

Outsourcing Strategy in Avionics Manufacturing in Indian DPSUs

Estrategia de Outsourcing en Manufactura Aviónica en DPSU India

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ABSTRACT:

The Avionics manufacturer DPSUs is a high end technology oriented which involve in complex integration among their supplier & vendors. The global competition of DPSUs not only related the manufacturing facility & technology but also their supply chain. This research paper point out the outsourcing as a strategic tool for economic growth of DPSUs. In this paper researcher discuss the present challenges in supply chain for avionics manufacturer DPSUs and GOI policy for outsourcing. Researcher develop a strategic outsourcing model for avionics manufacturer DPSUs which application enhances their performance.

Keywords: Avionics. Strategic Outsourcing, Supply Chain & Risk.

RESUMEN:

La fabricación aviónica DPSU es una tecnología de alta gama que implica una integración compleja entre proveedores y vendedores. La competencia global de DPSUs no sólo relaciona la instalación de la fabricación y la tecnología, sino también su cadena de suministro. Este trabajo de investigación señala la externalización como una herramienta estratégica para el crecimiento económico de las DPSU. En este documento, el investigador discute los retos actuales en la cadena de suministro para fabricantes aeronáuticos DPSU y GOI como política de *outsourcing*. La investigación pretende desarrollar un modelo de *outsourcing* estratégico para fabricante aeronáuticos DPSU para que su aplicación mejore el rendimiento.

Palabras clave: Aviónica. Outsourcing Estratégico, Cadena de Suministro y Riesgo.

1. Introduction

Defence & Aerospace sector is expanding globally and India is emerging as one of the largest defence markets. To boost the growth of Indian defence & aerospace industry, Government has simplified Licensing policy for manufacturing of defence products and raised FDI limit to 49%. With Make In India concept & increase limit of FDI in defence the DPSUs, try make Indian Avionics Industry to be self – reliance & internationally competitive. Avionics manufacturing is a high technology industry that involve complex interwoven process & integration which demands an optimum level of integration between Original Equipment Manufacturers (OEMs) & their supplier to work together & create integrated solution that make manufacturing more cohesive, efficient & cost effective.

Manufacturing capability of avionics articles is very critical indeed so as to minimise unit production cost while maintaining the required quality standards as its airworthiness requirement. Flexible production lines, procurement of material in bulk, production modelling during the design process, all help to achieve maximum yield. The application of technology in the form of system engineering & integration, enterprise resource planning, computer-based modelling techniques for design & development of avionics systems as well as growth of manufacturing sector. The global competition of Indian DPSUs not based anymore on a challenge between manufacturing companies but mainly on a challenge between manufacturing companies' supply chain, which consists in focusing on rapid response to customers' needs at low costs. Therefore, in order to stay competitive in reaching the wide spread customers in an effective and cost efficient way, more importance has to be given to the area of supply chain. Managing the supply chain aims at challenging constantly the corporate strategy by setting a new environment where cost savings must be done whenever an opportunity appears. Consequently costs which do not add any value to the final product have to be chased and reduced: outsourcing has become a widely accepted practice as companies concentrate on their core activity, savings in inventory holding costs are performed through smaller stock levels, deliveries from the supplier to the point of use must be optimized, etc.

Outsourcing is adopted by Avionics Article Manufacturer Indian DPSUs as a Business Strategy to develop state of- the-art technologies with long term vision to attain self-reliance by strengthening partnership with Indian Private Industry. This will propel, Indian DPSUs to become internationally competitive in the long run. To create a strong and vibrant manufacturing base in defence and aerospace in the country, a capable and cost effective supply chain needs to be built. In order to do so, there is a need for DPSUs/OFB to identify their core and strategic operations and outsource the non-core activities to Indian Private Industry and also core activities wherever feasible.

2. Objective

Under the topic “ Outsourcing Strategy in Avionics Manufacturing DPSUs” author establish different facts of outsourcing which make it strategic tool in project management. The objective of this research paper is to find challenges in Avionics Manufacturer DPSUs which can be resolved by healthy outsourcing policy. The existing Defence production process & feasibility of outsourcing is major focus area of this research work. With the statistical observation of outsourcing strategy author has develop a standard model on the same which is useful of DPSUs for their economic & work culture development.

3. Outsourcing as Tool of Strategic Management

Outsourcing is nothing but 'strategic partnership which is nothing but formal alliance between two commercial enterprises usually formalised by one or more business contracts but falling short of legal partnership or agency or corporate affiliate relationship. The DPSUs may adopt 'outsourcing' as its business strategy for one or more of the following reasons:

- Cost minimization,

- Resource access,
- Resource leverage, and
- Risk diversification.

The outsourcing practice, however does have certain inherent disadvantages including getting exposed to the risk of market forces, eventual loss of skills and core competence, the complications and difficulties in maintaining quality assurance, the need for sophisticated management techniques without having the privilege of formal control on the supplying agencies and the risk of reducing market base over a period of time. The decision of Outsourcing from DPSUs for Avionics article is not a easy decision , since it link with the National Importance & confidential information of fighter aircraft of IAF.As broad guidelines for DPSUs, the possibilities of outsourcing can be explored in those areas of low cost high volume items, dual use technology of items/areas, and heavy and complex system where subsidiary technology or items can be obtained through more competitive process from the market.

