quality spare-parts required for schedule maintenance works of locomotives?
- What are the challenges and risks in loco-spares procurement by stores department of BR?

### **1.4 RESEARCH OBJECTIVES**

The purpose of the study was to examine the current procurement practice used by Stores Department of BR for the procurement of locomotive spare-parts and assess how much it would meet the needs of the workshops in terms of timely delivery. The specific objectives were:

- To explore current procurement system used by BR for the procurement of locomotive spare-parts.
- To analyse the adherence to the procurement regulations
- To identify the challenges in the current procurement system
- To determine the level of satisfaction of the consuming department in terms availability of spare-parts.
- To recommend ways for improvement in the procurement system

### **1.5 RATIONALE OF THE STUDY**

Procured materials, parts, and components represent a growing percentage of the cost of maintenance. These purchased goods often represent 60% to 70% of the cost of repair. The increase in materials handling costs coupled with higher transportation and distribution costs have also forced management to focus its attention in these areas.

The locomotive fleet own by BR is not sufficient to proper operation of railway. So it requires highest level of availability. The inventory management and procurement, of more 26,000 items of locomotive spare-parts effectively and efficiently, are the key concern of BR. Stores Code written in 1952 cannot satisfy the current needs. Moreover, introduction of the Public Procurement Rules, 2008 has become a new source of challenges as it voids the previous practice, which was very specific to the needs of BR. Therefore, this study intended

to examine current practice, identify challenges, and suggest more efficient and effective system of procurement.

## **1.6 SCOPE AND LIMITATION OF THE STUDY**

The study would have core intention to examine the existing procedures followed for the procurement of loco-spares by the stores department of BR by the CCS. This study focused on the Material Requirement Plan, Procurement Plan, Tendering system, and Procurement Methods used in the procurement of spare-parts required, only, for the Pahartali Diesel Workshop. This study went further to investigate and analyse the whole procurement cycle and to identify average lead time (the time elapsed between the demand generation and demand fulfilment) of the procurement of spare-parts for Pahartali Diesel Locomotive Workshop.

The study was completed within very short time span (January/15 to February/15), as this was the maximum time allocated for the dissertation. Therefore, the study had a narrow focused area covering only one consumer of spare-parts. Besides, there were financial budget constraints for carrying out this dissertation.

## **1.7 STRUCTURE OF THE REPORT**

The report is comprised of five chapters. The first chapter contains an **Introduction**-covering background, scope, rationale, research questions, and objectives, limitation of the study and structure of the thesis. Chapter Two consists of a **Literature Review**-covering the discussion on the existing literatures and conceptual frame work of this research. Chapter three contains **Research Methodology**- contains an explanation on the data collection methods and justification for using the methods. This chapter also contains analytical frame work of the study. Chapter four holds **Data Analysis and Result Discussion**-covers analysing the data, interpreting the results and findings. Chapter five is the final chapter: **Conclusion and Recommendation**-contains a decisive conclusion and recommendation for the improvement of the current procurement system.

## CHAPTER-2

# LITERATURE REVIEW

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### 2.1 Purchasing, Supply and Procurement

#### 2.1.1 Defining Purchasing, Supply and Procurement

**Purchasing** can be defined in various ways, depending on perspective. The purchasing function of an organisation involves the acquisition of supplies or inputs (raw materials, components, goods and services) to the organisation's activity. In some organisations, there is a purchasing department which has responsibility for carrying out this function, while in others, it may be carried out by individuals or teams in other department (such as production or finance), or as part of the larger more integrated cross-functional structure such as materials management, logistics management or supply chain management.

The basic objective or purpose of purchasing is 'to buy materials of the right quality, in the right quantity, delivered to the right place at the right time at the right price'

**Procurement** is a wider term than purchasing, which implies the acquisition of goods or services in return for a monetary or equivalent payment. Lysons & Farrington<sup>2</sup> argue that traditional definitions of purchasing are inadequate and outdated. Procurement may be defined as 'the process of obtaining goods or services in any way, including purchasing, hiring, leasing and borrowing'. Procurement is therefore a more accurate term for what organisation's procurement function actually does. It reflects the more proactive, relational, strategic and integrated role of the function in modern organisation.

**Supply** may be defined simply as the act (or process) providing something or making something available, often in response to buyers' or customers' requirement. In practice, supply often happens in a longer chain of activity by which outputs of one supplier become inputs of its customer, and so on.

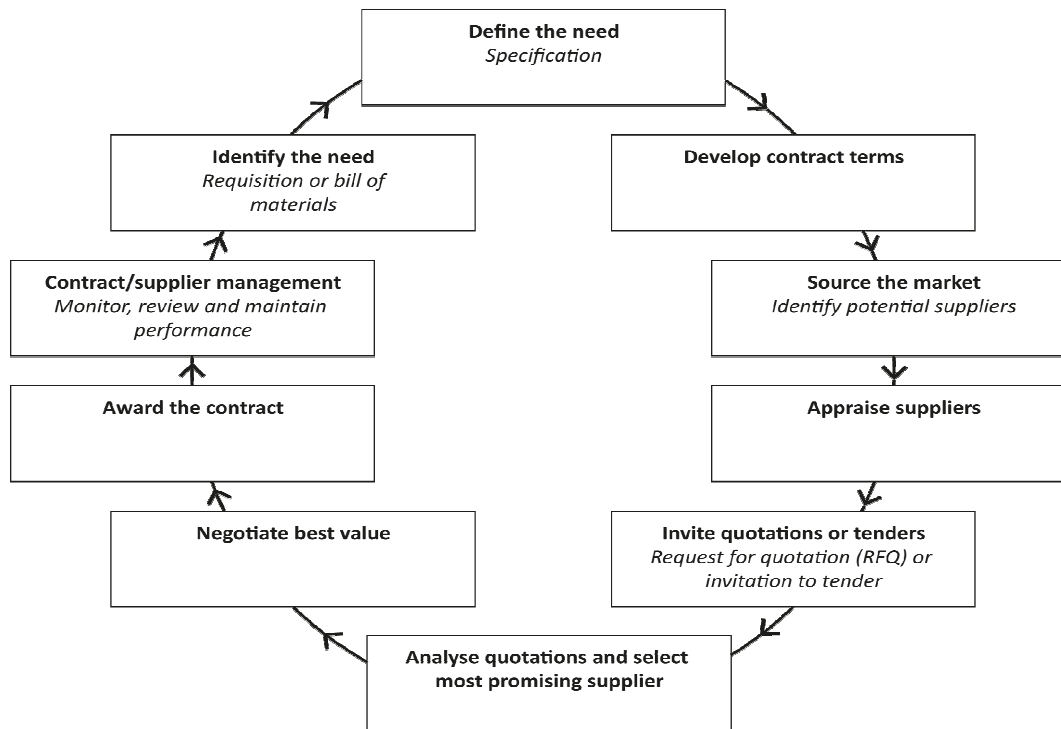
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<sup>2</sup> Purchasing & Supply Chain Management (Seventh Edition)-Lysons and Farrington

## 2.1.2 Generic Procurement Cycle

The generic procurement process may have several stages: from identifying the needs, defining the needs, developing contract terms, source the market, appraise suppliers, invite quotations, negotiate best value, award the contract, contract/supplier management (CIPS, 2012<sup>3</sup>).

Figure 1: Generic procurement cycle



For the purpose of this dissertation, **the author defines procurement as** ‘the strategic process of set stages, or a chain of events, undertaken by the procurement function (e.g. stores department in Bangladesh Railway) as part of the integrated supply chain, to make a purchase or acquisition, sourcing and negotiating with suppliers, placing an order, receiving the ordered supplies, and making payment under a regulatory framework on contractual means; and managing all issues arising thereby.

<sup>3</sup> Context of Procurement and Supply (CIPS, 2012)



## **2.2 Role of Procurement**

Role of procurement may vary widely according to departmental organisation, specific role descriptions, and organisation type, but in general, the task of procurement at an operational level includes the following activities:

- Supply market monitoring, and identifying potential sources of supply
- Supplier evaluation and selection
- Processing procurement or stock replenishment requests (requisitions)
- Providing input to the preparation of specifications for new purchases
- Negotiating, buying and developing contracts setting terms and conditions of trade between buyer and seller.
- Expediting or contract management ensuring that suppliers deliver according to the purchase order or contract
- Clerical and administrative tasks: record keeping, report generation and processing of documentation through all of the above activities.

## **2.3 Significance of Procurement**

### **2.3.1 Changes in the cost base of business**

In recent decades, the cost structures of manufacturing have been transformed. Previously, the largest expense was the cost of wages, due to labour intense manufacturing. Today the situation is different. Many industries have seen a huge investment in automated production process, and in many cases this has been accompanied by painful cuts in work forces.

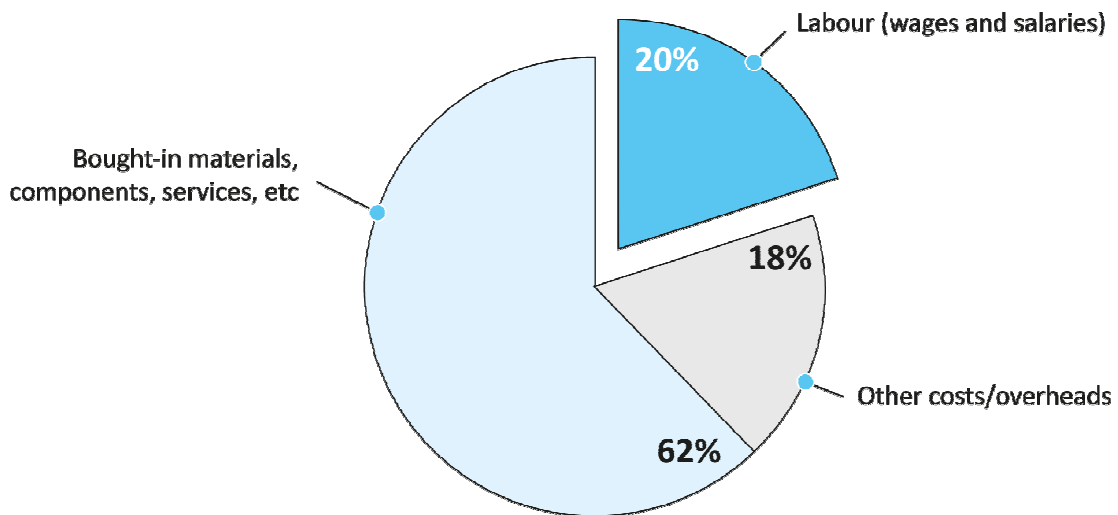
Manufacturing businesses have similarly increasingly ready to specialise in just one part of the manufacturing process. Where previously they might have 'made' product entirely from scratch, nowadays they are more like to 'buy' sub-assemblies or modules for that product from external suppliers and confine them to the assembly process.

One effect of these trends is to shift the balance of organisational costs away from internal labour costs-and towards external expenditure with suppliers and sub-contractors. Organisations spend a much greater proportion of their budgets on buying in goods, services and works than they used to do.

### 2.3.2 Typical Breakdown of costs

The situation will vary, according to the size and type of organisation and kinds of object of procurement. A typical view of the proportion of organisational costs represented by external procurements for a modern manufacturing company may be as follows:

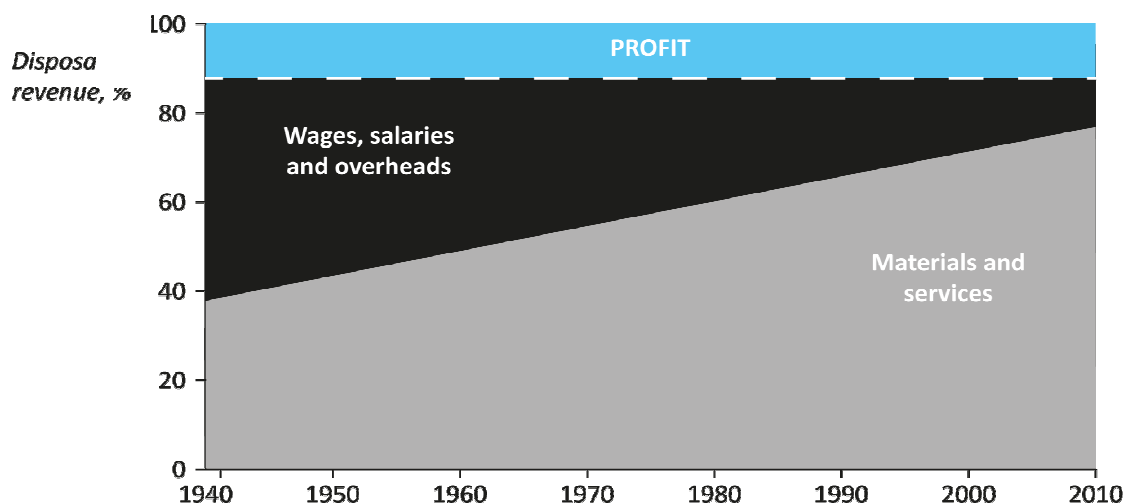
**Figure 2: Organisational costs represented by procurement spend<sup>4</sup>**



Source: Lysons & Farrington

The trend towards the growth of external spend in relation to internal costs such as wages and overheads in a manufacturing setting can be depicted as follows:

**Figure 3: The proportion of external to internal costs**



Source: Bailly et al

<sup>4</sup> Purchasing and Supply Chain Management (Lysons & Farrington)

One of the key implications of these trends for procurement is that, as the proportion of external expenditure rises, the potential impact of effective procurement activity on the costs, financial health and profitability of the organisation is correspondingly greater.

## **2.4 Categories of Procurement**

As procurement disciplines have been developed more and more widely, the procurement objects are divided into: Direct and In-direct Procurement, Commodity Procurement, Stock, and Non-stock Procurement, Capital Procurement, Consumables, and MRO supplies, in more general current terminology.

### **2.4.1 Direct and Indirect Procurement**

**Direct Procurement** refers to a range of situations when the items procured are either for resale or for incorporation in final product. In manufacturing setting, such as in locomotive repair workshop, these are often classified under the headings: raw-materials, components, assemblies and sub-assemblies, work-in-progress.

**Indirect Procurement** refers to the purchase of any other, ancillary items, including MRO supplies, services and other operating associated objects.

### **Significance of the difference**

A number of practical implications arise from the distinction between direct and indirect procurement:

- The quality of the direct procurements has the direct impact on the quality of the final products. By contrast quality of indirect the indirect procurement does not generally impact on the production quality.
- Direct procurements frequently need to be held in stock, in order to maintain production and service level. By contrast indirect procurements are usually made as and when required, minimising the inventory costs.
- Direct procurements are more likely to be made via longer-term, more collaborative supplier relationships, since the priority will be the security and continuity of supply. By contrast, indirect procurements are frequently made on the basis of one-off, transactional relationships, in order to take the advantage of price competition, since the priority will be cost efficiency.

- Direct procurements are more likely to be carried out by the procurement and supply chain department, because of their specialised nature, the need for complex contract and supplier management, and the potential impact of supply disruptions or quality problems on production operations. By contrast, indirect procurements are more likely to be carried out by the using departments, as they represent 're-buys' of standard supplies, often supported by 'approved suppliers lists' or 'framework agreements for supply' or 'blanket ordering' made by the supply chain department, against which orders can be 'called off' as required.

### 2.4.2 Commodity Procurement

Primary **Commodities** are items that occur in nature and provide raw-materials for businesses to incorporate in their products. They include minerals such as petroleum, coal, iron, ore, and bauxite.

The main challenges of sourcing commodities are:

- Commodities are unequally distributed, geographically: often involve procurement in international sourcing, which brings complex set of costs and risks.
- Commodities are subject to significant and unexpected fluctuations in price: often caused from weather conditions, industrial actions, political unrest, government policy

It is important for the purchasing department to monitor the relevant factors carefully. Generally, commodities are traded in the Commodity Exchanges (ComEx) such as New York Mineral Exchanges (NyMex). Four group of player's participate in these markets: Producers, Buyers, Traders, and Speculators. ComEx offers a numbers of methods to dampen price fluctuations and enable sensible forecasting and budgeting. 'Future Contract', 'Forward Contract', and 'Hedging' are common practice in case of commodity procurement.

### 2.4.3 Stock and Non-stock Procurement

Most organisations need to hold certain level of stock of items to meet customer needs and production requirements. Purchasing department procure **Stock Items** on the basis of formal or informal estimates of demand, based on historic usage rates, forecasted demand and so on. There are costs associated with holding stocks: cost of capital tied up in stock, cost of space and insurance, cost of stock wastage due to deterioration or obsolescence, and so on. Modern thinking 'lean thinking' emphasizes the need to minimise stock levels.

**Non Stock** procurement (Stock to order) policy refers the situations where purchasing department only procures materials as required to fulfil orders received from users and customers.

#### **2.4.4 Capital Procurement**

**Capital procurements** are, non-recurring, procurement of those items which have high acquisition costs and long life cycles, usually several years. Typical examples of capital procurements include: procurement of locomotives, plant, and machineries, construction of new railway tracks and so on. This requires different set of considerations because the initial purchase price is only one element, and sometimes not the most important element, in the 'total cost of ownership (TCO)' of the asset. The 'whole life costing (WLC)' of capital goods includes: cost of procurement, installation costs, operation costs, maintenance costs, downtime costs and disposal costs. Alternative options for capital procurements are: buy, lease, or hire.

### **2.5 Segmenting External Procurement**

#### **2.5.1 Procurement Portfolio Segmentation**

Segmentation is an approach to analysing expenditure with external suppliers by categorising the procurement portfolio or suppliers according to their priority, value, or importance to the organisation. The segment to which a procurement or supplier is allocated determines the procurement resources and approaches that will be used in each case. Procurement literatures suggest using the following tools for such segmentation: Pareto Analysis, Procurement Positioning Matrix etc.

#### **2.5.2 Pareto (or ABC) Analysis**

Italian economist Vilfredo Pareto formulated the proposition that 'in any series of elements to be controlled, a selected small factor in terms of number of elements (20%) almost always accounts for a large factor in terms of effort (80%)'.

In a procurement context, the Pareto principle can be interpreted as 80% of spends being directed towards just 20% of the suppliers. This elementary segmentation can be used to separate the critical few suppliers (who supply important, high-value, high-usage items, and limited source) from trivial many (who supply routine, low-value supplies). Most procurement effort and energy needs to be focused on the critical few suppliers and items procured from

them. This segmentation can be summarised<sup>5</sup> by categorising procurement or inventory in to following three categories:

**Category-A items:** Because of the high value, stock must be minimised, but due to high usage continuity of supply is important. Preferred option for procurement is 'Just in Time' (JIT), with known requirements and low buffer stock. Most procurement and managerial controls need to apply here.