On the other hand outsourcing may not be practicable in the restrictive and sensitive items or areas due to security reasons, restrictive volume of demands to sustain the line of production or profitability for the suppliers, high and complex technology area of purely military nature, and the items where quality assurance and management without control of source and chain of supply would be difficult.

The objective of outsourcing by Avionics Manufacturing DPSUs is to implement procurement and vendor operating strategies that streamline material/service flows, reduce manufacturer and supplier costs, improve quality and customer service, and create long-term buyer/seller partnerships along with confidentiality of sensitive information [4]. The DPSUs has to be shift their strategy in a similar way from vertical integration business model to system integration business Model. By adopting such a strategic shift, avionics manufacturer in India can serve their ultimate customer IAF in a better way. The outsourcing effort by DPSUs will add to their capacity enhancement, attain cost effectiveness and improve competitiveness in global market. The other significant objective of this outsourcing is to build a manufacturing eco-system in the country to attain self-reliance for defence avionics manufacturing. On the other hand, participation of Indian Private Industry will be an enabler in building technological and manufacturing capability inside the country. There are some outstanding advantages of strategic outsourcing for the manufacturers:

- Suppliers play a significant role in the production, delivery, and service of competitive quality products. Purchased materials and services represent up to 80% of total product costs in most high-technology avionics industries.
- Former procurement practices have focused on obtaining the lowest unit prices; the trade-offs of poor quality, erratic delivery performance, and the other problems have been buffered by inventory cushions, quality control personnel, and multiple vendors with short-term interests.
- Unlike efforts to reduce labor and general overhead costs, reductions in raw material costs result in financial transactions that improve a company's profits and cash position.

Because of these factors, a significant cost reduction opportunity exists in both the direct material and material and service overhead categories (i.e., purchasing and material planning administration, freight, receiving, incoming inspection, material handling, warehousing, inventory variances, packaging, etc.).

4. Challenges in the Avionics Supply Chain Management in DPSUs:

Supply chain management of the aerospace industry throws up additional challenges due to the following reasons:

1. Aerospace industry is a seller's market: With limited OEMs Aerospace market has always

been a seller's market.

2. Long Procurement Lead Time: The procurement lead times in the aerospace industry is much higher (From few weeks to 1-2 years) compared to the other industries.

Case of Boeing-787 :The case of Boeing would reveal the criticality of supply chain of the aerospace industry. By 2008-09 Boeing company was facing major delays in their prestigious 787 dream liner program. The deliveries to the customer were being delayed till the mid of 2010. Such delays were unparalleled in the history of Boeing. One driver for the delay was the industry wise shortage of fasteners. No one in Boeing could imagine that fasteners which contribute to a merely 3% of the Aircraft's cost would cause such a magnitude of delay in a program. To mitigate the risk of fasteners Boeing had completely re-engineered their procurement strategy for fasteners.

5. Defence production process – value and supply chain [Report-9]

The avionics article manufacturing is Capital-intensive defence manufacturing which is characterized by a high focus on technology and complexity. The various stages in the process value addition include design, development, manufacturing and integration, airworthy testing and evaluation, product support and the service life of equipment[42]. The figure below depicts the phases of the product lifecycle process and the stakeholders in the value chain