**Category-B items:** Regular stock review and replenishment will be required, with ordering against demand forecast, and some buffer stock held to maintain continuity of supply. A moderate level of controls needs to exercise in this area.

**Category-C items:** High in number, but with low usage value suggests minimum procurement and managerial effort. Organisation may use automatic replenishment methods, such as 'two-bin' system or 'Vendor Managed inventory" (VMI), where responsibility for managing stock is delegated to the supplier. Larger levels of safety stock are typically held, to minimise transaction costs.

### 2.5.3 Procurement Positioning Matrix

The Pareto or ABC approach to segmentation is based on the value and volume of business the organisations do with the suppliers. However, this is not only factor that a procurement or supply chain department should consider when segmenting suppliers.

The procurement managers should consider the following two factors:

- **The importance of the items to the organisation:** related to factors such as Value of the annual procurement, its profit potential or cost reductions
- **The complexity of the supply market:** related to factors such as difficulty of sourcing, vulnerability of supply or supplier failure, relative position of purchaser to the supplier or to supply market.

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<sup>5</sup>Supply Chain in 90 Minutes (Emmett)

Procurement Positioning Matrix<sup>6</sup> is a tool which can be used to map the above two factors to segment procurement portfolio as shown below:

**Figure 4: The Kraljic Procurement Portfolio Matrix**

		<i>Complexity of the supply market</i>			
		Low		High	
<i>Importance of the item</i>	High	<b>Procurement focus</b> Leverage items  <b>Key performance criteria</b> Cost/price and materials flow management  <b>Typical sources</b> Multiple suppliers, chiefly local	<b>Time horizon</b> Varied, typically 12-24 months  <b>Items purchased</b> Mix of commodities and specified materials  <b>Supply</b> Abundant	<b>Procurement focus</b> Strategic items  <b>Key performance criteria</b> Long-term availability  <b>Typical sources</b> Established global suppliers	<b>Time horizon</b> Up to 10 years; governed by long-term strategic impact (risk and contract mix)  <b>Items purchased</b> Scarce and/or high-value materials  <b>Supply</b> Natural scarcity
	Low	<b>Procurement focus</b> Non-critical items  <b>Key performance criteria</b> Functional efficiency  <b>Typical sources</b> Established local suppliers	<b>Time horizon</b> Limited: normally 12 months or less  <b>Items purchased</b> Commodities, some specified materials  <b>Supply</b> Abundant	<b>Procurement focus</b> Bottleneck items  <b>Key performance criteria</b> Cost management and reliable short-term sourcing  <b>Typical sources</b> Global, predominantly new suppliers with new technology	<b>Time horizon</b> Variable, depending on availability vs short-term flexibility trade-offs  <b>Items purchased</b> Mainly specified materials  <b>Supply</b> Production-based scarcity

**For routine items:** (Low importance-low complexity: such as locally available non-critical spare parts having multiple source); procurement focus will be on procurement costs. Arm's length approached such as VMI, blanket ordering, framework agreements and call-off orders and e-procurement solutions, purchasing cards, will provide routine efficiency. Procurement management is achieved by monitoring expenditure against regular reports received from vendors, end-user, or e-procurement.

<sup>6</sup> Purchasing must become Supply Management (Peter Kraljic, 1983)

**For bottleneck items:** (Low importance-high complexity: such as propriety spare parts or specialised spare parts having limited source, which could cause operational delays, if unavailable); procurement focus will be on continuity and security of supply. This may be achieved through approaches such as medium to long-term contracts with selected suppliers; developing alternative or back-up sources of supply; including incentives and penalties in contracts to ensure the reliability of delivery; or keeping higher levels of buffer or safety stock.

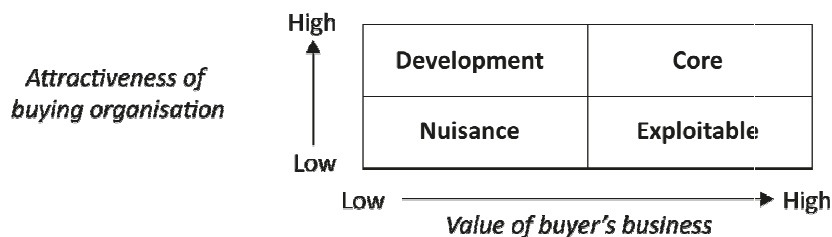
**For leverage items:** (High importance-low complexity: such as propriety spare parts or specialised spare parts having abundant source); procurement focus will be on using purchasing power in the market to secure best price and terms, on purely transactional basis. This may mean taking advantages of competitive pricing through: Standardising specifications to make supplier switching easier; using competitive bidding; forming procurement consortia to secure best deals.

**For strategic/critical items:** (High importance-high complexity: such as major components of locomotives); procurement focus will be on total costs, security and competitiveness of supply. This may be achieved through approaches such as developing long-term, mutually beneficial strategic relationship and relationships management disciplines.

#### 2.5.4 Supplier Preferencing

Procurement positioning models described above illustrate the buyers' perspective. For developing long-term collaborative relations with suppliers, it is desirable to examine how attractive the buying organisation in the eye of the selected suppliers. The Supplier Preferencing Model<sup>7</sup> is a tool for analysing how attractive it is to supplier to deal with a buyer, and the monetary value of the buyer's business to the supplier.

**Figure 5: Supplier Preferencing Model**



**Nuisance** customers are neither attractive nor valuable to do business with. For example, BR might be seen as a nuisance customer by GE Transportation, USA.

**Exploitable** customers offer large volume of business, which compensates for lack of attractiveness.

<sup>7</sup> Managing Contracts and Relationships in Procurement and Supply ( CIPS, 2012)



**Development** customers are attractive, despite of presently low levels of business, if potential to grow account is seen.

**Core** customers are highly desirable and valuable for suppliers, who will want to establish long-term, mutually profitable relationships, if possible.

## 2.6 Procurement Planning

To ensure availability of right quantity of materials at the right time strategic procurement planning is indispensable. Procurement regulations also emphasizes on the procurement plan at the beginning of each fiscal year (PPR, 2008)<sup>8</sup>. To make effect procurement plan, the purchasing managers need to consider the following factors:

- Production schedule or plan for manufacturing organisation
- Actual or estimated demand of materials
- Procurement portfolio segmentation and supplier preferencing
- Supplier segmentation
- Nature of the goods to be procured
- Market structure
- Supply side factors such as minimum order quantity (MOQ)
- Factors determining economic order quantity (EOQ)
- Lead time for procurement and supply
- Need by date, and so on.
- Inventory policy of the organisation (Push or Pull System)

### 2.6.1 Push Inventory Systems

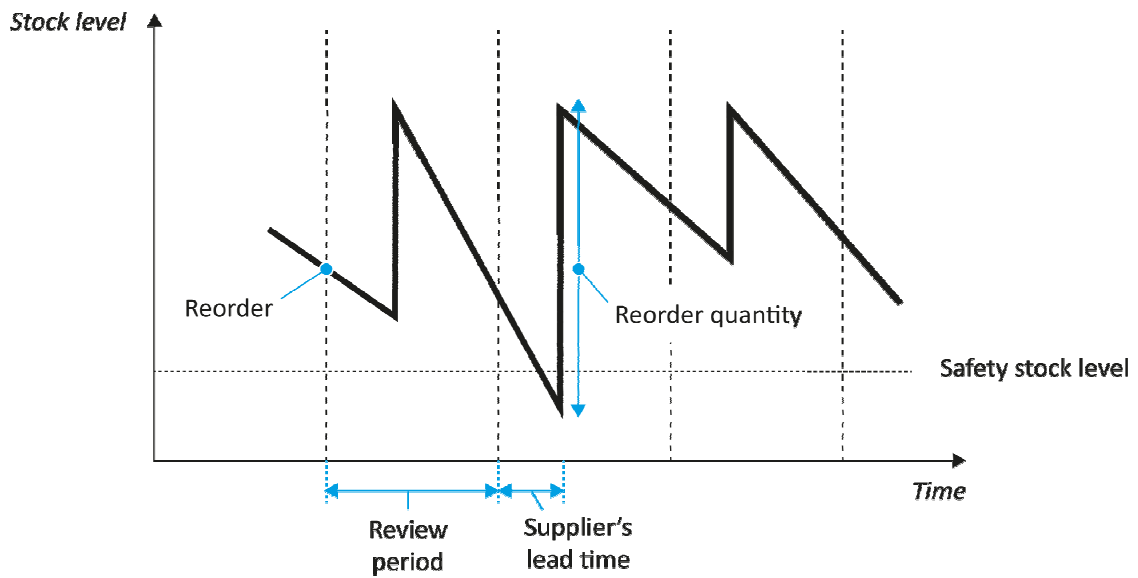
Push inventory system, for independent demand, aim to set up a regular system for monitoring levels of stock, and planning to replenish them in time to meet forecast demand. There are two main methods for replenishment: Periodic review system and fixed order quantity system (or Re-order Point system)

In **periodic review system**, the stock level of an item is reviewed at regular or fixed intervals, and depending on the quantity in stock a replenishment order is placed for whatever quantity appears to be appropriate to top up stock to the desired level. The review period will be determined depending on the category of the item.

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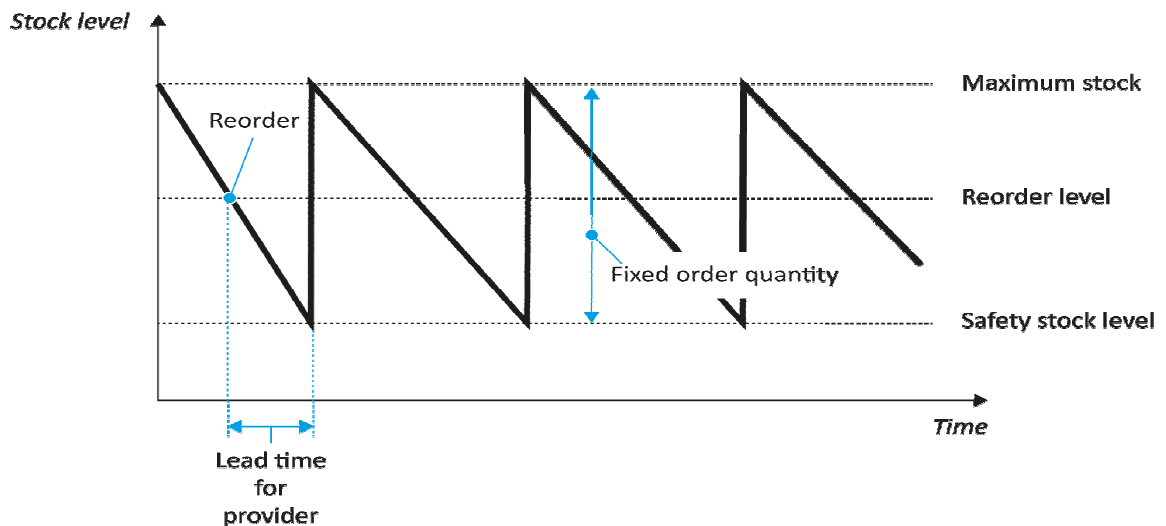
<sup>8</sup> The Public Procurement Regulations, 2008 (CPTU, GoB)

**Figure 6: Periodic Review System**



In a **fixed order quantity system**, stock item is replenished with a predetermined maximum quantity when inventory falls to a predetermined reorder level.

**Figure 7: Fixed Order Quantity System**



### 2.6.2 Pull Inventory Systems

Pull inventory management systems for dependent demand items, are based on producing goods in response to actual demand, such as actual production programme. In such system demand is much more certain: it can be planned to have low inventory, as in JIT.

Following are the world class practices for pull inventory management systems:

- (i) **Just in Time (JIT):** JIT is a radical Japanese approach to inventory reduction which aims to ensure that goods only arrive at the factory 'just in time' to go into the production.
- (ii) **Materials Requirement Planning (MRP):** MRP is a set of logically related procedures, decision rules, and records for managing dependent demand items. It is designed to translate a 'Master Production Schedule' (MPS) and 'Bills of Materials' (BOM) into 'time phased net requirements', taking into account existing stock, which trigger purchasing.
- (iii) **Manufacturing Resource Planning (MRP-II):** MRP-II is same as MRP plus personnel deployment, maintenance planning and financial analysis for accurate costing of manufacturing.
- (iv) **Enterprise Resource Planning (ERP):** ERP consolidates materials, manufacturing, logistics, supply chain, sales/ marketing, finance, and HR planning information into one integrated management system: a single database able to offer 'real time' information for solving range of business problems. It can handle both push and pull inventory system. It can be implemented through internet, intranet or extranet.

#### **Advantages of ERP:**

- (i) Faster inventory turnover may reduce inventory costs
- (ii) Improve customer service
- (iii) Better inventory accuracy
- (iv) Improved information management
- (v) Reduced inventory audit
- (vi) Eliminate duplication of effort and re-work
- (vii) Improved cash flow management

#### **Disadvantages of ERP:**

- (i) ERP implementation is very difficult, because it involves fundamental change from functional to process approach to business.
- (ii) ERP systems are very expensive; this is especially so when customisation of standard modules to accommodate different business processes is involved

- (iii) It has been estimated that some 50% of ERP implementation fail to deliver the anticipated benefits.
- (iv) Cost of training employees to use ERP is high

There may be a number of unintended consequences such as employee stress and a resistance to change and sharing information that was closely guarded by departments or functions

## **2.7 Supplier Appraisal and Pre-qualifications**

The purpose of supplier appraisal, evaluation, or pre-qualification is to ensure that a potential supplier will be able to perform any contract or tender that is awarded, to the required standard.

### **2.7.1 Pre-qualification**

'**Pre-qualification**' in its broadest sense is the assessment of criteria for supplier 'suitability', so that only pre-screened, short listed, suppliers with certain minimum standards of capability, capacity and compatibility are invited or considered for participation in a given sourcing process.

### **2.7.2 Supplier Appraisal**

'**Supplier appraisal**' or evaluation of potential suppliers, whether or not a separate prequalification is applied, in order to assess their capability and suitability, prior to entering into negotiation or other processes for supplier selection and contract award.

Pre-contract supplier appraisal may be used in several circumstances: to make a list of approved suppliers, for new purchases for which there are no approved source of supply, existing suppliers are unable to supply

### **2.7.3 Factors to be Considered for Supplier Appraisal**

Potential supplier may be appraised covering a wide and complex variety of factors that a purchaser may consider essential or desirable in its supplier. Criteria should be related to the requirements of the particular purchasing organisation and procurement type.

A comprehensive model frequently referred to in the procurement literature is the '**10 Cs**'<sup>9</sup>, as follows:

- i. **Capability** of the supplier to fulfilment the contract.
- ii. **Capacity** of the supplier to meet purchaser's present and future needs.

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<sup>9</sup> Original Framework (Ray Carter)

- iii. **Commitment** of the supplier to key values such as quality, service or cost management.
- iv. **Control** systems in place to monitor and manage resources and risks.
- v. **Cash** resources to ensure the financial status and stability of the supplier
- vi. **Consistency** in delivery and improvement of quality and service
- vii. **Cost:** price, the whole life cost and value for money offered by the supplier
- viii. **Compatibility** of the supplier with the buying organisation: both in terms of culture and technology.
- ix. **Compliance** with environmental, corporate social responsibility or sustainability standards, legislation, and regulations
- x. **Communication** efficiency and technology to support collaboration and coordination in the supply chain

## **2.8 Procurement Regulations and Procurement Methods**

### **2.8.1 Procurement Regulations in Bangladesh Railway**

In Bangladesh, government has passed procurement act and rules for the public sector procurement, in the name of 'the Public Procurement Act, 2006' (Act No 24 of 2006) and 'the Public Procurement Rules, 2008'. And these have been come into force on 31<sup>st</sup> January, 2008<sup>10</sup>.

### **2.8.2 Salient Features of the PPR, 2008**

The salient features of the PPR, 2008

- i. Annual Procurement Plan to be approved by the Head of the Procuring Entity or his Authorised Officer
- ii. Tender Document based on Standard Tender Document published by the CPTU
- iii. Preparation of Official Estimate for the procurement and to be kept confidential
- iv. Invitation and Publication of Invitation for Tender (IFT) in prescribed manner, including publication in the CPTU website for high value procurement.
- v. Tender selling, receiving, opening and evaluation
- vi. Formation of Tender Opening Committee (TOC)

<sup>10</sup>SRO No. 21-law/2008 dated 24 January 2008.

- vii. Formation of Tender Evaluation Committee (TSC)
- viii. Awarding contract based on Technical and Financial criteria considering economic factors, not only lowest price.
- ix. Approving Authority and Procedure for Approval, including timelines for each activity
- x. Separation of levels from the Procuring Entity and the Approving Authority.
- xi. Right to Complain by the aggrieved tenderer or supplier
- xii. Publication of Contract Award
- xiii. Contract Administration and Management.
- xiv. Debriefing
- xv. Safekeeping of Record of Procurement for Audit Trail
- xvi. Post Procurement Review
- xvii. Non Discrimination
- xviii. Professional Misconduct, Conflict of Interest and Ethical Behaviour

### **2.8.3 Methods of Procurement**

The PPR, 2008 describe the context, financial threshold, and procedure to be followed for any specific procurement. According to these rules tendering methods for procurement of goods are:

- i. Open Tendering Method (OTM);
- ii. Limited Tendering Method (LTM);
- iii. Request for Quotation (RFQ);
- iv. Two Stage Tendering Method (TSTM);
- v. One Stage Two Envelope Tendering Method (OSTM); and
- vi. Direct Procurement Method (DPM)

## **2.9 Supply Base Rationalisation and Supplier Tiering**

### **2.9.1 Supply Base Rationalisation**

The 'supplier base' is all the vendors that supply a given purchasing organisation. Supplier bases are often grouped in terms of location (local, international or global) and characteristics ( diversified or specialised) or size (broad, narrow, single –sourced).

The purchaser can manage supply risk by having more potential suppliers of a given item or category of purchases, pre-qualified and approved as being able to meet its requirements. Another advantage of broadening the supply base is it enables the buyer to be more opportunistic: taking advantage of the best available price, trading terms, quality, innovation, and flexibility on offer.

Strong collaborative supplier relationships are used to narrow supply, enabling purchasing to be concentrated on smaller group of developed and trusted supply partners. However, a very narrow supplier base opens the buyer to the risks of over-dependence on a single supplier, in the event of supplier failure.

Supplier base rationalisation is concerned with determining roughly how many suppliers the buying organisation wants to deal with. This can be done by managing tiered supplier base.

### 2.9.2 Supplier Tiering

Supply base optimisation aims to manage the trade-off between:

- (a) The desire to minimise the costs and complexity of managing a large supplier base and
- (b) The desire to minimise the risks of having a very narrow supplier base.

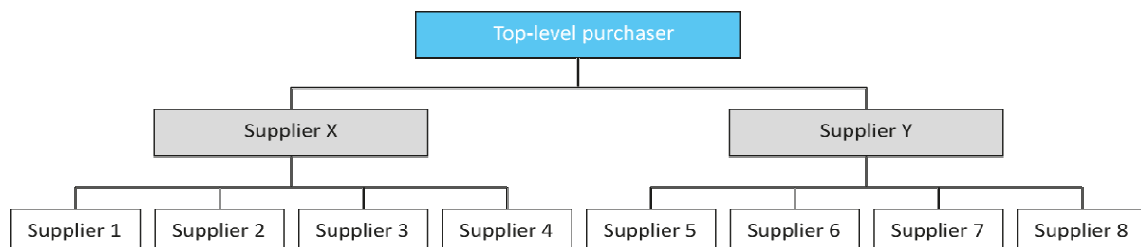
If a manufacturer buys in parts from a number of suppliers, and assembles them through a number of stages to produce a finished product. The structure of the supply chain function in this is as illustrated in fig. 2.8.

**Figure 8: Non-tiered Supply Base**



By contrast, if the same manufacturer sees strategic advantage in outsourcing all activities other than the final stages of production, in that case, its direct procurement relationship may be with a single supplier or tier of suppliers. Each supplier in the first tier would have an extensive role to fulfil in the manufacture of the final product, making use of ‘second-tier’ suppliers as illustrated in fig. 2.9.

**Figure 9: Tiered Supply Base**



In a manufacturing operation such as an automobile manufacturer, the top-level purchaser is the “**Original Equipment Manufacturer**” (OEM) or assembler, which manages few numbers

of specialist manufacturers of sub-assemblies. They will organise and manage a second tier of suppliers of component manufacturers, metal finishers, and so on, from which they can source required items on the OEM's behalf.

## **2.10 Managing Contract and Relationships with Suppliers**

### **2.10.1 Contract Management**

Contract Management is a process designed to ensure that both parties to a contract meet their obligations, and that the intended outcomes of a contract are delivered. It also involves building a good working relationship between the buyer and supplier, continuing through the life of a contract.

Once the contract has been awarded, the buyer accepts the following ongoing responsibilities:

- To maintain regular contract with the supplier
- To monitor the supplier's performance against the agreed terms and standards.
- To motivate the supplier
- To work with the supplier to solve any performance and relationship problems

### **2.10.2 Elements of Contract Management**

Key elements of contract management are:

- **Contract development:** the formation of legally binding agreement, setting detailed terms of trade, and specifications of requirements.
- **Contract communication:** copies of the contract documents and delivery plans, and change orders should be distributed to those involved with managing them on day-to-day basis.
- **Contract administration:** the implementation of procedures, by buyer and supplier, to ensure that contract obligations are fulfilled. This may include procedure for:
  - o Contract maintenance, updating and change control
  - o Budgeting and monitoring of costs and charges
  - o Ordering and payment procedures
  - o Management reporting
- **Managing contract performance:** includes the following:
  - o Risk management
  - o Performance monitoring and measurements
  - o Supplier motivation
  - o Performance management



- **Relationship management:** It includes the following:
  - o Developing working relationship through regular contract, communications, and information sharing.
  - o Supplier performance measurement and vendor rating
  - o Assessing right relationships: Transactional or long term collaborative relationships (e.g. outsource, partnership etc.)
  - o Supplier development (Training, giving opportunity to use purchasers resources, helping them to get finance from bank, etc)
  
- **Contract renewal or termination:** towards the end of the contract period, contract manager should review the contract in terms of success of the contract and relationships as well as the needs of supply, if need has been met, or performance is unsatisfactory the contract may be terminated. Contract may be renewed, if ongoing need remains.

## 2.11 Risks, Hazards and Vulnerability in Procurements

**Risk** is ‘the probability of an unwanted outcome happening’<sup>11</sup>. Probability is a measure of likelihood of occurring a given event or result. **Hazard** is ‘source of potential harm’<sup>12</sup> **Vulnerability** is ‘an area of weakness that can be exploited, which ‘makes the risk greater’<sup>13</sup>

### 2.11.1 Categories of Risks

Risks may be categorised in the following broad heads: Strategic Risks, Operational Risks and hazards, Financial Risks, Compliance Risks.

#### Strategic Risks

Strategic risks arise from organisation’s vision and direction, its positioning in a particular industry or market or geographic area. Example of strategic risks include decisions about: Markets, Competitors, Technology, The economy, Consumer needs, Corporate level legal issues and Merger and acquisition risks.

#### Operational Risks and Hazards

Operational risks arise from the functional, operational and administrative procedures by which organisational strategies are pursued. They primarily relate to the production and service delivery operations of the organisation. Example of operational risks include: Supply

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<sup>11</sup> Managing Risks in Supply Chains (CIPS, 2012)

<sup>12</sup> ISO-31000

<sup>13</sup> Managing Risks in Supply Chains (CIPS, 2012)

security, Supplier security, Quality, Delivery ,Fraud, Health and safety, Transport and logistics, System and technology security, Weather and so on.

### **Financial Risks**

Financial risks arise from internal financial structures of the business and the financial transactions with the external organisations. It may, also, come from the macro-economy of the country. Examples of financial risks include: Interest rate, Exchange rate, Cashflow and liquidity, Costs and credits

### **Compliance Risks:**

Compliance risks arise from the need to ensure compliance with laws, regulations and policy frameworks; and the potential damage incurred by exposure of non-compliance or illegal activity by the organisation or its supply chains.

Examples of compliance risks include: Company law, Tax law and requirements, Environment regulations, Ethical standards and internal control, Employment law.

### **2.11.2 Fraud Risks in Procurement and Supply Chains**

**Fraud** is ‘an act of deliberate deception, with an intention of gaining some benefit’<sup>14</sup>. This is a key area of risk management, as it raises financial, compliance and reputational risk. Types of corruption and fraud are: Fraud, Bribery and Money laundering.

**Main Categories of Fraud:** In a corporate context, fraud generally falls into one of the following two main categories:

- **Removal of fund or assets from business:** examples include-
  - Theft of cash, goods, equipment or stationary
  - Over statement of expenses claims
  - Creation and payment against false invoices
  - Authorisation of salary payments to non-existent staff members and so on
- **Intentional misrepresentation:** examples include-
  - Omission or miss-recordings of company’s account
  - Falsification of data in financial statements
  - Overstating profits or stock position

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<sup>14</sup> Chambers Concise Dictionary.

## 2.12 Main Operational Risks in Supply Chains

### 2.12.1 Contract Failure Risks:

Contract failure means non-performance of the obligations of a contract. Contract is essentially a risk management tool. It is designed to minimise the risk of loss or damage to the organisation and its owners arising from curtail or cease of activities owing to supply failure or disruption, lack of resources or breakdown in supplier relationships.

Risks of contract failure arise from supplier's reliability and performance and/or from the buyer's contract, project and supplier management policies and practices.

Contract failure risks might be rooted to the following risks:

- Poor contract development and contracting processes-e.g. ambiguous terms
- Unmanaged '**battle of the forms**'
- Poor Contract Administration and change control
- Lack of protection against IPR and confidentiality
- Issues of liability
- Applicable laws and jurisdiction
- Negotiation Risks

### 2.12.2 Financial Risks

Financial risks arise from internal financial structures of the business and the financial transactions with the external organisations. It may, also, come from the macro-economy of the country.

Examples of risks which arise from internal financial structure:

- Lack of price or cost analysis in setting or negotiating prices for a contract
- Lack of budgetary and cost control and management through the life cycle of the contract
- poorly designed financial control and procurement or payment procedure
- procurement and other financial fraud

Examples of risks which arise from external financial structure:

- **Macro-economic factor such as:** business cycles, fluctuation in the commodity price and exchange rate, availability and costs of finance
- **The financial strength, stability, and general health of suppliers:** Poor credit rating, high gearing ratio, cashflow problem, supplier insolvency leading to supply failure.

### 2.12.3 Currency and Exchange Rate Risk

One of the key considerations in international sourcing is the need to manage risks arising from exchange rates. Importers want the value of their domestic currency to be high as possible, so that their imports are cheaper in domestic terms. The position of the exporters will be just reversed.

Fluctuation in foreign exchange rates, therefore, represents a source of financial risks for purchasing organisations. An overseas supplier will normally quote their price in its own currency (FC), buyer will need to purchase FC in order to make payment. If the value of the domestic currency is weakened, the buyer will end up paying more. The risk is even greater if staged payments are to be made.

### 2.12.4 Managing Exchange Rate Risk:

There are numbers of ways of managing exchange rate risks:

- **Transfer the risk:** Transfer the risk to the supplier by getting them to quote in buyer's domestic currency.
- **Fixed Rate:** If the exchange rate is more or less stable, negotiate a fixed exchange rate applicable at the time of payment.
- **Leading payment:** Pay in advance, at the time of contract and do not wait for delivery, to take the advantage of positive low exchange rate.
- **Lagging payment:** Pay latter than agreed time, to take the advantage of exchange rate. There is a risk of reputational damage and it is also an ethical issue.
- **Hedging: Forward Exchange Contract:** Contract now to buy FC at a stated future date, at a rate agreed now. For example, a purchaser enters into a forward exchange contract on day-1, to purchase FC 1million on day-60 at a rate fixed by the bank on day-1, to make payment to overseas supplier. There is a cost of doing so, but the uncertainty is removed. The purchaser knows on day-1 exactly how much its purchase will cost.
- If the risk is severe, consider temporarily **sourcing from domestic market**, if available or from a market with less volatility.

### 2.13 Supplier's Financial Instability

The risk of supplier encountering financial instability is a major focus of contract and supplier management.

Financial information about suppliers can be obtained from various sources:

- Published financial statements and accounts: balance sheet, profit and loss account and cashflow statement
- Secondary data on suppliers: Analysis of financial statements and result in business and trade press, published bespoke reports by research agencies-such as Dun & Bradstreet or DataMonitor.
- Credit rating companies
- Networking with other buyers who use the same suppliers
- Inviting supplier's financial director to make presentation on their financial status

### **Signs of financial Instability of Suppliers**

- It is not making profit or is experiencing falling profit margins or is making loss
- It is not managing cashflow or is experiencing a strong cash drain, making difficult to meet its short term liabilities (debts and expenses)
- It has more loan capitals than share capitals, incurring high finance costs performance
- Additional signs:
  - Rapid deterioration in delivery and quality performance
  - Senior managers leaving the business within a short period of time
  - Changes in the auditors and bankers of the firm
  - Adverse press reports
- Very slow responses to requests for information
- Problems in the supply chain e.g.- changes in subcontractor
- Chasing payment before it is due

### **2.14 Quality Failure Risks**

**Right quality** is 'Fitness for purpose' or 'Conformance to requirements or specifications' or 'Comparative excellence'.

**Cost of quality:** Cost of ensuring and assuring quality. It involves:

Appraisal cost, Prevention cost and Failure cost: internal failure cost + external failure cost

Failure cost= internal failure cost + external failure cost

- **Internal Costs**
  - Loss or reworking
  - Scrapping
  - Re-inspection
  - Downgrading
  - Waste incurred in holding contingency stock
  - Time and cost of activities
  
- **External Costs**
  - Costs of reverse logistics
  - Cost of repairing and replacing
  - Cost of customer claims
  - Administrative costs of handling complaints
  - Cost of lost customer
  - Reputational damage due to dissatisfied customer and negative publicity

Therefore, cost of **'getting it wrong'** is generally greater than the cost of **'getting it right'** and that is why there has generally been an increase emphasis on **Quality Management System (QMS)**, with the aim of **'getting it right first time'**.

## **2.15 Quality Management**

Basic two approaches for quality management are Quality Control (QC) and Quality Assurance (QA).

### **2.15.1 Quality Control**

Quality Control is a system for the detection and correction of defects. This is essentially a reactive approach, focusing on:

- Establishing specification, standards and tolerances
- Sampling and inspection
- Identifying defective goods
- Scrapping or re-working

### **2.15.2 Quality Assurance**

Quality Assurance is a system for the proactive prevention of defects. This is essentially a proactive and integrated approach to quality risk management, building quality in every stage of the process. It is a matter of **'building in quality'**- not **'weeding out defects'**. It focuses on:

- Product design
- Specification and contract

- Robust supplier selection and award
- Supplier development and management
- Continuous improvement and
- **Total Quality Management (TQM)**

### **2.15.3 Total Quality Management (TQM):**

It refers to a radical approach to quality management, as a business philosophy. TQM is an orientation to quality in which quality values and aspirations are applied to the management of all resources and relationships within the firm-and throughout the supply chain, in order to seek continuous improvement and excellence al all aspects of performance.

### **2.16 Security of Supply Risks**

Supply risk is the risk associated with suppliers being unable to supply or supplying goods inadequate quality. It may arise from:

- Poor supplier appraisal, selection and contracting
- Poor contract and/or supplier management
- Unanticipated level of demand
- Un anticipated shortage of material or price fluctuation due to environmental factors
- Unmanaged performance issues or quality and delivery
- Excessively lean supply
- Natural disaster
- Suppliers system failure
- Financial instability of supplier due to macro economic factors
- Increased logistics complexity and disruption of transportation links
- Lack of physical security of goods

### **2.17 Technology and Information Risks**

Information risks may arise from:

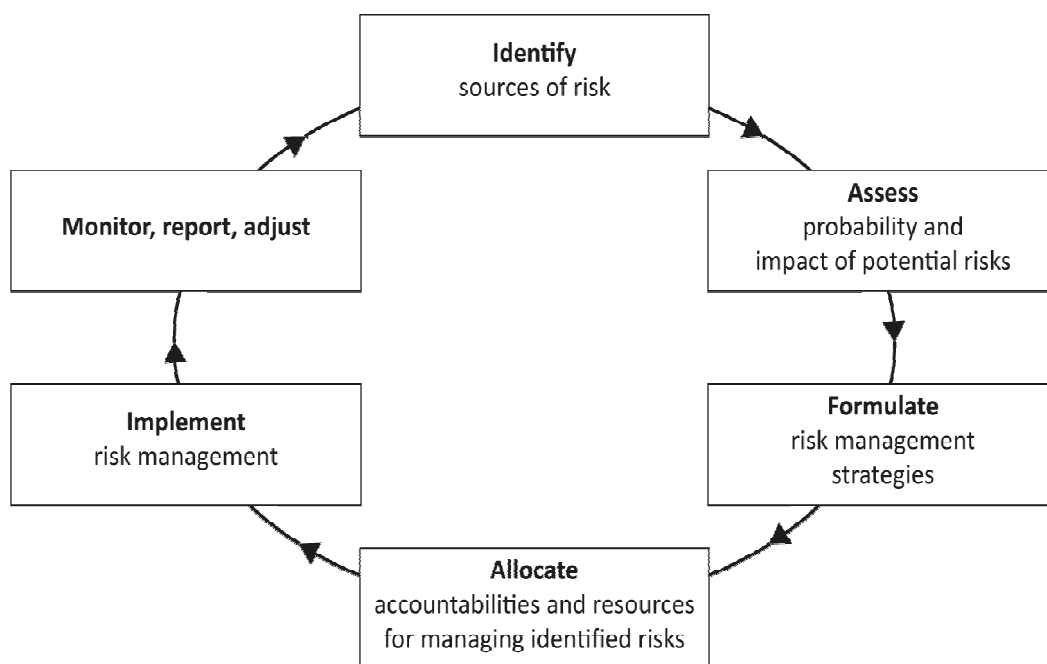
- Technology failure
- Hardware and software theft
- Cyber attack and data theft
- Implementation of new technology
- Information Risks
- Role of information Assurance

## 2.18 Managing Risks in Procurement

### 2.18.1 Risk Management Process

**Risk management** is ‘the process whereby organisation methodically addresses the risks attaching to the activities with the goal of achieving sustained benefit within each activity and across the portfolio of all activities’<sup>15</sup>. It involves understanding and analysing the nature of the risks involved; calculating the possibility and impact of the risk event and developing options to offset or reduce the risks.

**Figure 10: Generic Risk Management Cycle**



### 2.18.2 Risk Management Options

The objective of the risk management is, therefore, to arrive at a residual risk exposure which is acceptable to the organisations. Basic risk response options are:

- **Tolerate (or accept) the risk:** if the assessed likelihood or impact of the risk is negligible (or there is no viable way to reduce the risk), no further action may, for the moment, be required, or justified
- **Transfer (or spread) the risk:** e.g. by taking out insurance cover, or not putting all supply eggs in one basket – or using contract terms to ensure that the costs of risk events will be borne by (or shared with) supply chain partners

<sup>15</sup> The Institute for Risk Management (IRM)



- **Terminate (or avoid) the risk:** if the risk associated with a particular project or decision is too great, and cannot be reduced, the organisation may consider not investing or engaging in the activity or opportunity
- **Treat (mitigate, minimise or control) the risk:** take active steps to manage the risk in such a way as to reduce or minimise its likelihood or potential impact, or both

### 2.18.3 Risk Management Grid

Figure 11: Risk Management Grid

		<i>Impact/effect on organisation</i>	
		Low	High
<i>Likelihood of occurrence</i>	Low	A	C
	High	B	D

### 2.19 Corporate Governance and risk management:

Corporate governance refers broadly to ‘the rules, policies, processes and organisational structures by which organisations are operated, controlled and regulated, to ensure that they adhere to accepted ethical standard, good practices, laws and regulations’<sup>16</sup>. In Bangladesh the Public Procurement Act, 2006 and the Public procurement Rules, 2008 provide a major source of regulations for the procurement in the public sector. It defines the standard practice of procurement process. Many risks of procurement can be managed if it is followed.

#### 2.19.1 Risk Management Tools:

##### Developing mechanisms supportive for good governance in procurement:

- A strong internal control environment designed to support business objectives and to identify area of risk:
- Development and application of codes of ethical conduct in procurement activities
- The effective budgeting, controlling, and monitoring of procurement spend across the organisation.
- Clearly defined roles, responsibilities, and accountabilities.
- Control over the authority levels of the individual procurement personnel.