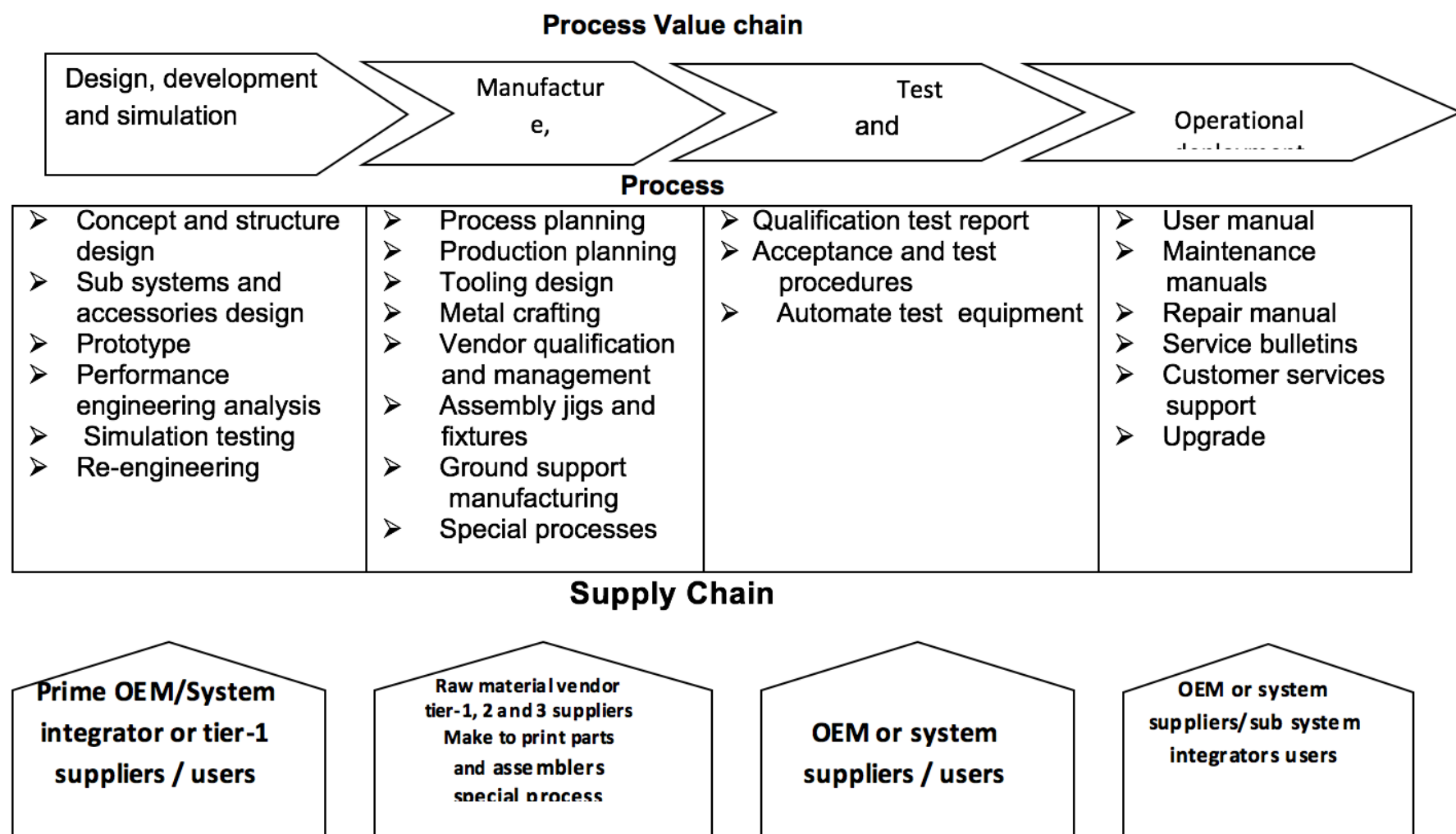


Figure -1: Process Value Chain in DPSUs Production Process

Coordination and integration of supply chain practices and processes has assumed paramount importance in defence avionics supply chain. In the current environment, increasing competition, cost pressures, rising energy costs and high raw material prices for avionics article manufacturing are key challenges for DPSUs. To combat these challenges, manufacturers, OEMs and tier-I suppliers are leveraging the advantages arising from the globalization of the supply chain. The DPSUs are witnessing outsourcing of elements of technology, design and component/subassembly manufacture. This transformation provides an opportunity for those

vendors/ suppliers who can innovate, adopt high-level technologies, implement best practices and invest in change.

6. Definition & Measurement of Outsourcing [Report-11]

Outsourcing is defined as the act of sourcing goods and services that go into the production of various products by DPSUs/OFB from Indian Vendors. The outsourcing contribution is measured in terms of financial value. The formula to measure the Outsourcing content of a DPSUs/OFB can be derived as :

$$\text{VoO} = \text{VoP} - \text{DI} - \text{RM} - \text{IVA} \quad \% \text{ of VoO} = \text{VoO} / \text{VoP} \times 100$$

Where,

VoO : Value of Outsourcing

VoP : Value of Production

DI : Value of Direct Import

RM : Value of Raw Materials purchased from domestic market

IVA : In-house Value Addition (In terms of money value) for conversion of Raw Materials & components to saleable Product. Value Addition will not only cover manufacturing but also the services which adds into value of production.

7. Scope and Feasibility of Outsourcing in DPSUs [Report-11]

In order to attain higher level of outsourcing by each DPSU/OFB, the most significant step is to identify categories of Goods and Services in their yearly manufacturing program which can be considered for outsourcing. Possible categories of items may be broadly classified as under:

(i) The first category of items will be the items which are low in cost, generic in nature and less technology intensive e.g. Screw, Rivets, Bush, Bearings, Rubber items, Springs, Wire harnessing, PCBs, Electrical motors, Filters, Transformers etc. They must be considered for outsourcing to private vendors/SMEs. The Know-how & Know-why available with DPSUs/OFB for such items are to be shared with Indian Private Vendors. It may not be economically viable for DPSUs/OFB to manufacture these items, therefore, these items must be assigned to private industry. PSUs/OFB shall not make future investment in manufacturing of such category of items, if capability and capacity is available with Indian Private Industry.

(ii) The second category of items will be the items which are manufactured by DPSUs/OFB under Transfer of technology from Licensors/OEMs. Such items may need special manufacturing processes. The items may be Sub-system or System or higher assembly. Many Sub-systems or Systems are strategic in nature and in consideration of this, they may not like to outsource the entire Sub-system or System. However, machining & other operations which are not strategic in nature may be outsourced to Indian vendors. The necessary technical assistance like manufacturing drawings, 3D model, process documentation, quality process etc. may be shared by them with potential vendors for initial learning and operational acquaintance.

(iii) The third category of items will be the items which are not so technology intensive but imported by PSUs/OFB. Such items shall be identified and assigned to Indian vendors for indigenous development. DPSUs/OFB must extend technical assistance to vendors to develop such import substitution items. If required, financial assistance shall also be extended to the potential vendors during developmental phase. Suitable schemes may be drawn up by the DPSUs/OFB with the approval of their respective Boards/competent authority. Indigenous development of such items will reduce the import content and in due course of time, Indian industry will attain process capability in manufacturing of such items.

(iv) The fourth category of items will be those which are technology sensitive, strategic and complex in manufacturing. Invariably, Transfer of Technology is denied by OEMs/Licensors for such critical systems & subsystems. Many such systems & sub-systems (Mainly Electronics & software oriented) also become obsolete and licensor/foreign OEMs refuse to support repair & maintenance for entire product life cycle. Even if they agree to support, they demand exorbitant support price. Hence, it becomes absolutely essential to develop/co-develop and indigenise these items within the country to achieve self-reliance. If required, financial assistance shall also be extended to the potential vendors during developmental phase. In order to attain self-reliance, there is a need to develop/co-develop and manufacture these systems and sub-systems in the country jointly by DPSUs/OFB and Indian Private Industry.

8. Decision for Outsourcing in DPSUs & Its Analysis:

Most of the avionics article manufacturing DPSUs have their robust procurement process. However, in a SWOT analysis the supply chain would emerge as one of the weakness. They have a long procurement cycle time which has resulted in high levels of inventory. DPSUs's value of procurement exceeds our value of consumption which is resulting in the increase of our inventory every year. In aerospace industry wherein the lead time can exceed a year, a higher inventory is the way to mitigate the supply chain risk. However, by implementing effective supplier management techniques, it would be possible to achieve on time supplies and shifting the supply chain risks to the suppliers. On average DPSUs procurement throughput time exceeds 6 months. A study of the data would reveal that 50% of the procurement throughput time is the ordering time. By managing the ordering time, we would be in a position to effectively manage the supply chain. The basis of this model is to classify the procurement according to potential supply risk and profit impact. The items are classified us under

8.1 Strategic Items

These items have a high impact on the product cost and are having a high supplier risk. Most of these items are single source. The buyer and supplier have to work in a collaborative approach. Management of these items would require the involvement of the top management.

8.2 Bottleneck Items

These are ordered in small quantities and the buyer is in a weak position for negotiation. The common way to manage these items is to keep the inventory.

8.3 Leverage Items

They are easy to manage, however have a major impact on the product cost. Multiple suppliers are available for these items. The buyer has a reasonably good bargaining power. Parallel sourcing is a way to obtain optimum leverage for these items.

8.4 Non-Critical Items

These items are best suited for Vendor Managed Items and automatic replenishment. Consolidation of requirements over a larger planning horizon would yield better bargaining power for the buyer.

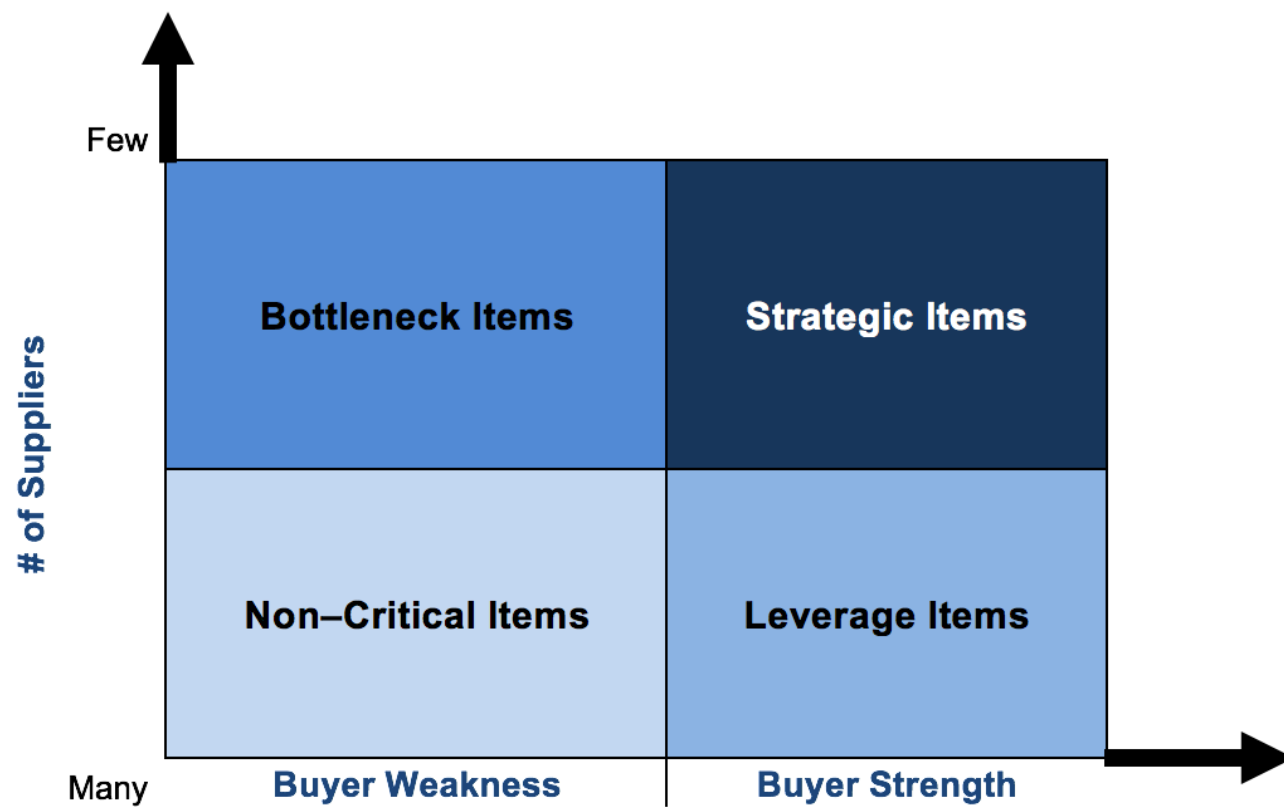


Figure-2: Pictorial View of Classification of Item for Outsourcing & Buyer-Supplier Status