<sup>16</sup> Managing Risks in Supply Chains (CIPS, 2012)

- Clear requirements for approvals and authorisations of requisitions, procurements, and payments.
- The requirements of clear audit trails (record keeping)
- The segregation or division of procurement duties (award by higher authority than the procuring entity)
- Rotation of project buyers (regular transfer of procurement personnel)
- Mandatory use of holiday allowances
- Control over preferred supplier list and single sourcing deals (administrative approval before starting direct procurement method)
- The use of e-procurement tools to minimise cash transactions.
- The use of physical security measures to protect asset, cash and data.
- The use of standard terms and conditions of contract
- Internal audit of procurement processes, decisions and controls.
- Encouraging employees and suppliers to report ethical breaches ('whistle blowing')
- Establishing an ethical forum or committee to discuss ethical issues and conflict of interests arising in course of work (code of ethics for procurement)

## **2.20 Procurement Performance: Customer Satisfaction**

Procurement performance measurement is the comparison of a procurement function's current performance against:

- Defined performance criteria (e.g. KPIs), to establish whether the aimed-for or agreed level of performance has been achieved.
- Previous performance, to identify deterioration or improvement trends.
- The performance of other procurement functions in the related area, or standard benchmarks, to identify areas where performance falls short of best practice.

### **2.20.1 Key Performance Indicators (KPI)**

Different authors defined performance in different ways. According to Federal Highway Administration, U.S. Department of Transportation (2009), "Performance is a qualitative or quantitative measure of outcomes, outputs, efficiency, or cost-effectiveness". As per National Committee for Quality Assurance, USA (2009) "Performance is a quantifiable measure to assess how well the organization carries out specific functions or processes"

According to Chartered Institute of purchasing and Supply (CIPS), using Key Performance Indicators (KPI) is the best way to measure procurement performance of an organization(CIPS<sup>17</sup>, 2011). Performance of two organizations can also be effectively compared through KPI.

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<sup>17</sup> Measuring Purchasing Performance (CIPS, 2011)

Organization for Economic Co-operation and Development (OECD) together with the World Bank developed (*OECD<sup>18</sup>, 2006*) a set of indicators to assess the national procurement capacity. These performance indicators are the basis for subsequent KPIs developed to measure the performance of public procurement. OECD performance indicators address the following areas of public procurement system. Subsequently, inspired by the OECD indicators, the World Bank uses the following 35 indicators while assessing the implementation of Public Procurement Regulations in Bangladesh (The World Bank<sup>19</sup>, 2009).

**Table 1: Procurement Performance Indicators by World Bank**

Indicator #	Process/Area	Procurement Performance Indicator
1.	Annual Procurement Plan	% of procuring entities prepared annual procurement plan
2.	Contract packaging	% of contracts in a procurement plan appropriately packaged.
3.	Advertisement of tender opportunities in newspaper	% of open tender publicly advertised
4.	Advertisement of tender opportunities in CPTU's website	% of open tender (above threshold) advertised in CPTU's website
5.	Multiple submission of tender	% of cases allowed submission of tenders in multiple locations.
6.	Tender preparation time in open tendering method	Average number of days between IFB publication and tender submission deadline.
7.	Tender preparation time compliance	% of cases allowed adequate time for tender preparation.
8.	Sale of tender documents	Average number of tender documents sold

<sup>18</sup> Methodology for assessment of national procurement systems, 2006 (OECD)

<sup>19</sup> Assessment of Implementation of Public Procurement Regulations, 2009 (WB)

Indicator #	Process/Area	Procurement Performance Indicator
9.	Tenderers' participation	Average number of tenderers submitting tenders.
10.	Tender Opening Committee formation	% of cases TOC included at least one member from TEC.
11.	Tender Evaluation Committee Formation	% of cases TEC formed by contract approving authority.
12.	Outside member in TEC	% of cases TEC included two external members outside the procuring entity.
13.	Tender evaluation time	Average number of days between tender opening and completion of evaluation.
14.	Compliance of tender evaluation time	% of cases tender evaluation has been completed within timeline.
15.	Tender Acceptance	Average no. of responsive tenders
16.	Re-tendering	% of cases TEC recommended for re-tendering
17.	Tender Evaluation Approval Time	Average number of days taken by the approving authority.
18.	Submission of evaluation report to appropriate authority	% of cases TEC submitted report directly to the approving authority.
19.	TER approval compliance	% of cases contract award decision made within timeline by contract approving authority.
20.	Additional review of TER	% of cases TER reviewed by person / committee other than the contract approving authority.
21.	Tender processing lead time	Average number of days between tender opening and Notification of Award (NOA).
22.	Publication of award information	% of contract awards published in CPTU's website.

Indicator #	Process/Area	Procurement Performance Indicator
23.	Efficiency in contract award	% of contracts awarded within initial tender
24.	Opening of L/C	Average number of days taken between signing of contract and issue of L/C
25.	Delivery time	% of contracts completed within original deadline.
26.	Liquidated damage	% of cases liquidated damaged imposed for delayed delivery / completion.
27.	Completion rate	% of contracts fully completed and accepted
28.	Late Payment	% of contracts where payment made late.
29.	Complaints	% of tender procedures with complaints
30.	Resolution of Complaints	% cases complaints have been resolved
31.	Independent Review Panel	% cases review panel's decision was upheld
32.	Fraud & Corruption (F&C)	% of cases identified with F&C
33.	Trained procurement staff	% of procuring entities with trained procurement staff.
34.	Procurement post review	% of procuring entities conducted annual procurement post review.
35	Sub-delegation	% contract approved as per rule

Central Procurement Technical Unit (CPTU), Govt. of Bangladesh maintains an online Procurement Management Information System (PROMIS) to measure the procurement performance of key government organizations. PROMIS measures procurement performance using 45 indicators (SRGB, 2012).

**Table 2: Procurement Performance Indicators by CPTU**

SN.	Indicator Category	Process	Performance Indicator
1	Invitation for Tender	Advertisement of tender opportunities in Newspaper	Percentage of Invitation for Tender (IFT) published in newspaper
		Advertisement of tender opportunities in CPTU website	Percentage of IFT(above threshold) advertised in CPTU's website

SN.	Indicator Category	Process	Performance Indicator
		Tenders following GoB procurement Rules	Percentage of Tenders following GoB procurement Rules
		Tender following Development Partner Rules	Percentage of Tenders following Development Partner Rules
		Multiple locations submission tenders	Percentage of tenders allowed to submit in multiple locations
		Tender preparation time	Average number of days between
2	Tender Submission	in open tendering method	publishing of advertisement and tender submission deadline
		Tender time compliance	Percentage of tenders having sufficient tender submission time
		Sale of tender documents	Average number of tenderers purchased tender documents
		Tenderer Participation	Average number of Tenderers submitted tenders
		Tenderer Participation Index	Ratio of number of tender submission and number of tender document sold
3	Tender Opening Committee (TOC) and Tender Evaluation Committee (TEC)	Tender Opening Committee formation	Percentage of cases TOC included at least ONE member from TEC
		Tender Evaluation Committee formation	Percentage of cases TEC formed by Contract Approving Authority
		External member in TEC	Percentage of cases TEC included two external members outside the procuring entity

SN.	Indicator Category	Process	Performance Indicator
4	Tender Evaluation	Tender evaluation time	Average number of days between tender opening and completion of evaluation
		Compliance of tender evaluation time	Percent of cases tender evaluation has been completed within timeline
		Tender Acceptance	Average number of responsive tenders
		Re-tendering	Percentage of cases TEC recommended re-tendering
		Tender Cancellation	Percentage of cases where tender process cancelled
5	Tender Evaluation Report (TER) approval	Tender Evaluation Approval time	Average number of days taken between submission of Tender Evaluation and approval of contract
		Compliance of financial Delegation	Average number of tenders approved by the proper financial delegated authority
		Submission of evaluation report to appropriate Authority	Percentage of cases TEC submitted report directly to the contract approving authority
		TER approval Compliance	Percentage of cases contract award decision made within timeline by
		Additional review of TER Higher tier approval	Percentage of cases TER reviewed by person/committee other than the Contract Approving Authority Percentage of tenders approved by higher tier than the Contract Approving Authority

SN.	Indicator Category	Process	Performance Indicator
6	Contract Award	Time for issuance of NOA to Tenderer	Average number of days between final approval and Notification of Award (NOA)
		Tender processing lead time	Average number of days between tender opening and Notification of award (NOA)
		Total tender processing time	Average number of days between Invitation for Tender (IFT) and Notification of Award
		Publication of award information	Percentage of Contract awards published in CPTU's website
		Efficiency in Contract Award	Percentage of contracts awarded within initial tender validity period
7	Delivery/Completion	Delivery time	Percentage of Contracts completed/ delivered within the original schedule as mentioned in Contract
8	Payment	Liquidated damage	Percentage of Contracts having liquidated damage imposed for delayed delivery/completion
		Completion rate	Percentage of Contracts fully completed and accepted
		Payment release compliance	Average number of days taken to release payment
		Late payment Interest paid for delayed payment	Percentage of cases (considering each instalment as a case) with delayed payment Percentage of Contracts where interest for delayed payments was Made



SN.	Indicator Category	Process	Performance Indicator
9	Complaints	Tender procedure complaints	Percentage of tender procedures with complaints
		Resolution of complaints with award modification	Percentage of complaints resulting in modification of award
		Resolution of complaints	Percentage of cases complaints have been resolved
		Independent Review Panel	Percentage of cases review panel's decision upheld
10	Contract amendments	Contract Amendment/variation	Percentage of contract amendments/variatio
11	Contract dispute resolution	Unresolved Disputes	Percentage of Contracts with unresolved disputes
12	Fraud and Corruption (F & C)	Fraud and Corruption	Percentage of cases F & C Detected
13	Procurement Management Capacity	Procurement training	Average number of trained procurement staff in each procuring Entity
			Percentage of procuring entity which has at least one trained/certified procurement staff
			Total number of procurement persons in the organization with procurement training.

KPIs should be developed and used considering the context of the procurement.

## CHAPTER 3

# RESEARCH METHODOLOGY

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### 3.1 METHODOLOGY

The study was explorative in nature and used qualitative and quantitative data. The main objective of the study was to explore the current practice of procurement i.e. methods of procurement, methods of selecting suppliers, major challenges faced by the procurement function, adherence to the regulations, risks in the procurement of loco-spares, to identify the level of satisfaction of the consumer and to suggest way for improvement in the procurement system. The study was focused on Procurement performance of the CCS for satisfying the needs of Pahartali Diesel Locomotive Workshop. The evaluation was conducted on the basis of the KPIs covering the areas within the scope of the study.

The locomotive spares are considered as goods of specialised in nature and these are procured centrally by the CCS following Limited Tendering Method (International). Therefore, the KPIs were relevant to the LTM only. The chosen KPIs are shown below in the **Table-3**.

**Table 3: Key Performance Indicators**

Area of Evaluation	KPIs
Transparency of Procurement Process	<ul style="list-style-type: none"> <li>- % of IFT delivered to all the approved qualified potential tenderers</li> <li>- % of IFT delivered directly to the approved potential foreign tenderers electronically</li> <li>- % of items having single source</li> <li>- % of tender cancelled due to unwanted political pressure</li> </ul>
Efficiency of Procurement Process	<ul style="list-style-type: none"> <li>- Average number of days between SR and PI</li> <li>- Average number of days between PI and IFT</li> <li>- Average number of days between IFT and Tender acceptance</li> <li>- Average number of days between tender acceptance and Contract Signing</li> <li>- Average number of days between Contract Signing and L/C opening</li> <li>- Average number of days between L/C opening and Shipment of materials by supplier</li> <li>- Average number of days between shipment and clearing from port</li> <li>- Average number of days between clearing and delivery</li> </ul>

Area of Evaluation	KPIs
	<p>to depot</p> <ul style="list-style-type: none"> <li>- % tender finalised within the timeline mentioned in the APP</li> <li>- % of contract completed within timeline</li> <li>- % of tender evaluation completed within timeline i.e. without extending the original tender validity</li> </ul>
Adherence to the PPR	<ul style="list-style-type: none"> <li>- Average time between pre-qualification and approval of new potential foreign tenderer</li> <li>- % contract signed within 28 days of issuing NOA</li> </ul>
Capacity of procurement management	<ul style="list-style-type: none"> <li>- Average Number of IFT published per year by CCS</li> <li>- Average Number of IFT published per year for the procurement of loco-spares</li> <li>- % of budget remains unspent during the last three FY</li> </ul>
HRM of Procurement function	<ul style="list-style-type: none"> <li>- % of procurement personnel trained in PPR</li> <li>- Number of training events conducted in the last FY to improve skill of the procurement personnel</li> </ul>
ICT facilities in the procurement function	<ul style="list-style-type: none"> <li>- Does CCS use MRP, MRP-II or ERP ?</li> <li>- Number of training events conducted in the last FY to improve skill of the procurement personnel</li> </ul>
Procurement Discipline	<ul style="list-style-type: none"> <li>- Does CCS use Supplier tiering?</li> <li>- Does CCS use vendor rating?</li> <li>- Does CCS segment their procurement portfolio</li> <li>- % of tender invited for long term collaborative basis with trusted suppliers, rather than inviting tender on 'one-off' basis?</li> <li>- Does CCS conduct systematic risk assessment in the procurement of loco-spares?</li> </ul>
Customer satisfaction	<ul style="list-style-type: none"> <li>- Number of items made available 'On Time in Full' (OTIF)</li> <li>- % of demand fulfilment</li> <li>- % of out of stock items</li> <li>- Number of rejection due to quality failure</li> <li>- Number of delivery failed the 'need by date'</li> </ul>

## 3.2 Data Collection

To determine the KPIs both primary and secondary data were collected from the procuring entity and the user workshops. **Primary data** were collected, to capture data required to determine the chosen KPIs, through questionnaires, meeting minutes of cross-functional teams on the procurement of vital spare-parts, While most of the answers were found from the respondent, some supplementary and missing information were collected from the respective tender files and minutes of the TEC. **Secondary data** were collected from the published Bangladesh Railway Information Books. A few tender cases were examined in detail to understand the whole procurement process, starting from the demand to the fulfilment, followed by the procuring office.

Finally, the Works Manager of Pahartali Diesel Workshop was interviewed to understand the insights of demand supply relationships with procurement function. Collected data and answers of the questionnaire were analysed meticulously to determine average lead times in each stage of procurement. Finally, the satisfaction level of the WM, DLW, PHT was determined in terms of the chosen KPIs.

## 3.3 Primary Data

Sources of primary data were: NL card, Questionnaires, Tender case study and Meeting minutes.

### 3.3.1 Numerical Ledger (NL) Card Data

Diesel Stores Depot is managed by an Assistant Controller of Stores. There are NL cards for each item, on which the receipt, issue, and recoument particulars are recorded. Sixty five stock items were selected randomly to collect detailed history of procurement. Numerical Ledger (NL) cards were examined and the dates of stage for the procurement cycle were recorded in a table. I have collected information regarding: dates of Stock Recoument, Purchase Indent, Purchase Order, Shipment, Receipt Note and final Received date from the NL cards. Collected data is shown in Table-4.

## Questionnaires

### Questionnaire-1: For the Procurement Office

Qquestionnaire-1 was prepared, to explore the current practice as well as the strength, weakness and challenges in the procurement practice of the CCS. The questionnaire-1 is annexed in **Appendix-A**.

### **Questionnaire-2: For the Diesel Workshop**

Questionnaire-2 was prepared, to explore the current satisfaction level of the WM, DL, PHT as a customer of the procurement function of BR. The questionnaire-2 is annexed in **Appendix-B**.

### **Questionnaire-3: For the Procurement/ Maintenance Expert**

Questionnaire-3 was prepared for collecting expert opinion, to understand the views of them about the current procurement system as well as how the system can be improved, in order to enhance spares availability and customer satisfaction. The questionnaire-3 is annexed in **Appendix-C**. The target people were ex-procurement personnel who worked in the procurement of loco-spares and worked in the loco-maintenance workshop of BR.

#### **3.3.2 Meeting on Procurement Position of the Vital Spares**

I have attended few cross functional meetings with the officials of the workshop and the procurement function. I have gone through the minutes of these minutes to understand the challenges present in the system, and the ways they overcome the challenges.

#### **3.3.3 Tender Case Study**

A few tender cases were studied by the researcher to understand the sourcing, supplier appraisal, tender evaluation, award criteria and contract management processes.

### **3.4 Secondary Data**

Sources of secondary data were: published railway information book, prequalification documents, BRASS.

#### **3.4.1 Bangladesh Railway Information Books:**

BR publishes a book named Bangladesh Railway Information Book which contains a lot of information. I have collected statistics related to locomotive and procurement from the Railway Information Book, 2013.

#### **3.4.2 Pre-qualification Documents for the Enlistment of Suppliers**

BR approves a list of suppliers as Approved Qualified Potential Suppliers for the procurement of loco-spares. To understand the enlistment procedure, I have studied the Prequalification Documents they used for the Invitation of Application for Enlistment. I have gone through the minutes of the evaluation committee and acquired hand on knowledge over the prequalification procedure.

### **3.4.3 BRASS- Bangladesh Railway automated Support System**

BR uses customised SQL Server based web application software for inventory management. I have collected some data from the Deputy Director Inventory Control, BR, CRB, Chittagong, which was generated by running reports of the software by him.

## **3.5 Data Analysis and Reporting**

Detailed analyses were made by studying the primary and secondary data thoroughly, and testing the consistency of data. Some data found to be redundant and those were omitted and emphasise were given to the ultimate goal of this study. Aspects that were looked into were: time taken to complete each segment of procurement cycle, adherence to the regulations, challenges, and risks in the procurement, transparency, and efficiency of the procurement process, way of improvements, etc. The collected information was tabulated for further analysis. The results are shown in **Table-5**. From the table different KPIs were calculated to determine the results.

## DATA ANALYSIS AND RESULT DISCUSSION

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### 4.1 Exploring Current Procurement Practice

#### 4.1.1 Procurement Discipline

The study revealed that CCS does not practice supplier base rationalisation and supplier tiering. There is no systematic process of vendor rating to measure existing supplier's performance. CCS does not segment the procurement portfolio for strategic procurement planning and tenders are invited only for 'one-off' basis, not for long-term collaborative basis. CCS does not conduct any systematic risk assessment in the procurement of loco-spare. They use Standard Tender Documents, which cover most of the issues that need to be addressed for sustainable contract management.

#### 4.1.2 Inventory Management

BR has about 242<sup>20</sup> numbers of diesel electric locomotives, which are of more than 10 categories. These locomotives are assembled with thousands of spare-parts. Each year CCS has to buy more than 5000 items of spares for these locomotives. For the diesel workshop, Pahartali there are about 5000 of stock items, out of which more than 2000 items are used regularly, which have to stock at the feeding diesel stores depot. Demand for the stock items are generated according to the actual consumption in the workshop.

BR uses '**Push Inventory Management**' for DLW, Pahartali and the stock recoument system falls in the category of '**Fixed Order Quantity**' system as described below.

The Depot Officer of the feeding stores depot (ACOS/DL/PHT) places SR, when the stock level comes to, or below, a prefixed Re-order Point (REOPT). The Re-order point is calculated as follows:

$$\begin{aligned} \text{REOPT}^{21} &= \text{Minimum stock} + \text{Safety stock} + \text{Stock in lead time} \\ &= \text{AMC} \times (\text{Minimum stock factor} + \text{Safety factor} + \text{Lead time}) \end{aligned}$$

Where, **Minimum stock**: The level of stock beyond which the stock should not normally come down.

**Safety stock**: This is the stock to cover any risk to meet unforeseen demand & supplier's failure to supply material within delivery period.

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<sup>20</sup> The Railway Information Book, 2013

<sup>21</sup> Revised Procedure Order No 234/A

**Lead time:** Approximate time required for recoument i.e. the period counted from the time of initiating stock recoument to the time of receipt of material by stocking depot.

**AMC:** Average monthly consumption i.e. average materials consumed during the last three years and total month of present years.

Re-order quantity (ROQ) is calculated as:

$$\mathbf{ROQ} = \mathbf{REOPT} + \mathbf{EOQ} - (\mathbf{P.S} + \mathbf{DUES}) + \mathbf{P.D}$$

Where, P.S. = Present Stock; P.D.= Pending Demand; For materials procurable from foreign source, it is assumed that Minimum stock factor = 6 month, Safety factor = 6 month and Lead time= 9 month

Therefore, for foreign sourced loco spares:

$$\mathbf{REOPT} = 21 \times \mathbf{AMC} \text{ and}$$

$$\mathbf{ROQ} = 27 \times \mathbf{AMC} - (\mathbf{P.S} + \mathbf{DUES}) + \mathbf{P.D} \text{ (if any)}$$

Where, EOQ=Economical procurable quantity = 6 × AMC

After getting SR, DIC prepares the final PI (Purchase indent) and sends it to CCS office for procurement.

#### **4.1.3 Classification and Codification of Spares for Inventory Policy**

BR classified spare parts with emphasize given on maintenance. But classifications and codification of stores for inventory policy are absent in the inventory management of BR. The unique policy of reorder point is applied to all items. Spares should be divided into segments according to their value, availability, complexity in the market and criticality for the production. Importance should be given on the failure characteristics of the spares.

The consumers use the term 'vital' to denote important items for production which is out of stock of stores and cannot be procured from the local market and they change they items on monthly basis. This definition has significant deviation from standard production and operations management. In standard practice, vital items are highly critical for production, absence of those causes stoppage of production. These items are fixed and need to be stocked at a much higher level than essential items<sup>22</sup>. The vital spare list should be fixed, so that procuring office may give special attention for ensuring availability of the items.

#### **4.1.4 Identification of Spare-parts**

The loco-spares are identified by the part number given in the parts catalogue supplied by the Original Equipment Manufacturer (OEM) or the Locomotive Assembler. The detailed specification against part number is not available to BR, and it is not possible to get as these

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<sup>22</sup> Production and Operations Management (S. Chary)



are highly technical and business confidential. But the output of few big components can be known to BR. BR uses the part number of the spare as the basis for identification and tendering. BR does not allow alternative or equivalent part number by the supplier while receiving tenders, except the superseded number given by the OEMs. The standard practice is each part has its part number given by individual manufacturer and order placed to a manufacturer mentioning the specific part number used by the manufacturer. Therefore, all suppliers and their manufacturers are approved against the same part number for an item. This is a considerable deviation from standard business practice. BR codified items giving 7-digit numerical number. But the codification is not done in a systematic manner to identify loco-class, for what component, what source of procurement, or what inventory management applies to the item.

#### **4.1.5 Tendering Method and Tender Document :**

Loco-spare are not available in the local market and can be procured from the few manufacturers, situated in the geographically dispersed locations of the world, Specifications of loco-spare are not available to BR, and these are manufactured using high technical capability that is why these are considered as the goods of specialised nature. Under the provisions of PPR, procurement of loco-spare falls in the category of Limited Tendering. International LTMs (International) are being invited from the approved qualified potential tenderers on item by item basis i.e. each item is considered as a separate lot. Standard Tender Document–PG4 is being used with appropriate adjustment for the LTM tender. Tender Documents are being given to the local agent of the approved supplier and the foreign suppliers are being informed through e-mail along with a list of tendered items. Tenders are evaluated following the procedure prescribed in the PPR.

#### **4.1.6 Pre-qualification and Enlistment of Potential Source of Supply:**

To identify the potential sources of supply and to invite tenders under rules-63(2) and 86 of the PPR, 2008, prequalification is done by CCS. The qualified applicants are approved by the DG and CCS enlists them as 'Approved Qualified potential Tenders' for the procurement of the loco-spare. During approval the supplier is given approval against a specific manufacturer and they are being allowed to quote on the lines for which they are approved and the quoted manufacturers must match with the manufacture against which they have been given approval. The list is updated on regular intervals and the latest approved list is made in 2013.

Previously spares were procured by CCS only the OEMs or the assemblers and before 2005, there were no enlistment. After introducing the PPR, 2008 the enlistment application were invited from the manufacturers, distributors of the manufacturers along with the OEMs and assemblers.

BR has some 700 items approved for procurement from the local BSCIC approved manufacturers. There is a standing policy of for the approval and the interested manufacturers may apply any time for getting approval as local supplier. There is no standing policy for pre-qualification and approval for foreign source of supply.

#### **4.1.7 Major Tender and Contract Terms**

There are more than 40 numbers of general conditions of contracts, but following are the important specific conditions of the contract, used at present as contract terms and conditions<sup>23</sup>:

- More than 90% of the spares procured from the foreign source. And these are procured using CFR/Chittagong Sea Port (INCOTERM-2010).
- Payment is made through irrevocable letter of credit (L/C) to the amount of 100% of quoted price on the production of shipping documents.
- Delivery period is 10 months from the date of opening L/C
- Pre-shipment inspection is not required, but a certificate by the manufacturer is needed to the effect that the goods supplied are manufactured by them and the spares are as per the part number of the tendered item(s).
- The shipping documents must include: Manufactures Certificate as per merchandise list to the effect that the goods corresponds to the part number of the tendered item. And the country of origin certificate from the Chambers of Commerce of the country of shipment.
- The warranty period is one year from the issue of receipt note by DCOS (Shipping)
- Free delivery to CTG i.e. DDP/CTG is not acceptable.
- There is no need for tender security but performance security to the amount of 10% of the contract value is required and the currency of the performance security must be same as the currency of the contract with the supplier.
- There is no option for submitting tenders electronically by the foreign suppliers.
- Only authorised person is allowed to sign in the tender and contract between BR and Suppliers.

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<sup>23</sup> Terms and Conditions for Enlistment (CCS , Version-1, 2013)

#### **4.1.8 Inspection and Quality Control**

As pre-shipment inspection is not performed, the purchaser asks for a certificate from the manufacturer to the effect that they have manufactured the supplied spares and the supplied spares are new and as per the part number of the tendered item(s).

When shipping document is delivered by the L/C opening bank to the purchaser (CCS), the documents are checked. If all the documentation requirements are fulfilled, quality of the goods are considered okay and then the documents are accepted by the CCS. District Controller of Stores (shipping), BR, Pahartali acts as a clearing agent for BR and he is the final inspector for the goods procured. Payment is made before the goods are accepted by the inspector. DCOS (Shipping) has no instrument to ensure quality of loco-spares, but to send the spares to the stocking depot. When issued to workshop the spares are finally checked practically installing in locomotive. If it is found defective, a complaint is raised and the depot officer prepares Manuscript Memorandum of Differences (MDM) and sends the materials to DCOS (Shipping) for replacement with correct materials. The purchaser is the final authority to for disposal of the MDM.

The manufacturers certificate regarding conformance to quality and warranty certificate as to replace defective spare-parts are the tools for assuring quality and the practical test by the consumer is only tool for ensuring quality. Therefore, the quality of the supplied spare basically based on the trust between the supplier and buyer. That is why this type of procurement is highly vulnerable to the risk of wrong and inferior supply. Scrutiny of shipping documents is highly essential in all consignments. Presently shipping documents in all consignments are not sending to CCS for acceptance.

### **4.2 Identifying Challenges in the Procurement**

#### **4.2.1 Invitation of Considerably High Number of Tenders**

CCS has to procure about 5000-7000 items of spare per year through invitation of international limited tender among the approved qualified potential tenderers. More than 400 tenders are being invited per year by CCS for procuring loco-spars. Procurement of a huge inventory of spares without the aid of procurement software and maintaining data of procurement is a major challenge in the loco-spares procurement. Use of modern ICT based system such as e-procurement and inventory management system may be a cost effective tool for managing such a huge number of tenders and inventory.

#### **4.2.2 Broad Supplier Base**

At present BR have more than 100 suppliers for supplying loco-spares. Out of them more than 60 suppliers are local suppliers who supplies only more or less 700 items and the rest 25,300 items are being supplied by the 30-35 foreign suppliers. The suppliers are manufacturers, loco-builders, and distributors of manufacturers. The supply base is very broad and it very difficult to manage such a broad supplier base without contract and supplier management software, such as e-supplier module of ERP software. The world class practice is to use of supplier tiering and maintain close relationship with few trusted first tier suppliers and placing the other suppliers in the second and third tier. This practice is successfully used in the automobile manufacturing sector.

#### **4.2.3 Non-availability of Specification**

Detailed specifications of spares are not available to BR. Spares are detected and procured on the basis of the part number mentioned in the parts-catalogue given by the loco-suppliers at the time of procurement of locomotives. The part number is given by the **OEM**, and ideally, the part number should be used in the communication with the original manufacturer as they have given these. No manufacturers, other than the OEM, should know and recognise the part number. BR uses the same part number in the communications with all the approved suppliers. This is a major deviation with the standard business practice. This may have give birth to increased wrong supply by the approved suppliers, who supplies spares from non-OEMs. The number of MDMs is considerably increasing in the recent years.

#### **4.2.4 Lack of Skilled Procurement Personnel**

Loco-spares are procured mostly from the foreign suppliers. Foreign procurement requires both linguistic and technical skill regarding international trade and finance, establishing L/C and inspection. The staffs of the CCS office are trained neither in procurement nor in communications. The external environment has been changed; especially the development of ICT radically changed the way of people doing their business in the following ways:

- Dramatically increasing the speed of communication and information processing.
- Offering wider access to knowledge and information, from global source.
- Facilitating 24/7, global business.
- Supporting paperless communications (e.g. e-mails, electronic ordering, web-based purchasing using debit card for routine items).
- Creating virtual relationships, teams and organisations, by making locations irrelevant to the process of data-sharing, communications and collaborations.

The procurement people are lacking behind the external environment and hence loosing the opportunities of ICT development. The skill and knowledge of procurement people may be

developed through appropriate training activities. Training may be on the job or off the job basis based on the findings of a training need analysis programme.

#### **4.2.5 Non-use of ICT**

At present CCS office does not use any specialised procurement software. They only capture data in a MS access bases database. This is highly vulnerable to the risk of fraud and corruption because of lack of traceability in the data change. To cope with the external environment, there is a immediate need for development of modern ICT based procurement system to manage this '**strategic drift**'.

#### **4.2.6 Price Un-quoting by the Approved Tenderers**

It revealed from the tender case study that a considerable percentage of tendered items are reaming unquoted due to various reasons, such as obsolescence, very low quantity or very low value spares. Sometimes the percentage of unquoted items is more than 30%. Coercive actions against the tenderer may used, e.g.- Deleting items from the approved supplier or delisting the suppliers who fail to quote the approved items, without assigning any reason. There should be a robust prequalification and enlistment process so that only genuine suppliers get approval.

#### **4.2.7 Lack of Information on Price**

Items which are not purchased previously could not be procured from first time tendering, due to high variances in estimated and quoted prices. These items are retendered. Items lacking LPR may be gone through a market survey. For loco-spares of BR, market may mean only the approved suppliers. Therefore, they may be asked for quotation, before going to tendering process.

#### **4.2.8 Very Long Lead Time**

Average lead time between demand generated and demand fulfilled is 20 months. If one item cannot be procured from the first tendering cycle, it needs another 20 months to procure. Moreover the locomotives BR used have crossed their economic life time. There is scarcity of the spares. The locomotive suppliers have fulfilled their obligations of supplying spare-parts for contractual period. In most cases the suppliers has to order their manufacturers after getting NOA or contract from BR. CCS may think of a backup source of supply.

#### **4.2.9 Fluctuation and Non-linear Pattern of Consumption**

SR is generated by the depot officer on the basis of actual consumption. The push inventory system (fixed order quantity) is used for the assessment of reorder quantity, considering linear consumption. But all the spares are not consumed in a linear pattern. Moreover BR uses the

same lead time for all materials procured from the foreign source. Actually the lead time is not the same for all items. These nonlinear un-anticipated patterns of consumption give birth to two opposite directional phenomena: - (i) Overstock and surplus (ii) Out of stock

### **4.3 Identifying Risks in the Procurement**

Only 2.69% of loco-spares (700 items out of 26000 items) are procured from local suppliers. Therefore, this procurement is governed by international sourcing and contracting. Any international sourcing is exposed to some generic risks. The current loco-spares procurement practice of CCS is vulnerable to the following risks:

#### **4.3.1 Fraud Risk**

After analysing the current contracting procedure used by CCS it is revealed that fraud may be originated from:

- Presentation of false document in the enlistment processes. The probability and consequence both are high in this type of fraud, as this does impact on the quality of goods.
- Submission of false or improper quality certificate and manufacturer's certificate during shipment of materials. Probability is moderate but consequence is high for this type of fraud, as this does impact on the quality of goods.
- .Submission of false freight bill memo with invoice. Probability is low and consequence is also low as this does not impact on the quality of goods.
- Supply of inferior quality or rebuilt materials
- Supply of spares from un-approved manufacturers
- Bid rigging, among the tenderers
- Quoting excessive price, especially for the items for which there is no completion (single approved sourced). At present BR has more than 15000 items which have single approved source.

#### **4.3.2 Currency Risk**

Foreign tenderers, generally, quote prices in their home currency. If price of the FC is increased after contracting, buyers will have to pay more in home currency. This is a generic risk of foreign procurement. The probability is high and impact is low.

#### **4.3.3 Supplier Failure Risk**

Supplier failure may be originated from the ill financial health of the supplier or supplier fails to collect spares from the approved manufacturers on need by date, and so on. Moreover those

15000 items, which have only one approved source, are very vulnerable to the risk of supplier failure. Identifying more sources of supply for these items is necessary.

#### **4.3.4 Quality Failure Risk**

Quality failure may be rooted to the approval of manufacturers which have poor quality management. In the case of loco-spare parts the right part number is the guaranty of right materials with right quality. Increasing vigilance and applying due diligence by the procuring entity and consumers can reduce quality failure. Robust pre-qualification and supplier appraisal before enlistment and contract award can play a major role in the improvement of quality of spares. Approved manufacturers' certificate as per merchandise list can assure right quality.

#### **4.3.5 Information Risks**

CCS office keeps records of procurement in a MS Access based database software, which does not have any protection against data theft and using for ill purpose. Moreover reliability of the data is very low, as it cannot detect any data change. Therefore, the system is highly vulnerable for information risks and the consequence is also high.

### **4.4 Procurement performance Measurement**

#### **Efficiency in Procurement Processing**

To measure the efficiency of the procurement processes of CCS, the researcher collected data about the whole procurement cycle for randomly selected 65 items, which has regular consumption by the DLW. The lead time calculations are shown in **Table-5** in the next page. After analysing the data from the data tables and consulting respective tender case files for the missing data, following KPIs are calculated on the basis of consistent data:

#### **4.4.1 Pre-tender activities**

- Average number of days between SR and PI : **48 days**
- Average number of days between PI and IFT : **97 days**

The figures show inefficiency in DIC as well as in purchase sections. These inefficiencies may be reduced by introducing automatic SR and PI generation using computerised systems. The ideal lead time for SR to PI generation should not be more than 7 days. It is discovered that in many cases the PI contains items which were not procured previously. In that case preparation of official estimates becomes a challenge for the purchaser, as no information is available in the local market. Purchaser, generally, forms a estimate preparation committee and this is very time consuming.

#### 4.4.2 Pre-contract activities

- Average number of days between IFT and NOA : **212** days
- Average number of days between PI and PO : **572** days

The figures show unacceptable level of inefficiency in purchasing section. Regulations suggest to keep LT between IFT and NOA is 120 days and may be extended to 180 days with permission from HOPE. Therefore maximum LT between IFT and NOA should not exceed 180 days in any case. The LT between PI and PO is also unacceptable. Detailed investigation shows that sometimes TEC takes 8-12 months to finalise the tender. Moreover, for small value award suppliers do not submit requisite performance security and the consequence is delay in the issue of PO. Solution to the problem may be:

- Accept permanent security from enlisted tenderers, accounts must be maintained to keep record of such permanent security.
- Waive performance security for small value award; the value must be inserted in the Tender document.

#### 4.4.3 Post contract activities

- Average number of days between PO and L/C : **57** days
- Average number of days between PO and Shipment : **173** days
- Average number of days between shipment and clearing from port and issue of R. Note : **105** days
- Average number of days between R. Note and delivery to depot : **30** days

The first two KPIs seem to be acceptable, but the shipment may be made earlier if suppliers are chased for. Clearing of materials from port needs to be expedited. As ship berthing date is not recorded, the KPI does not give any significant information whether it is acceptable or not. In an ideal case, clearing of materials from port should be completed within 7 days from the date of ship berthing in the port. The delivery of materials after issuing R. Note also be improved. For Wm/DL/PHT materials should be sent within 3-7 days from issuing R. Note.



#### 4.5 Adherence and Compliances to Regulations

- % tender finalized within the timeline mentioned in the APP : **10%**
- % of contract completed within timeline : **72%**
- % of tender evaluation completed within timeline i.e. without extending the original tender validity : **10%**
- Average time between pre-qualification and approval of new potential foreign tenderer : **3 years**
- % contract signed within 28 days of issuing NOA : **35%**

Tender finalisation timelines mentioned in the APP could not be followed by CCS. It has acceptable reasons, as described the procurement officials of CCS:

- Demand is generated in accordance with the re-order point system, depending on the actual consumption by DLW.
- It is unforeseen, when and how much demand would be generated.
- Therefore, APP is prepared only based on the previous purchase record, which in many cases might not come true.

The contract completion rate is satisfactory; however this KPI would have been better, if the suppliers could have been chased for.