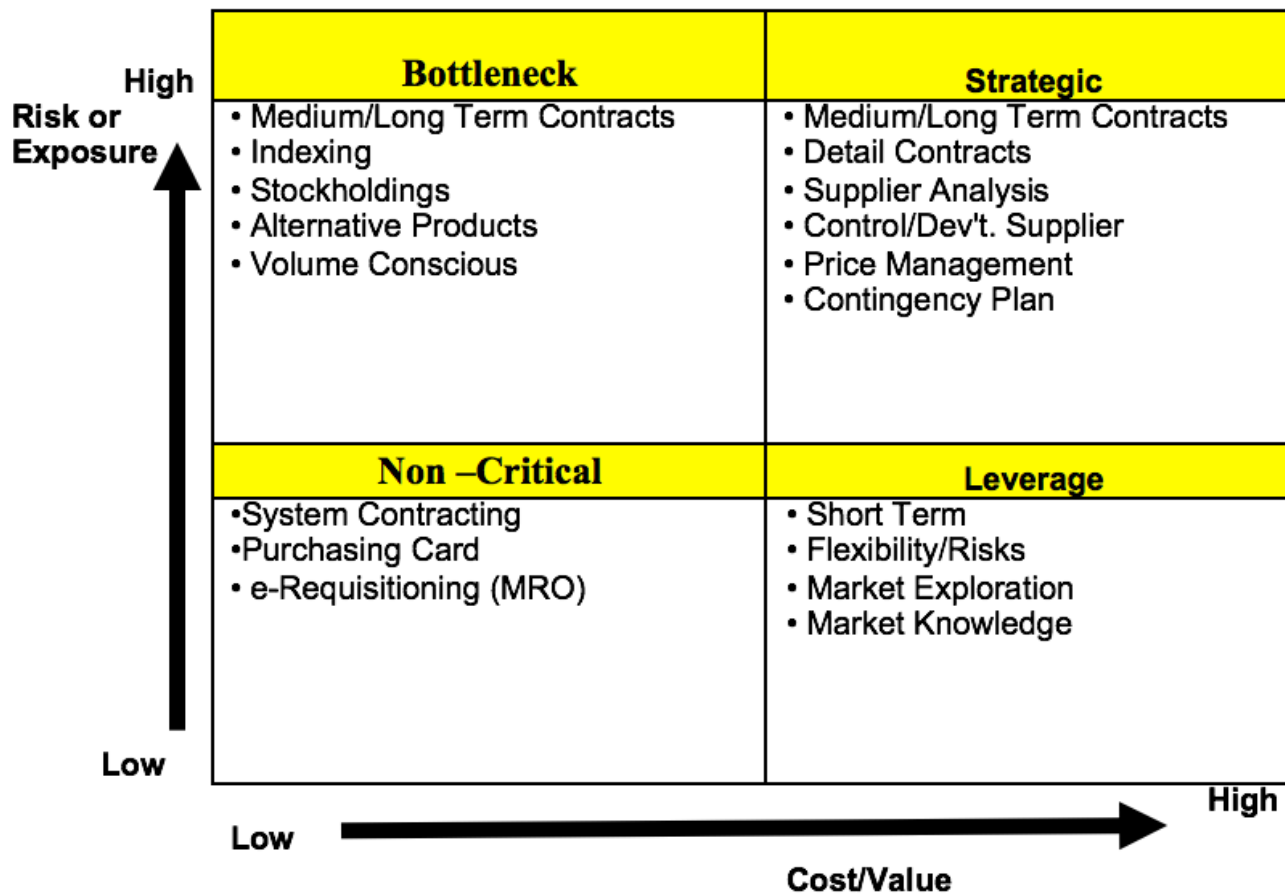
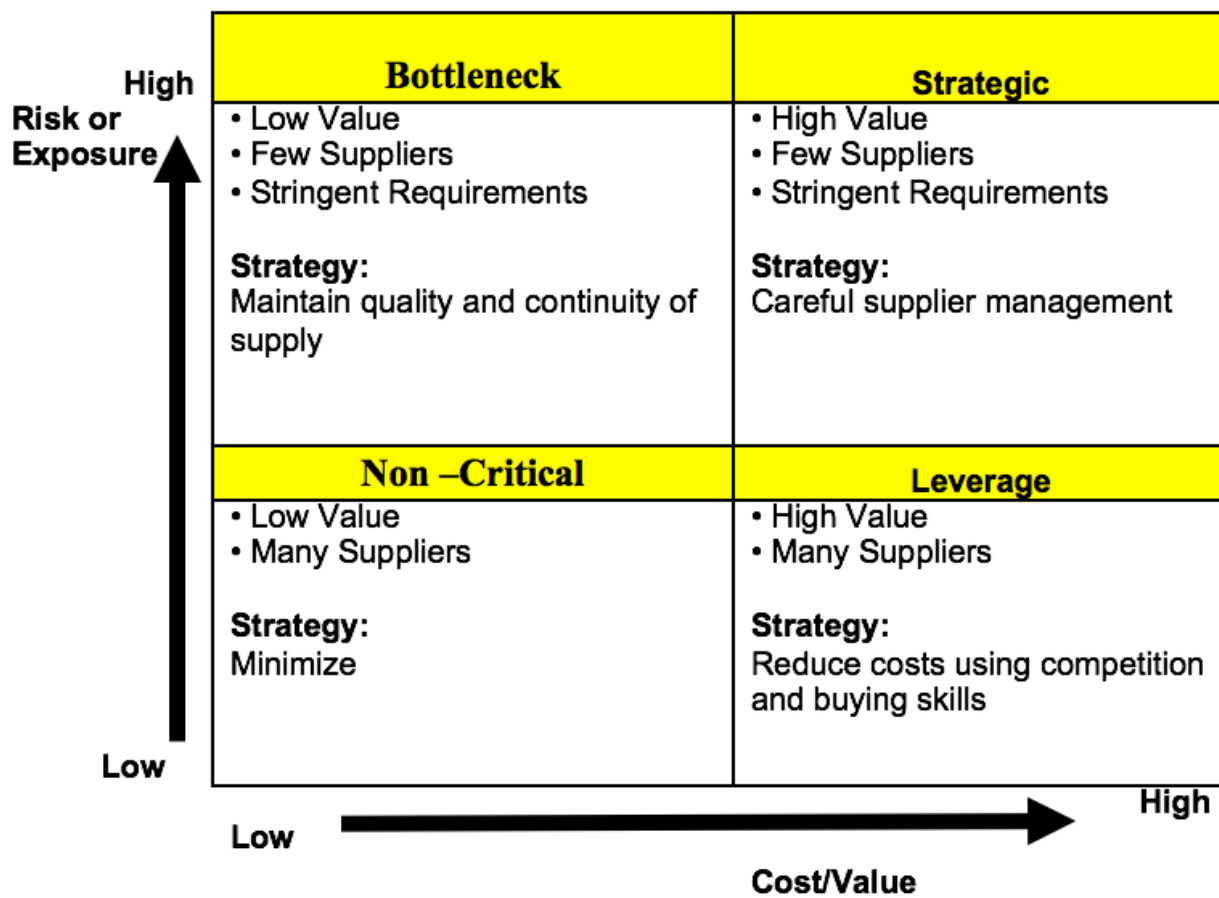