Average times for successive prequalification and enlistment is 3 years. Regulations suggest to update the in every year. If fresh applications are invited, it is practically impossible to complete the prequalification and enlistment. Because it is a big task to scrutiny papers submitted by the applicants (suppliers) along with the application. Therefore, the following policy may be a solution:

- There should be a standing policy for pre-qualification and enlistment of foreign source of supply, as is in the case of local suppliers .The policy should clearly contain:
  - the appraisal criteria
  - Applicant qualification
  - Application procedure
  - Evaluation and approval procedure
  - Renewal procedure
  - Disqualification and de-listing
- With the approval from HOPE, CCS may constitute a standing Application evaluation Committee. This committee may be assisted with a Technical sub-committee.
- Application may be received round the year, but committee may seat only twice a year and report to DG for approval

- The committee may evaluate the performance of the enlisted supplier once a year, taking performance report from CCS, and may report to DG for renewal or delisting as the case may be.
- The enlistment process should be fair but robust and all application should be examined meticulously, as enlistment of right source is the key to getting right quality of materials at the right time.

**Table 4: Procurement History of 65 Items (randomly selected)**

SI No	Item No	Received Particulars				R. Note Date	Shipment date	PO Date	PI Date	SR Date	AMC
		Qty	UoM	Unit Price	Received Date						
1	09-12696	3	No	\$2.13	13/12/2012	05/12/2012	14/09/2012	07/06/2012	11/04/2010	15/02/2010	1.660
2	09-14960	70	No	\$0.08	12/09/2011	10/08/2011	22/05/2011	13/10/2010	28/01/2008	20/10/2007	8.580
3	09-18361	5	No	\$3.98	13/12/2012	05/12/2012	14/09/2012	07/06/2012	12/05/2010	03/04/2010	0.208
4	09-25105	30	No	\$1.55	02/09/2012	11/08/2012	23/04/2012	30/06/2011	15/10/2009	12/09/2009	6.500
5	16-04980	80	No	\$51.14	13/01/2015	07/01/2015	22/07/2014	06/02/2014	13/01/2013	12/02/2012	37.870
6	16-13740	10	No	\$2.12	23/12/2009	15/12/2009	13/10/2009	17/06/2009	29/04/2008	12/03/2008	1.160
7	16-13978	32	No	\$26.13	15/12/2012	05/12/2012	14/09/2012	07/06/2012	11/04/2010	17/02/2010	2.140
8	16-15420	15	No	\$65.58	01/10/2012	29/08/2012	18/06/2012	08/12/2011	30/11/2009	18/10/2009	0.840
9	16-16660	8	No	\$139.90	05/05/2012	22/04/2012		28/06/2011	07/09/2009	11/08/2009	0.472
10	16-18940	3	No	\$554.36	15/03/2010	14/02/2010	08/10/2009	10/05/2009	02/06/2005	31/05/2005	0.285
11	16-19410	4	No	\$8.51	15/11/2012	03/11/2012	29/06/2012	30/06/2011	30/11/2009	03/11/2009	0.333
12	16-20980	20	No	\$0.22	27/07/2010	27/06/2010	13/04/2010	17/01/2010	14/12/2008	18/11/2008	2.770
13	16-25220	1465	No	\$1.00	05/05/2012	22/04/2012		28/06/2011	15/10/2009	29/08/2009	43.380
14	16-29850	176	No	\$2.02	10/05/2012	22/04/2012		28/06/2011	15/08/2009	06/07/2009	9.550
15	16-29840	96	No	\$3.50	16/10/2012	25/09/2012		18/06/2012	07/08/2011	31/07/2011	7.760
16	16-30380	3	No	\$513.33	28/10/2008	12/10/2008	20/06/2008	14/11/2007	31/07/2005	19/07/2005	0.250
17	16-31590	6	No	\$60.78	27/07/2010	27/06/2010	13/04/2010	17/01/2010	24/07/2008	05/07/2008	0.193
18	16-32410	3	No	\$1,257.60	28/06/2006	31/05/2006		02/02/2006	28/04/2004	13/03/2004	0.020
19	16-32270	4	No	\$1,650.00	15/03/2010	09/02/2010	12/11/2009	18/06/2009	28/11/2007	20/11/2007	0.222
20	16-32750	1	No	\$174.28	09/02/2005	03/01/2005		26/06/2003	29/10/2002	24/10/2002	20.102
21	16-33401	22	No	\$9.92	17/03/2009	12/10/2010	06/01/2009	26/06/2008	11/10/2006	19/08/2006	0.641
22	16-32560	8	No	\$68.97	11/09/2011	10/08/2011	22/05/2011	13/10/2010	26/06/2009	26/05/2009	0.214
23	16-33090	1	No	\$121.23	15/03/2010	14/02/2010	08/10/2009	10/05/2009	14/08/2007	23/07/2007	0.170
24	16-34070	34	No	\$26.58	26/12/2010	03/11/2010	28/07/2010	05/04/2010	10/11/2008	20/09/2008	2.260
25	16-35940	10	No	\$200.29	30/12/2009	15/12/2009	13/10/2009	17/06/2009	28/11/2007	26/09/2007	0.487
26	16-35845	1	No	\$32.41	14/07/2009	17/06/2009	08/04/2009	25/06/2008	04/03/2007	22/01/2007	0.042
27	16-37050	15	No	\$77.22	30/12/2009	15/12/2009	13/10/2009	17/06/2009	28/11/2007	12/11/2007	0.444
28	16-37810	500	No	\$0.09	14/03/2010	08/02/2010	30/10/2009	18/06/2009	28/11/2007	26/09/2007	21.170
29	16-35660	7	No	\$7.29	20/03/2010	03/03/2010	08/11/2009	07/05/2009	30/01/2008	14/11/2007	1.500

SI No	Item No	Received Particulars				R. Note Date	Shipment date	PO Date	PI Date	SR Date	AMC
		Qty	UoM	Unit Price	Received Date						
30	16-36490	48	No	\$0.28	08/01/2012	12/12/2011	25/08/2011	27/02/2011	07/09/2009	24/08/2009	8.000
31	16-36560	72	No	\$8.80	07/09/2014	05/07/2014		24/06/2013	23/11/2011	23/10/2011	14.760
32	16-36760	6	No	\$15.77	27/06/2000	09/05/2000		28/06/1999		15/12/1997	0.477
33	16-36650	11	No	\$33.62	04/07/2009	15/06/2009	27/03/2009	22/06/2008	04/03/2007		0.425
34	16-37430	4	No	\$6.25	05/01/2009	30/11/2008	31/08/2008	26/05/2008	09/07/2005	20/06/2005	0.018
35	16-37740	99	No	\$0.35	14/11/2012	03/11/2012	29/06/2012	30/06/2011	07/09/2009	28/07/2009	10.070
36	16-38430	15	No	\$57.80	19/03/2003	08/03/2003		15/05/2002		30/04/2000	0.690
37	16-38150	11	No	\$0.67	26/12/2010	03/11/2010	28/07/2010	05/04/2010	10/11/2008	19/10/2008	2.410
38	16-38700	200	No	\$2.94	09/05/2012	24/04/2012	10/02/2012	10/10/2011	24/02/2010	27/01/2010	9.660
39	16-45960	3	No	\$4.00	27/06/2010	27/06/2010	24/03/2010	22/06/2009	04/06/2008	29/04/2008	0.071
40	16-95790	20	No	\$18.10	15/01/2003	14/01/2003		02/06/2002	30/05/2001		4.630
41	16-88010	3	No	\$308.75	30/10/2006	18/09/2006		12/10/2005	27/09/2004	24/07/2004	6.650
42	16-76010	40	No	\$256.50	13/12/2012	05/12/2012	14/09/2012	07/06/2012	13/07/2010	09/05/2010	0.538
43	16-46960	100	Set	\$83.78	13/12/2012	05/12/2012	14/09/2012	07/06/2012	11/04/2010	16/02/2010	14.550
44	16-85020	30	No	\$27.60	29/12/2013	10/11/2013	28/06/2013	06/03/2013	15/05/2011	26/04/2011	1.910
45	16-85010	20	No	\$38.50	12/09/2011	10/08/2011	22/05/2011	13/10/2010	29/11/2009	28/04/2009	1.270
46	16-89270	49	No	\$9.45	30/10/2010	29/09/2010	23/07/2010	23/12/2009	05/10/2008	04/08/2008	3.370
47	16-79070	150	No	\$8.59	27/04/2013	20/03/2013	16/12/2012	10/06/2012	30/08/2010	08/06/2010	14.250
48	16-70925	2	No	\$397.50	28/10/2010	29/09/2010	23/07/2010	18/04/2010	24/02/2009	03/02/2009	0.117
49	16-71455	116	No	\$4.20	08/01/2012	12/12/2011	25/08/2011	02/02/2011	07/09/2009	21/08/2009	9.310
50	16-71785	30	No	\$13.49	09/05/2012	24/04/2012	10/02/2012	10/10/2011	24/02/2010	24/01/2010	2.060
51	16-36210	11	No	\$20.67	25/11/2009	10/11/2009	31/08/2009	10/06/2009	03/03/2008	16/02/2008	0.378
52	16-35285	200	No	\$76.50	06/02/2011	30/01/2011	20/10/2010	14/01/2010	24/07/2008	13/07/2008	9.750
53	16-35850	300	No	\$24.24	30/04/2012	07/03/2012		30/06/2011	30/11/2009		9.020
54	16-36180	3	No	\$92.30	13/12/2012	05/12/2012	14/09/2012	07/06/2012	12/05/2010	11/04/2010	0.095
55	16-47580	52	No	₹ 4,500.00	26/11/2014	03/11/2014		30/10/2014	02/06/2014	08/03/2014	10.630
56	29-32860	28	No	₹ 57,325.00	23/02/2014	21/01/2014		19/01/2014	10/02/2013	03/12/2012	3.250
57	16-33820	2	No	₹ 10,120.00	28/02/2011	07/02/2011		28/04/2014	04/12/2012	08/12/2012	0.150
58	16-32570	6	No	\$132.00	11/09/2011	10/08/2011	22/05/2011	13/10/2010	23/06/2009	26/05/2009	0.263
59	04-10040	16	No	\$1,244.00	04/06/2014	22/05/2014		02/05/2013			

SI No	Item No	Received Particulars				R. Note Date	Shipment date	PO Date	PI Date	SR Date	AMC
		Qty	UoM	Unit Price	Received Date						
60	16-45190	3	No	\$416.26	14/11/2012	03/11/2012		30/06/2011	27/01/2010	11/01/2010	0.085
61	16-45990	1219	No	\$0.49	04/09/2012	29/04/2012	18/06/2012	08/12/2011	23/11/2009	25/10/2009	2.790
62	16-47110	2	No	\$15,213.00	16/02/2014	04/05/2013	12/02/2013	17/06/2012	11/04/2010	10/03/2010	0.020
63	16-48195	18	No	\$137.61	22/08/2010	22/07/2010		18/06/2009	11/06/2008	26/05/2008	0.489
64	16-96300	8	Set	\$47.85	13/08/2008	06/08/2008	18/04/2008	07/06/2007	06/09/2005	15/08/2005	
65	16-18510	4	No	\$554.80	09/11/2014	25/09/2014	22/01/2014	17/06/2013	20/09/2011	23/08/2011	

**Table 5: Lead Times in Procurement Cycle for the Selected Items**

SI No	Item No	Received Particulars			Lead times in days					
		Qty	UoM	Unit Price	SR-PI	PI-PO	PO-Ship	Ship-RN	RN-RCD	SR-RCD (Total LT)
1	09-12696	3	No	\$2.13	55	788	99	82	8	1032
2	09-14960	70	No	\$0.08	100	989	221	80	33	1423
3	09-18361	5	No	\$3.98	39	757	99	82	8	985
4	09-25105	30	No	\$1.55	33	623	298	110	22	1086
5	16-04980	80	No	\$51.14	336	389	166	169	6	1066
6	16-13740	10	No	\$2.12	48	414	118	63	8	651
7	16-13978	32	No	\$26.13	53	788	99	82	10	1032
8	16-15420	15	No	\$65.58	43	738	193	72	33	1079
9	16-16660	8	No	\$139.90	27	659			13	998
10	16-18940	3	No	\$554.36	2	1438	151	129	29	1749
11	16-19410	4	No	\$8.51	27	577	365	127	12	1108
12	16-20980	20	No	\$0.22	26	399	86	75	30	616
13	16-25220	1465	No	\$1.00	47	621			13	980
14	16-29850	176	No	\$2.02	40	682			18	1039
15	16-29840	96	No	\$3.50	7	316			21	443
16	16-30380	3	No	\$513.33	12	836	219	114	16	1197
17	16-31590	6	No	\$60.78	19	542	86	75	30	752
18	16-32410	3	No	\$1,257.60	46	645			28	837

SI No	Item No	Received Particulars			Lead times in days					
		Qty	UoM	Unit Price	SR-PI	PI-PO	PO-Ship	Ship-RN	RN-RCD	SR-RCD (Total LT)
19	16-32270	4	No	\$1,650.00	8	568	147	89	34	846
20	16-32750	1	No	\$174.28	5	240			37	839
21	16-33401	22	No	\$9.92	53	624	194	644		941
22	16-32560	8	No	\$68.97	31	474	221	80	32	838
23	16-33090	1	No	\$121.23	22	635	151	129	29	966
24	16-34070	34	No	\$26.58	51	511	114	98	53	827
25	16-35940	10	No	\$200.29	63	567	118	63	15	826
26	16-35845	1	No	\$32.41	41	479	287	70	27	904
27	16-37050	15	No	\$77.22	16	567	118	63	15	779
28	16-37810	500	No	\$0.09	63	568	134	101	34	900
29	16-35660	7	No	\$7.29	77	463	185	115	17	857
30	16-36490	48	No	\$0.28	14	538	179	109	27	867
31	16-36560	72	No	\$8.80	31	579			64	1050
32	16-36760	6	No	\$15.77					49	925
33	16-36650	11	No	\$33.62		476	278	80	19	
34	16-37430	4	No	\$6.25	19	1052	97	91	36	1295
35	16-37740	99	No	\$0.35	41	661	365	127	11	1205
36	16-38430	15	No	\$57.80					11	1053
37	16-38150	11	No	\$0.67	22	511	114	98	53	798
38	16-38700	200	No	\$2.94	28	593	123	74	15	833
39	16-45960	3	No	\$4.00	36	383	275	95	0	789
40	16-95790	20	No	\$18.10		368			1	37636
41	16-88010	3	No	\$308.75	65	380			42	763
42	16-76010	40	No	\$256.50	65	695	99	82	8	949
43	16-46960	100	Set	\$83.78	54	788	99	82	8	1031
44	16-85020	30	No	\$27.60	19	661	114	135	49	978
45	16-85010	20	No	\$38.50	215	318	221	80	33	867
46	16-89270	49	No	\$9.45	62	444	212	68	31	817
47	16-79070	150	No	\$8.59	83	650	189	94	38	1054
48	16-70925	2	No	\$397.50	21	418	96	68	29	632
49	16-71455	116	No	\$4.20	17	513	204	109	27	870

SI No	Item No	Received Particulars			Lead times in days					
		Qty	UoM	Unit Price	SR-PI	PI-PO	PO-Ship	Ship-RN	RN-RCD	SR-RCD (Total LT)
50	16-71785	30	No	\$13.49	31	593	123	74	15	836
51	16-36210	11	No	\$20.67	16	464	82	71	15	648
52	16-35285	200	No	\$76.50	11	539	279	102	7	938
53	16-35850	300	No	\$24.24		577			54	
54	16-36180	3	No	\$92.30	31	757	99	82	8	977
55	16-47580	52	No	₹ 4,500.00	86	150			23	263
56	29-32860	28	No	₹ 57,325.00	69	343			33	447
57	16-33820	2	No	₹ 10,120.00		510			21	
58	16-32570	6	No	\$132.00	28	477	221	80	32	838
59	04-10040	16	No	\$1,244.00	0				13	
60	16-45190	3	No	\$416.26	16	519			11	1038
61	16-45990	1219	No	\$0.49	29	745	193		128	1045
62	16-47110	2	No	\$15,213.00	32	798	240	81	288	1439
63	16-48195	18	No	\$137.61	16	372			31	818
64	16-96300	8	Set	\$47.85	22	639	316	110	7	1094
65	16-18510	4	No	\$554.80	28	636	219	246	45	1174
Total					2597	36044	8306	4950	1913	93563
Valid data					60	63	48	47	64	62
Average LT					<b>43</b>	<b>572</b>	<b>173</b>	<b>105</b>	<b>30</b>	<b>1509</b>

**Note:**

1. lines / columns with missing and/ or inconsistent data have been ignored in calculations.
2. Qty.-Quantity procured, UoM- Unit of Measurement, SR- Stock Recoupment, PI-Purchase Indent, PO- Purchase Order, ship- Shipment, RN- Receipt Note, RCD- Received.

#### 4.6 Transparency of Procurement Process

- % of IFT delivered to all the approved qualified potential tenderers :**100%**
- % of IFT delivered directly to the approved potential foreign tenderers electronically :**0%**
- % of items having single source : **57%**
- % of tender cancelled due to unwanted political pressure : **0%**

IFT is delivered to each approved tenderers through their local agents. The tender cases studied by the researcher, it is found that no IFT is sent directly to the foreign tenders. But, though it is not mandatory in the PPR, presently IFT and Material Lists are being sent through e-mail and the potential tenderers are giving acknowledgement of IFT and tender receipt. Hence, the tendering process is very transparent.

#### 4.7 Capacity of procurement management

- Average Number of IFT published per year by CCS : **1000 nos.**
- Average Number of IFT published per year for the procurement of loco-spares : **300 nos.**
- % of budget remains unspent during the last three FY : **4.8 %**

CCS has to invite more or less 1000 numbers of tenders per year, including stores bulletins, OTM and DPM,. It is a gigantic figure. Perhaps, CCS is the top-1 ranked PE in Bangladesh who invites such a big numbers of tenders per year. For procuring loco-spares it has to invite 300 tenders per year. There is deficit of procurement budget in each year. CCS fails to sign contract for the accepted tenders due to shortage of budget. The consequence is, the demand is accumulated to the next year to give more negative impact to the budget for the next year.