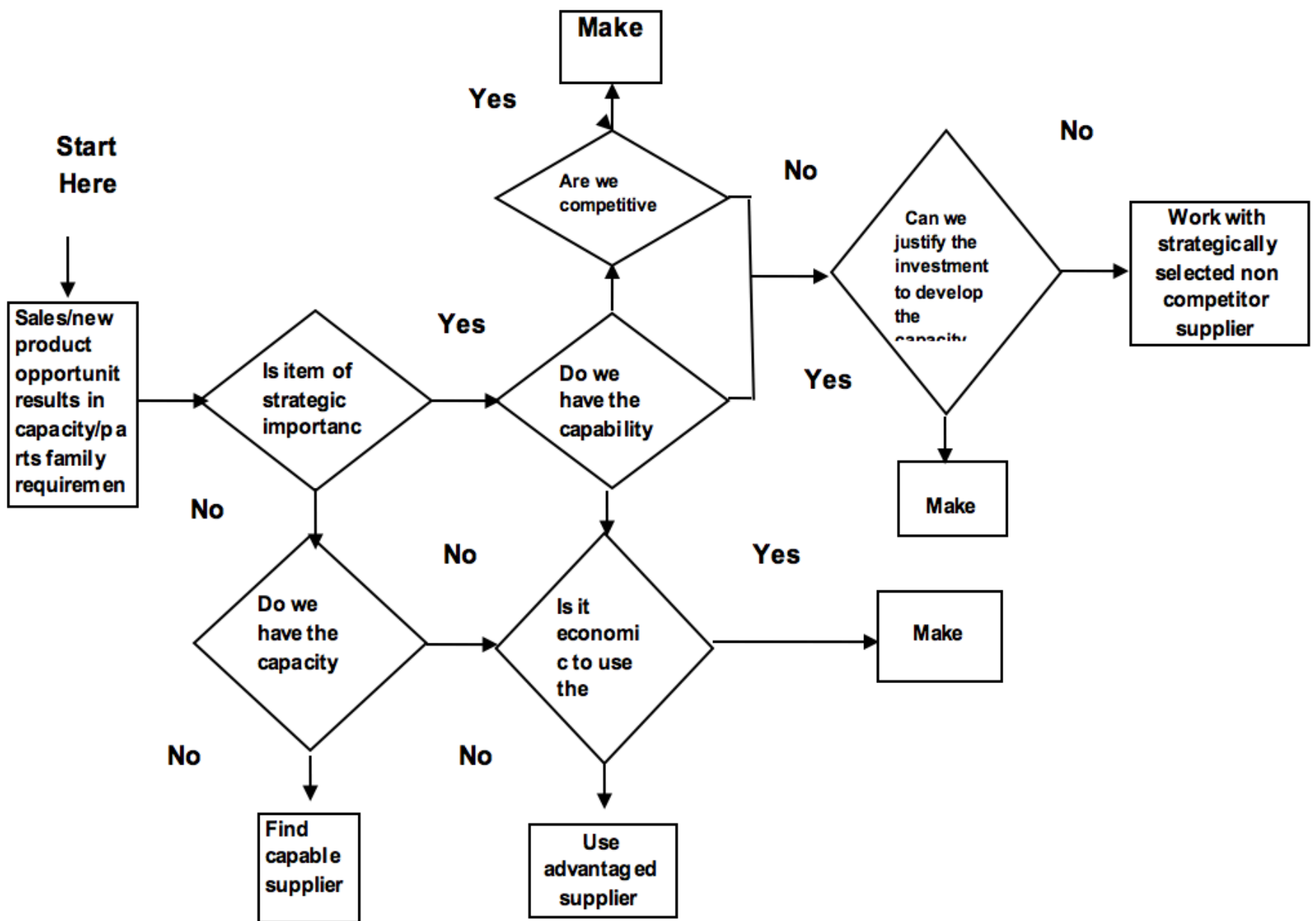


Figure-3 (a & b) : Analytical View of Outsourcing & Recommended Strategy by Segmentation Characteristics for DPSUs

8.5 Flow Chart for Decision of Make or Buy by DPSUs



9. Strategic Elements Of Outsourcing for DPSUs [7]

The most successful avionics manufacturers (like Honeywell, [Rockwell Collins](#), [Thales Group](#), [GE Aviation Systems](#) etc) have developed sourcing strategies with their vendors that produce shared opportunities. They have created formal strategic alliances bound by homogeneous goals, investment, obligation, and mutual trust. The most common strategic elements of outsourcing are as follows which can be observed by Indian DPSUs as per their requirement:

9.1 Global Strategies That Impact Outsourcing

In an outsourcing program, the firm management must understand the global strategic issues and the external and internal drivers that impact sourcing decisions.

On the external side, it is particularly important to understand the avionics industry structure, there are some definitions about the suppliers such as defining the suppliers in the industry, analyzing the supplier's bargaining power, selecting the emerging technologies and substitute products, forecasting the new entrants may enter the market, analyzing the customers' bargaining power.

On the internal side, it is important to understand the company's strategic direction and the tactical actions that are being pursued in the areas of technology development, engineering, materials management, manufacturing, distribution, and field service.

An outsourcing program should be designed around a company's overall corporate strategy so

that products can be brought to the marketplace at the right time, at a competitive quality and price, and with a reliable level of performance.

9.2 Procurement Specifications

Procurement objectives should be developed around considerations such as facility locations and focus, vertical integration, technology life cycles, and other related elements of the total manufacturing infrastructure. In addition, the metrics of competitive performance must also be considered as part of a JIT purchasing program. For example, competing on the basis of cost, delivery, quality, flexibility, or innovation may have a major impact on procurement objectives and the subsequent daily activities of buyers.

9.3 Supplier Management Plan

During this task the best sources are determined and the vendor base is consolidated. Manufacturer/supplier relationships are established and the purchasing objectives are communicated and agreed upon. The vendors chosen are integrated into the manufacturing process through:

- Joint training and education activities aimed at learning each other's products, manufacturing processes, and customer service issues (within security limitations of the industry)
- Long-term contracts and blanket orders with multiple release dates
- Joint involvement in product/process design, value analysis, quality improvements, and cost reductions
- Open exchange of information such as schedules, design data, quality results, and cost structures
- Formal vendor evaluation that incorporates in-process controls, multiple measurements, continuous feedback, and joint corrective action.

9.4 Quality Commitment

The objective of quality commitment is to push incoming inspection activities back to the supplier where it is controllable and correctable. Being the airworthy quality requirement of avionics article the quality checks play important for selection of vendor & suppliers.

9.5 Schedule Stability

The impact of schedule changes increases as you move upstream from the ultimate customer. Predictable delivery schedule allows suppliers to implement JIT techniques in their own processes and eliminates costs associated with excess inventory buffers, overtime and expediting. Thus improvements in the supplier's process can be passed on to manufacturers in the form of flexibility and price reductions.

9.6 Long-Term Buyer/Seller Relationships

Formal linkages evolve between manufacturers and their suppliers through frequent contact, open communication and joint planning sessions involving manufacturing, quality, design, and materials management. Long-term contracts provide an incentive for investment in new equipment to reduce costs and improve quality.

9.7 Procurement Lead Times

Local sourcing, blanket orders with multiple releases, and paperwork simplification are common

approaches for shortening lead times. Some companies have implemented electronic data interchange (EDI) and bar-coding applications to streamline purchasing and receiving administrative tasks. Others have adopted the buyer/planner concept which also shortens the processing cycle by consolidating traditional purchasing and planning tasks into a single function.

9.8 Inventory Buffers

As supplier quality increases and ship-to-stock programs are implemented, the replenishment pipeline is shortened. In addition, the cooperative manufacturer/supplier relationship evolves to a point where both parties are identifying and solving problems at the source. Over time, raw material and work-in-process inventory buffers can be reduced as problem areas are exposed and corrected.

9.9 Long-Term Cost Reduction

The objective of this task is to jointly analyze the supplier's manufacturing process, methods, and equipment, and understand the components of the supplier's manufacturing cost structure. Through this approach, a manufacturer and his suppliers can identify opportunities and implement changes to reduce costs from which both benefit [9].

9.10 Non-product Expenditures

Traditionally companies are allowed the human resources department to purchase insurance, the engineers to purchase capital equipment, the data processing department to purchase software/hardware, and the maintenance department to purchase construction services. It is becoming less unusual to find purchasing functions within engineering, data processing, or marketing organizations. Companies are beginning to negotiate the scope of services or apply make-versus-buy logic to maximize the benefits of auditing and legal fees. In short, substantial purchasing cost reduction opportunities can be found within nonproduct expenditure areas not traditionally serviced by purchasing professionals.