The budget allocation and expenditure along with expenditure for the procurement of loco-spares are shown in the table below:

**Table 6: Budget Allocation and Expenditure of CCS Procurement**

FY	Allocation		Expenditure		Unspent		Expenditure for Loco-spares		Unspent % (Foreign) (Crore BDT)
	Local (Crore BDT)	Foreign (Crore BDT)	Local (Crore BDT)	Foreign (Crore BDT)	Local (Crore BDT)	Foreign (Crore BDT)	Local (Crore BDT)	Foreign (Crore BDT)	
2007-08	46	30	45.99	22.65	0.01	7.35	-	13.29	24.5%
2008-09	55	42.76	54.70	41.51	0.30	1.25	-	37.17	2.92%
2009-10	48	40	48	39.75	0.00	0.25	12.29	34.85	0.63%
2010-11	47	40	46.82	38.48	0.18	1.52	6.82	36.36	<b>3.8%</b>
2011-12	46	41	45.99	38.37	0.01	2.63	9.71	35.84	<b>6.41%</b>
2012-13	46	45	45.99	24.39	0.01	20.66	6.52	44.95	45.91% *



FY	Allocation		Expenditure		Unspent		Expenditure for Loco-spares		Unspent % (Foreign) (Crore BDT)
	Local (Crore BDT)	Foreign (Crore BDT)	Local (Crore BDT)	Foreign (Crore BDT)	Local (Crore BDT)	Foreign (Crore BDT)	Local (Crore BDT)	Foreign (Crore BDT)	
2013-14	48	45	47.86	43	0.14	2.00	5.13	31.77	4.44%
2014-15	45	45	37.2 (Jan/15)	30.86 (Jan/15)	7.8	14.14	4.26 (Feb/15)	18.04 (Feb/15)	31.42%

(\*In FY 2012-13 the pattern is un-usual, therefore, Average unspent % is calculated ignoring this year's data)

- Average unspent in the last three FY is 4.88%.

CCS may pay more attention to ensure proper utilisation of limited budget.

#### 4.8 HRM of Procurement Unit

- % of procurement staff trained in PPR : 0%
- Number of training events conducted in the last FY to improve skill of the procurement personnel : 0 nos.

This result is very unsatisfactory. CCS should take immediate steps to carry out a systematic training need analysis (TNA) for the staffs of procurement section, especially for those who are engaged in the international sourcing and contracting.

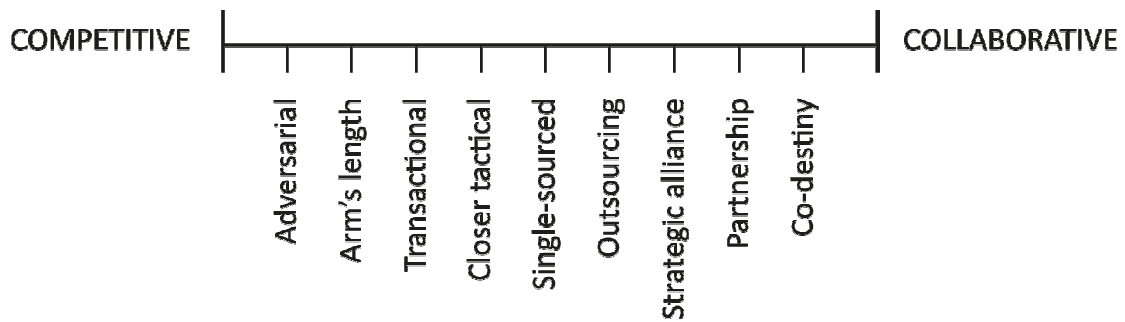
#### 4.9 ICT Used in the Procurement Unit

CCS does not use modern ICT based planning and information management system. The whole procurement record management is based on manual and register based. Tender cases are processed in a unsecured MS access based customized software. The data remains unsecured as data change cannot be traced. ERP or e-procurement software may be used for fast, reliable and transparent procurement processing and record keeping.

#### 4.10 Supplier Relationships Management

After signing the contract both supplier and the buyer have to discharge some responsibilities as mentioned in the contract and this is the case of a 'one-off' contract. The modern concept of maintaining ongoing supplier relationships, with a view to assess suppliers' performance so as to engage in long-term collaborative relationship, is not being practised by BR.

**Figure 12: Relationships spectrum**



Relationships with suppliers may extend from ‘**one-off**’ arm’s length transactions at one end to long-term **collaborative** ‘partnerships’ at the other end as shown in figure-10. No specific relationship is the best for all procurement. Kraljic portfolio matrix suggests that for locospares, being bottle neck items, purchasers priority is to ensure supply security and continuity of business. The appropriate action plan is to make medium to long term contracts with carefully prequalified and selected suppliers, developing alternative backup sources of supply, including incentives and penalties in contracts, and performance monitoring and expediting, to ensure the reliability of delivery.

#### **4.11 Customer satisfaction**

CCS is the only procuring entity for stock procurement. All other departments (Mechanical, Signal and Telecom, Electrical, Engineering, Personnel, Planning, RNB, Transportation and Commercial, and other operating units of BR) are the internal customers of CCS. This dissertation was focused only to the needs of the DLW, Pahartali. The author collected data thorough questionnaire and in-depth interview with the WM, DLW, Pahartali. For the FY 2013-14, data were collected regarding supply and demand fulfillment for the stock items.

The following KPIs give a picture of satisfaction and dissatisfaction:

- Total number of stock items : **5232** items
- Regularly used items : **2000** items
- Number of items demanded during FY 213-14: **1000** items
- Number of items supplied from Stores depot : **800** items
- Number of items made available
- ‘On Time in Full’ (OTIF) : **650** items
- % of demand fulfillment : **80%**
- % of out of stock items : **20%**
- Number of rejection due to quality failure: **4** items

In addition to physical transaction, financial data were also collected to test the consistency of the data provided by the respondents. During the FY 2013-14, BDT 10.6 crore were allocated to WM/DL/PHT to incur expenditures for materials requirements of DLW, and BDT 10.00 crore was expended.

The nature of the budget spends is shown below:

- Spent to draw materials from stores depot : BDT **9.12** crore
- Spent to purchase materials from local suppliers : BDT **0.88** crore
- Unspent : BDT **0.60** crore
- % of stores spend to the total spend : **91** %

The above budget KPIs are more or less consistent with the KPIs for physical transaction data. The procurement function has fulfilled about 80% of demand which covers the 91% of total material budget of the customer. This result shows high satisfaction of the customer. WM/DL/PHT has expressed that during the FY 2013-14 the procurement performance was satisfactory, in terms of availability of right quality materials at the right time.

# CONCLUSION AND RECOMMENDATION

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## 5.1 CONCLUSION

Spare Parts Management requires special treatment, somewhat different from the inventory management of regular items. This is because of the purpose of keeping a stock of spares to serve as a replacement to the worn-out in the locomotives. The statistics of failure is of much importance in the management of spare-parts. Moreover, spare parts are not always available during the entire life-time of the locomotives. Spare-parts are special independent demand items deriving their demand from the failure characteristics of the component, and with a specialised supply situation.

The challenges faced by stores department or BR, the unique challenges faced the organisations in controlling/ managing/ procuring spare-parts are as follows:

**Firstly**, there is an element of uncertainty as to when a part is requires and also the quantity of this requirement. **Secondly**, spare-parts are not easily available in the markets. the OEM has to supply the spares in most cases. **Thirdly**, new models are introduced to incorporate the design improvements and old models are phased out. **Fourthly**, the number and variety of spare parts are too large machining the close control more or less tedious. **Fifthly**, the consumptions for some spars are very high, while for some are very low.

Inventory management of spare parts plays an important role in achieving desired locomotive availability, at an optimum cost. It has been observed that non-availability of spare parts, as and when required, contributes to as much as 50% of the total down time. The cost of spare parts is more than 50% of the total maintenance cost. A suitable and robust inventory management is essential which will help optimise inventory cost.

Therefore, BR should proceed systematically and establish an effective spare-parts management system. Codification helps to minimise duplication of spare-parts stocking, thereby reducing inventory and facilitates computerisation of spares management systems. In addition, codifications should be aimed at applying selective procurement effort to evolve optimum replacement policy. **Lastly**, the application of computers for processing of spare parts information and operating an effective spare parts control system will be very helpful for CCS procuring unit and will ensure timely actions for an efficient and effective spare parts management.

The BR specific procurement practices and challenges are summarised below:

- (i) CCS has to procure 5000 to 10000 items of locomotive spares parts, out of which approximately 1000 items are for DLW, Pahartali. CCS follows regulations for public procurement for procuring loco-spares. International limited tenders are invited amongst the approved qualified potential tenderers. International sourcing and procurement have some generic risks. Therefore, in the case of procurement of loco-spares have some generic along with specific risks of fraud in the process of prequalification, quality assurance, payment, supply, supplier failure and information risks.
- (ii) The procurement process is very transparent but highly in-efficient. There are lot of scope to reduce the lead time of some stages in the procurement cycle, especially in between purchase indent and publication of IFT; tender opening and tender finalisation & accepting.
- (iii) CCS office does not utilise the opportunities of the development of ICT. The whole procurement process is based on manual and unsecured data management, which is highly vulnerable to the risks of data theft, data damage, and fraud, as there is no protection against data change and there is no instrument for tracing data change. Manual system consists of duplication of effort for record keeping, which is time consuming and not suitable for producing real time procurement status for a specific item.
- (iv) Staff working in the procurement sections is adequately qualified but not skilled in the procurement discipline, as they have not received any training on procurement and on use of ICT.
- (v) CCS usage standard tender documents (PG4) published by the CPTU for procuring loco-spares. The use of standard tender documents helps to avoid 'battle of the forms' between purchaser and tenderers. Some contract terms are risky to the procuring entity.
- (vi) Classifications and codification of spare parts for inventory and procurement policy are absent in the inventory management of BR. The policy of reorder point is applied to all items. Spares needs to be re-classified and codified according to the procurement requirement with a view to giving selective effort according to the code and class of spares

- (vii) The consumers use the term 'vital' to denote important items for production which is out of stock of stores and cannot be procured from the local market and they change they items on monthly basis. This is a deviation from standard production and operations management. In standard practice, vital items are highly critical for production, absence of those causes stoppage of production. These items are fixed and need to stock in the high level.
- (viii) Existing Payment, Inspection, and Warranty terms of contract proved to be unsatisfactory and unsustainable regarding getting right quality of spare parts and management of MDMs for complaint materials.
- (ix) Procurement processes possess high level of information risks in keeping procurement data safe and confidential.

## **5.2 RECOMENDATIONS**

### **5.2.1 Inventory Management and Codification of spare parts**

- (i) Spares should be divided into segments according to their failure nature, value, availability, complexity in the market and criticality for the production. Systematic classification and codification may be introduces to identify items by the code number, for example: for what loco series, for what component, what source of procurement-shop made/ bought, what inventory and procurement policy applies to the item, etc.
- (ii) Classification may be made based on other characteristics: capital spares, insurance spares, overhaul spares, wear and tear spares and consumable spares.
- (iii) Consumers may prepare vital, essential, and desirable items' list and the lists should not be changed frequently.

### **5.2.2 Standing Policy for Pre-qualification and Enlistment**

- (i) CCS may take initiatives to setup a standing policy for implementing robust and meticulous pre-qualification, vendor rating and enlistment of potential foreign source of supply. There may have a standing high level committee, supported with a technical sub-committee, for scrutiny, evaluation of applications for enlistment, as well as performance appraisal of the existing suppliers (vendor rating). The process should go round the year, as is in the case of local source approval, but committee may report to DG for approval twice a year. This is required because all the respondents emphasis on the approval of right suppliers and right manufacturers for getting right quality of spare-parts.

- (ii) A considerable number of items tendered are decided for retender due to the variances of official estimates and quoted price ; variance of tender quantity and Minimum Order Quantity (MOQ). Moreover, it is observed that the lead time between PI and IFT is very long. Major reason for this delay is lack of LPR and price information for the spares which have not been purchased or tendered. To overcome this challenge, CCS may (during invitation for Application for pre-qualification and enlistment) ask to submit, along with the application, an indicative price list from their manufacturer and MOQ for all items which they will have applied for enlistment,. This will, also, help to identify genuine manufacturers.

### **5.2.3 Modification of Tender terms**

Disposal of the MDM of complaints spares has become a challenge for the procuring entity, particularly for the complaints raised by the users beyond the warranty period, for the loco-spare procured from the foreign source. The issue can be managed safely by transferring it to the supplier as well as spreading the risks to the consumer to some extent. These can be done through incorporating suitable tender and contract terms in the tender documents.

As no pre-shipment inspection is made, due to lack of detailed specifications of the spare-parts, the only means of assuring quality is the 'Manufacturer's certificate' and 'Warranty certificates' issued by the suppliers/ manufacturers. This is a high risky procurement in terms of getting correct and right quality of materials.

Therefore, the following contract terms are highly recommended by the researcher, to ensure correct and right quality of materials and to reduce MDMs:

#### **(i) Payment :**

- (a) For the procurement of loco spare-parts from foreign suppliers, the payment may be made 100% of contract value (CFR/ CTG value) through L/C, but may be made in two stage, first 80% contract value (CFR/ CTG value) on shipment of materials, submission of documents in the banking channel, as motioned in the L/C and upon acceptance of the shipping documents by the CCS.
- (b) Incoming spares of stores depot may be checked by the consumer regarding suitability, upon getting satisfactory report from the consumer, final acceptance may given by the DCOS (Shipping) for payment of rest 20 % of contract value.

#### **(ii) Inspection :**

It is mentioned in the contract that final inspection and test shall be carried out by DCOS (shipping). Therefore L/C opening bank shall send the original documents to the inspector i.e. DCOS (Shipping). DCOS (shipping) shall scrutinize the documents as mentioned in the contract and put-up files with his remarks for acceptance by the CCS. Payment shall be made only upon getting acceptance by the CCS.

For high value procurement, PSI may be made to assure quality at the production level and to ensure that the component is being made by the approved manufacturer.

(iii) **Warranty period:**

The warranty period should be extended up to 18 months from the date of issuing Receipt Note by DCOS (Shipping), for spares other than rubber or similar items. And for wrong supply, the supplier shall be responsible for replacement of correct material, even if detected beyond the warranty period. If supplier fails to replace correct materials within the replacement time allowed in the contract, they also shall be liable for paying compensation for the loss to the PE at the of Liquidated Damage (L/D).

For raising MDM against high value procurement and beyond warranty period, a high level committee may be formed, taking members from Procurement, Inventory Control, and Consuming unit.

#### **5.2.4 Cross Functional Collaboration**

- (i) System for more regular oral and written communications of Inventory control, procurement, and workshops should be setup, to engage them systematically to contribute in procurement planning, acceptance of spares and technical decisions. A mini Stores Cell in the office of the DG, BR may be setup consisting of Director (stores), DD (Stores). Director (stores) may play a pivoting role for co-ordinations among procurement, inventory control and workshops and DD (Stores) may play role of desk officer of the confidential sections of ADG (RS) for the finalisation of tenders. This will not only improve the procurement, acceptance and delivery performance but also contribute, considerably, expedite tender evaluation and finalization by TEC at RB.
- (ii) Engage consuming department in the preparation of procurement plan and tender documents, so that their expectations can be addressed at the outset through the development of contract terms

#### **5.2.5 Emphasize on R&R Programme**

CCS may give more emphasize on component overhauling at CLW, through R&R programme, to support lessening downtime in F&G schedule of DLWs.

#### **5.2.6 Procuring Assembly, Components, rather than Spare Parts**

Consumers may use more assembly, sub-assembly and components, rather than using low-value, huge number spare-parts. This will also help to reduce inventory level and locomotive down-time.



### **5.2.7 Use of Framework Agreement**

CCS may procure low-value, frequently used items using long-term contracting options from reliable, trusted supplier, using framework contract agreement with the prequalified trusted suppliers.

### **5.2.8 Special Attention to Low-value Procurement**

Special strategic decisions are required for low-value NOA, as suppliers are not interested to submit performance security in foreign currency for low-value award. And this is practically not feasible to submit Bank Guarantee in foreign currency, as required by regulations, for NOA value less than 1000 USD or less and opening L/C for contract value 5000 USD or less. In these cases bank charges are considerably higher than the original value of the spares.

### **5.2.9 Search More Genuine Local Source of Supply**

To save foreign currency as well as to reduce lead time of supply, more local source of supply for loco-spares may be approved and the process should be robust but fair. This may be considered as Business Continuity Plan (BCP) in the management of foreign suppliers' failure risk.

### **5.2.10 Procure Component-wise Lot-by-Lot , rather than item-by-item**

To overcome un-quoting of low-value spares and to make the suppliers interested to do business with BR, more assembly, sub-assembly and components may be procured from the trusted suppliers, rather than procuring spare-parts in small amount.

### **5.2.11 Use of Best Practices of Procurement Discipline**

World class practices of procurement and supply discipline such as: procurement segmentation, supplier tiering, and supplier relationships management may be adopted to ensure supply security and continuous improvement in terms of price and delivery.

### **5.2.12 HRM and Staff Training**

Training of the procurement personnel, at each level of the staff involved, is vital to ensure, or enhance knowledge and improve skill at least up to the working level.

### **5.2.13 Finance and Budget**

CCS is not getting sufficient budget for procuring diesel loco-spares and a considerable portion of the indent remains un-tendered due to the budget deficit. Required budget for loco-spare procurement may be ensured by BR to commensurate with the demand of the consumers.

#### **5.2.14 Business Process Re-engineering (BPR)**

Modern ICT (internet, intranet, extranet, etc.) based inventory and procurement management systems such as e-procurement and inventory modules of **ERP** software (e.g. SAP, Oracle) may be introduced for quicker, easier, transparent and information risks managed procurement. To overcome strategic drift, present in the procurement processing systems, there is a need for radical change to utilise the development of ICT and the current procurement processes need to be re-engineered for the implementation of e-procurement system in the CCS office, implementing ERP systems (via intranet, extranet etc). Surely, this will involve a 'big change' and appropriate 'change management' along with appointing 'change champion' and **support from the people at the strategic level** will be required to make the change a success.

### **5.3 LIMITATION and SCOPE FOR FURTHER STUDY**

Study of this dissertation was limited to the demand and supply of DLW Pahartali. The results may be used to describe the demand and supply of other DLWs of BR. For DLWs the inventory policy used by BR is push inventory system. The nature of demand is totally different for CLW, where pull inventory system is followed, according to the locomotive maintenance programme and demand is generated based on the Bills of Materials (i.e. Kit list). Therefore, there is a scope for further study for the procurement and supply of spare parts required for CLW.

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# APPENDICES



BRAC Institute of Governance and Development (BIGD)  
BRAC University, Dhaka



**Questionare-1** : For the Procuring Entity  
(CCS office, BR, Chittagong)

**Dissertation Topic** : Current Practice and Challenges in the Procurement of Goods in Bangladesh Railway: A case study on Locomotive Spare-parts Procurement.

(This is a survey questionnaire intended to perform an academic research with a view to exploring the current practices and challenges in the procurement of locomotive spare-parts by Bangladesh Railway and also to find out the ways to improve the current performance of the procurement function. Your honest response is valuable for the researcher. The researcher does assure that the information provided by you and your office will be kept confidential and will be used only for the academic purpose)

**Note:** Please put ✓ mark as appropriate

**Part-A:** You and your experience

1. Name :
2. Job Title :
3. Present Position :
  - a. Senior Level
  - b. Mid Level
  - c. Junior Level
4. Over all Experience:
  - a. 0-5 years
  - b. 6-10 years
  - c. 11-15 years
  - d. 15+ years
5. Procurement Experience:
  - a. 0-5 years
  - b. 6-10 years
  - c. 11-15 years
  - d. 15+ years

**Part-B: Your Opinion**

1. BR has about 242 diesel electric locomotives, how many items of spare-parts for locomotives do you have to procure annually?
  - a. 500 to 1000
  - b. 1000 to 5000
  - c. 5000 to 10000
  - d. 10000 to 15000
  
2. How do you get demand for the locomotive spare-parts from Pahartali Diesel Locomotive Workshop (Pahartali DLW)?
  - a. Re-Order System
  - b. Min-Max System
  - c. As and when required system
  - d. Others:
  
3. In Re-order system, demand is generated only when materials are issued and stock falls below a pre-determined stock level. In this case, how do you prepare Annual Procurement plan (APP) under the Public Procurement Rules (PPR), 2008?
  - a. We do not prepare APP for Loco-Spare-parts.
  - b. We consider previous year's consumption than revise it quarterly.
  - c. Considering the past year's consumption we prepare an APP in the start of every FY and then we get approval of actual APP case-by-case basis.
  - d. Others, please specify:
  
4. Does this procedure adhere to requirements of the PPR, 2008 ?
  - a. Yes
  - b. No
  - c. No, but we had a consent from the CPTU as loco-Spare-parts are goods of specialised nature.
  
5. How many tenders do you need to invite for Loco spares procurement?
  - a. 50-100
  - b. 100-200
  - c. 200-300
  - d. 400-500
  - e. 500+
  
6. Why Loco spare-parts are considered as goods of specialised nature?
  - a. Its detailed specification is not available
  - b. It is manufactured by only few manufacturers in the world.
  - c. High lead time of procurement
  - d. It is not available in the local market.
  - e. They are only known by the part numbers given by the manufactures in the Part-catalogue.
  - f. All of the above

- g. others
7. Do you have preferred suppliers (approve supplier) list for loco spare-parts?
    - a. Yes
    - b. No
  8. How many suppliers do you have to maintain in your Loco- spares supplier loose?
    - a. 5-10
    - b. 10-15
    - c. 15-20
    - d. 20-30
    - e. 30-50
    - f. 50-100
  9. Do you use supplier segmentation and supplier tiering to optimise your supplier base?
    - a. Yes
    - b. No
    - c. If yes, how ?
  10. Do you use e-procurement system?
    - a. Yes
    - b. No
  11. How do you prepare official estimates for the Loco-spare?
    - a. We use price list book by us
    - b. We use price list book by us provided by the approved suppliers
    - c. We conduct purchasing research
    - d. we consider the last purchase price and for new items we constitute a estimate committee
    - e. Others :
  12. What method of tendering is generally followed, for procurement of loco- spares supplier?
    - a. OTM
    - b. LTM
    - c. RFQ
    - d. DPM
    - e. Others.
  13. Do you update your list of approved qualified potential supplier regularly?
    - a. Yes
      - annually/ bi-annually/ every 3 years
    - b. No
  14. When did you publish the last potential supplier list?
    - a. Date:
  15. What is the minimum qualification criterion for the enlistment as potential Loco spare suppliers?
    - a. General
      - (a)
      - (b)



- b. Experience
  - (a)
  - (b)
- c. Financial
  - (a)
  - (b)

16. Do you measure the efficiency of the procurement function?
- a. Yes
  - b. No

17. What is the average lead time between:
- a. Getting demand and inviting tender :-----months
  - b. Inviting tender and tender acceptance :-----months
  - c. Tender acceptance and contract signing :-----months
  - d. Contract signing and L/C opening :-----months
  - e. L/C opening and shipment :-----months
  - f. Shipment and clearing :-----months
  - g. Clearing and delivery to depot :-----months

18. How lead time in each stage could be shorten:
- a. ....
  - b. ....

19. Loco-spare supplies are geo-graphically dispersed. How do you sent tender document to them?
- a. we deliver Tender Documents electronically direct to them
  - b. We deliver Tender Documents to their authorised Local Agent and send e-mail direct to the approved suppliers
  - c. Others

20. In your experience, what are the major challenges in the procurement of Loco-spare with the aim of satisfying the customers' needs of quality spare parts?
- a.
  - b.
  - c.

21. In the absence of material specifications at your end, as a purchaser how do you ensure the right quality of spare-parts?
- a.
  - b.

22. What do you do when you get complaints from the consumer after the warranty period?
- a.
  - b.

23. The public procurement Rules, 2008 has been enacted since 2008 and some provisions of the stores code regarding procurement has become null and void. What is the impact of the PPR on the procurement of Loco- spares?
- a.
  - b.

24. How many spares have only one approved source?
- a. -----Nos.
25. Do you think long term collaborative agreement with qualified approved suppliers can improve the quality and delivery performance?
- (a) Yes            (b) No
26. In your opinion, what is/are the bottle neck in the long supply chain starting from the demand generation to the demand fulfilment?
- Estimate preparation
  - Comparator statement preparation
  - Tender evaluation
  - Tender accuracy
  - Contract agreement signing
  - L/C opening
  - Goods shipment.
27. Procurement of loco spares falls in the category international limited tendering amongst the approved qualified potential tenderise. Any international procurement poses some generic risks like currency risk, payment risk, difference in culture, language and time, quantity assurance risk. What are the specific risks for the procurement of loco spares that has to be addressed by the purchaser through contractual agreements between the suppliers and buyers to make it sustainable?
- Quality assurance
  - Wrong supply
  - Fraud
  - Currency difference and fluctuation
  - Obsolescence
  - Others: please specify
28. Have you carried out any systematic risk assessment programme in organisation, especially for the management of procurement risk?
- Yes
    - What are the risks identified in the assessment?  
(a)
    - What measures have been taken to manage the identified risks?  
(a)
  - No
29. What types of contract terms do you use in the contract with suppliers to procure loco spares?
- STD published by CPTU (Please specify name):
  - Modal form of contracts (Please specify name):
  - Bespoke contracts: Tailored in each procurement and negotiated before contracting
  - Others
30. How procurement data are captured for future reference
- Maintaining purchase Register
  - Maintaining purchase Card for each item
  - Data even entered into a customised computer data base.
  - We use ERP: procurement module

e. We do not capture data.

31. Do you think current system of data management is vulnerable to the risk of corruption and fraud?

0	1	2	3	4	5
Lowest			Highest		

Reason for '0' :.....

32. What type of audit do you have to ensure compliance and internal control to avoid risk of procurement?

- a. compliance audit by C&AG
- b. Procurement post review by independent specialist procurement auditors as specified in the PPR, 2008.
- c. Others please specify.

33. What are the major findings in the last audit reports in connection to the loco spare parts?

- a.
- b.

34. What specific measure you have taken to address those areas?

- a.
- b.

35. Do you face political pressure during enlistment of suppliers and procurement of loco spare-parts?

0	1	2	3	4	5
Not at all					Strong

36. Do you have any vendor rating programme to evaluate the current and past performance of the approved suppliers?

- a. Yes
- b. No.

37. Do you have any standing policy for the preparation of approved supplier base of loco spares?

- a. Yes
- b. No

38. How do you engage customers to improve their satisfaction?

- a. Involving them in the procurement process
- b. Regular oral and written communication
- c. Monthly meeting
- d. Others:

39. People are the heart of any organisation. Training is essential to develop skill of the people performing job. Do you have carried out any training need analysis (TNA) to identify skill gap:

- a. Yes
  - i. How many training programme you have provided to the staff working in the procurement function?
- b. No

40. Do you have any plan to have MRP/ MRP-II/ ERP/e-Procurement?

a. Yes

(a) MRP

(b) MRP-II

(c) ERP

(d) e-Procurement

----- Thank you for giving me your valuable time and effort-----



**Questionare-2** : For the User Department  
(Works Manager, DLW, Pahartali, Chittagong)

**Dissertation Topic** : Current Practice and Challenges in the Procurement of Goods in Bangladesh Railway: A case study on Locomotive Spare-parts Procurement.

(This is a survey questionnaire intended to perform an academic research with a view to exploring the current practices and challenges in the procurement of locomotive spare-parts by Bangladesh Railway and also to find out the ways to improve the current performance of the procurement function. Your honest response is valuable for the researcher. The researcher does assure that the information provided by you and your office will be kept confidential and will be used only for the academic purpose)

**Note:** Please put ✓ mark as appropriate, you are free to choose more than one where applicable

**Part-A: You and your experience**

6. Name :
7. Job Title :
8. Present Position :
  - a. Senior Level
  - b. Mid Level
  - c. Junior Level
9. Over all Experience:
  - a. 0-5 years
  - b. 6-10 years
  - c. 11-15 years
  - d. 15+ years
10. Loco- Maintenance Experience:
  - a. 0-5 years
  - b. 6-10 years
  - c. 11-15 years
  - d. 15+ years

**Part-B: Your Opinion**

11. BR has about 242 diesel electric locomotives, how many locomotives do you have to maintain per year?
- a. F-Schedule : No
  - b. G-schedule : No
  - c. Special : No
  - d. Others : No
12. In any manufacturing or workshop environment 4Ms (Man, Material, Money and Management) are important. In your experience, for your workshop how do you rate the following them, in terms of your management time and effort?
- a. Man : %
  - b. Material : %
  - c. Money : %
  - d. Management : %
13. How many locomotives were scheduled for maintenance in the FY 2013-14?
- a. \_\_\_\_\_ No.
14. How many locomotives were maintained in FY 2013-14?
- a. \_\_\_\_\_ No.
15. Percentage of target achieved: %
16. Could you give the following information?
- No. of items demanded in the last FY?
  - No. of items supplied in full from stores?
  - No. of items partially supplied?
  - No. of items rejected due to inferior quality or wrong supply?
  - No. of vital items?
17. How do you manage the loco-maintenance works, when stores depot fails to supply the demanded materials?
- a. Cannibalisation
  - b. Procure local materials or foreign materials from local suppliers to meet emergency
  - c. Others, Please specify .....
18. Do you think the current procurement systems followed by the Procurement Function (CCS office) of BR need to be overhauled to meet your demand?
- a. No
  - b. Yes, please specify: (You are free to choose more than one)
    - (a) CCS may procure more sub-assembly, assembly or components rather than procuring spare-parts
    - (b) CCS may give more emphasis on component overhauling at CLW, through R&R programme, to support F&G schedule of diesel workshop
    - (c) CCS should search more local source of supply for spare-parts
    - (d) Others, please specify: .....
19. Why Loco spare-parts are considered as goods of specialised nature?
- a. Its detailed specification is not available
  - b. It is manufactured by only few manufacturers in the world.
  - c. High lead time of procurement
  - d. It is not available in the local market.

- e. They are only known by the part numbers given by the manufactures in the Part-catalogue.
- f. All of the above
- g. others

20. In the last FY 2013-14, what was the strength of your materials budget in BDT?  
 a. \_\_\_\_\_ Crore

21. What was the pattern of utilisation of budget?  
 a. Spent to draw materials from stores depot : Crore  
 b. Spent to purchase through local suppliers : Crore  
 c. Remains unspent due to non-availability of materials : Crore

22. How do you rate the service level performed by the procurement function of BR in the Procurement of foreign sourced loco-spares?

Lowest			Highest		

Reason for 0: .....

23. How many items are vital for your workshop for the month of January, 2015?

a. ----- Nos.

24. How do you define 'vital' item?  
 .....

25. In the absence of material specifications, except part number, at your end, as a consumer, how do you ensure the right quality of spare-parts?

- a.
- b.

26. In the absence of material specifications at purchaser's end, except part number, how can the procurement function assure and ensure the right quality of spare-parts?

- a.
- b.

27. What could be done to avoid complaints from the consumer after the warranty period?

- a. The incoming spare-parts of stores depot should be checked by the consumer regarding suitability, before giving final acceptance and suppliers should be paid only after acceptance from the consumer.
- b. The warranty period should be extended up to two years
- c. The wrong supply should be replaced if detected even after the warranty period
- d. Others:

.....  
 .....

e.

28. Do you thing long term collaborative agreement with qualified approved suppliers can improve the quality and delivery performance?

- (a) Yes
- (b) No

29. Do you thing more open, collaborative engagement of consumers in the early stages of procurement can improve your satisfaction as a customer?

- f. No
- g. Yes: how?  
 (e) preparation of specification

- (f) preparation of tender document and contract terms
- (g) evaluation of tender and awarding the contract
- (h) acceptance of materials
- h. Regular oral and written communication
- i. Monthly meeting
- j. Others:

30. If anything not covered, but seems, to you, may help improve the materials availability?

- k. -----
- l. -----
- m. -----

---Thank you for giving me you valuable time and effort.---





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**Questionare-3** : For the User/ Procurement Department  
(Expert Opinion)

**Dissertation Topic** : Current Practice and Challenges in the Procurement of Goods in Bangladesh Railway: A case study on Locomotive Spare-parts Procurement.

(This is a survey questionnaire intended to perform an academic research with a view to exploring the current practices and challenges in the procurement of locomotive spare-parts by Bangladesh Railway and also to find out the ways to improve the current performance of the procurement function. Your honest response is valuable for the researcher. The researcher does assure that the information provided by you and your office will be kept confidential and will be used only for the academic purpose)

**Note:** Please put ✓ mark as appropriate, you are free to choose more than one where applicable

**Part-A:** You and your experience

1. Name :
2. Job Title :
3. Present Position :
  - a. Senior Level
  - b. Mid Level
  - c. Junior Level
4. Over all Experience:
  - a. 0-5 years
  - b. 6-10 years
  - c. 11-15 years
  - d. 15+ years
5. Loco- Maintenance/ Spare-parts Procurement Experience:
  - a. 0-5 years
  - b. 6-10 years
  - c. 11-15 years
  - d. 15+ years

**Part-B: Your Opinion**

1. In any manufacturing or workshop environment 4Ms (Man, Material, Money and Management) are important. In your experience, for locomotive workshop of BR how do you rate the following them, in terms of your management time and effort?
  - a. Man : %
  - b. Material : %
  - c. Money : %
  - d. Management : %
  
2. How do the Works Managers manage the loco-maintenance works, when stores depot fails to supply the demanded materials in the right time?
  - a. Cannibalisation
  - b. Procure local materials or foreign materials from local suppliers to meet emergency
  - c. Others, Please specify .....
  
3. Do you think the current procurement systems followed by the Procurement Function (CCS office) of BR need to be overhauled to meet present demand and to improve consumers satisfaction?
  - a. No
  - b. Yes, please specify: (You are free to choose more than one)
    - (a) CCS may procure more sub-assembly, assembly or components rather than procuring spare-parts
    - (b) Spare-parts could be procured only from the renowned loco-builder, assembles and the Original Equipment Manufacturers
    - (c) CCS may give more emphasis on component overhauling at CLW, through R&R programme, to support F&G schedule of diesel workshop
    - (d) CCS should search more local source of supply for spare-parts
    - (e) CCS office should engage users in the procurement process, so that their expectations can be addressed through the contract terms.
    - (f) CCS could develop a standing policy for the approval of foreign sources as potential tenderer, and there should be a standing committee for evaluation of the applications of the foreign suppliers, as well as evaluation of the performance of the approved suppliers and they could report to the procuring entity twice a year.
    - (g) Others, please specify: .....

4. Why Loco spare-parts are considered as goods of specialised nature?
  - a. Its detailed specification is not available
  - b. It is manufactured by only few manufacturers in the world.
  - c. High lead time of procurement
  - d. It is not available in the local market.
  - e. They are only known by the part numbers given by the manufactures in the Part-catalogue.
  - f. All of the above
  - g. Others

5. How do you rate the service level performed by the procurement function of BR in the Procurement of foreign sourced loco-spares?

0	1	2	3	4	5
Lowest			Highest		

Reason for 0: -----

6. In the absence of material specifications, except part number, at user end, as a consumer, how could they ensure the right quality of spare-parts?
  - a.
  - b.
7. In the absence of material specifications , except part number, at purchaser's end, how could the procurement function assure and ensure the right quality of spare-parts?
  - a.
  - b.
8. Managing the MDM (Manuscript Memorandum of Differences) has become a challenge or the procuring entity, particularly for the complaints raised, by the users beyond the warranty period, for the loco-spare procured from the foreign source. What could be done to avoid complaints from the consumer after the warranty period?
  - a. The incoming spare-parts of stores depot should be checked by the consumer regarding suitability, before giving final acceptance and suppliers should be paid only after acceptance from the consumer.
  - b. The warranty period should be extended up to\_\_\_\_\_ years
  - c. The wrong supply should be replaced if detected even after the warranty period
  - d. Others: .....
9. Do you thing long term collaborative agreement with qualified approved suppliers can improve the quality and delivery performance?
  - (a) Yes
  - (b) No

10. Do you think more frequent and open communication and engagement with users in the early stages of procurement can improve user's satisfaction?
- No
  - Yes: how?
    - preparation of specification
    - preparation of tender document and contract terms
    - evaluation of tender and awarding the contract
    - acceptance of materials
  - Regular oral and written communication
  - Monthly meeting
  - Others:
11. Procurement of loco spares falls in the category international limited tendering amongst the approved qualified potential tenderise. Any international procurement poses some generic risks like currency risk, payment risk, difference in culture, language and time, quantity assurance risk. What are the specific risks for the procurement of loco spares that has to be addressed by the purchaser through contractual agreements between the suppliers and buyers to make it sustainable?
- Quality assurance
  - Wrong supply
  - Fraud
  - Money laundering
  - Currency difference and fluctuation
  - Obsolescence
  - Others: please specify
12. For the procurement of loco spare-parts from foreign suppliers, the contract terms exercised by the procurement function (Stores Department) of BR is CFR/ Chittagong Sea Port. And the payment is made through letter of credit (L/C), the payment is made to the 100% contract value (CFR/ CTG value) on shipment and production of the shipping documents. No pre-shipment inspection is done as it is not possible without detailed specifications of the spare-parts. The only means of assuring quality is the 'Manufacturer's certificate' and 'Warranty certificates' issued by the suppliers/ manufacturers. In your opinion, how risky the payment term is for the purchaser in terms getting correct spare-parts of right quality?

0	1	2	3	4	5
Lowest			Highest		

Reason for 0: .....

13. What contract terms could be added to minimise the risk, mentioned in Q 11, with a view to transfer the risk to the suppliers and/or to spread the risk to the users?

a. -----

b. -----

14. In your experience, what are the major challenges in the procurement of Loco- spares with the aim of satisfying the customers' needs of quality spare parts at the right time?

a.

b.

15. If anything not covered, but seems, to you, may help improve the materials availability?

a. -----

b. -----

---Thank you for giving me you valuable time and effort.---