10. Strategic Outsourcing Process in DPSUs

10.1 Analyze Market

The team has to analyze the market in terms of the available sources / vendors capable of taking the task which is to be sourced depending upon the criticality of the component. The capability of vendors in terms of manpower, technology, available resources, list of customers, quality needs to be analyzed before adding the vendor in approved vendor directory.

10.2 Identify Requirements

Based on need and market analysis you can identify skill sets which can be out sourced to vendors/suppliers to reap maximum benefits.

10.3 Develop strategy

There is need to have brain storming sessions with the cross functional teams from various disciplines to frame the strategy for RFP formulation which resulted to form strategic alliance with the supplier to yield maximum benefits.

10.4 Formulation of Strategic Sourcing Cell

These teams are small groups of people with the charter to examine the sourcing options for the category and to make recommendations to senior Management. Within the sourcing department there is need to have strategic sourcing cell comprising of cross functional team from various departments like design, manufacturing, process planning, sourcing and quality control department. The team has to carry out the analysis for ongoing in house production activities, analyze the bottle necks, carry out the cost analysis with all statistical data like Tact time, lead time, operational efficiency, to decide on make or buy options and seek the possibility of sourcing to the potential suppliers/vendors with associated advantages/disadvantages. In the present context the terms and conditions are being formulated completely in isolation without considering technical and commercial expertise during formation of RFP/RFQ conditions. This results in incomplete or inappropriate contractual conditions which have either resulted into delay in contract signing or non-completion of contract as per anticipated requirement.

10.5 Vendor Registration Cell & Vendor Directory

The registration process for vendors of avionics components / sub-components & full assembly shall be different from the regular or non-critical items. The vendors who are manufacturer of avionics components / sub-components & full assembly should go through a rigorous audit by the cross functional team who should visit and inspect in terms of its manufacturing capability, productivity, quality, financials of the Company and its customer base in detail. Based on the audit the committee should be empowered to register or non-register the vendor in its approved vendor directory. However for regular or items which are not related to aircraft safety or items commercial in nature the vendor registration should be made more simpler than the existing procedure. In such cases only incorporation certificate, PAN details, VAT/TIN details should be more than enough to empanel the vendors.

10.6 Improvements in ERP System

In ERP system and e-portal the major drawback is that the vendors cannot be searched with respect to their product profile or business. Due to this constraint there may be many vendors who are in approved vendor list but not have been issued RFQ / enquiry. Hence, there is a need to have search engine which can identify the vendors for their product profile which should be categorized into various groups or subgroups.

10.7 E-procurement

The integration of ERP with e-portal can enhance its usefulness manifold. In that context e-procurement can not only be used as a tool for e-tendering but it will also provide the real time information to the suppliers like displaying information from PO placement, to supply of material, to the release of payments to the supplier. Hence, e-portal can also be utilized as a tool for supplier relationship Management. The bid clarification process can also be automated in e-portal and can be made more transparent in which any vendor can seek information regarding tender which is equally shared with all the prospective bidders.

10.8 Internal policies and procedures

In tendering process generally technically acceptable L-1 is the only criteria used for selection of vendor and signing of contract. The items which are very critical and required state of the art technology in such cases other criteria such as R&D expenditure, items indigenized, manufacturing capability, customers in the portfolio of supplier etc should be given utmost importance for selection of vendor. In such cases the committee should be formed who should select or identify such vendors with exceptional capabilities and only among those vendors

based on technical and commercial criteria vendor needs to be selected. The open tender in such instances should be avoided otherwise RFP should be formulated with considering such criteria as explained above. In this regard standard conditions for such requirement should be added in the manual to achieve standardization.

There are certain approvals like re-rendering, e-procurement waiver, acceptance of late/delayed offer (in case of proprietary items), sending enquiry to less than 5 sources etc. In such cases which do not require any financial approvals powers should be delegated to head of IMM in place of head of Division to cut short the cycle time required for processing the files.

10.9 Manage the supplier relationship aggressively

Supplier Management is the area of Strategic Sourcing with the greatest opportunity for both success and failure. Too many companies just sign the contract and forget about the relationship until contract renewal time. To make the relationship a real success and to ensure that the benefits are sustained, both parties must be actively involved in monitoring results, reviewing pre-established performance metrics, partnering on creative ways to mutually lower costs, ironing out any contract or performance disputes, etc. There is also a need to implement strong payment review system to eliminate the procedural delays. The existing e-portal can also be leveraged as a supplier relationship Management module to display the information from tendering stage to finalization of contract to payment of bills to the vendors. This SRM module not only tells the real time information but also displays the hidden inefficiencies which can be collectively rooted out of the system.

11. Conclusion

Progress towards effective supply chain management can be gradual and we may have to face and surmount many obstacles for implementing these strategies. Therefore in the current scenario we need to enhance our strategic positioning, induce flexibility to the supply chain system which would improve the supply security and lower the procurement costs. In this regard the outsourcing may be viewed as a strategic tool to expand our production set up and as an enabler to meet the Time, Quality and Cost (TQC) requirements of our customers. Outsourcing Managers in DPSUs need to remember that the three TQCs are closely linked to each other and that outsourcing is not an option which will always result in large scale cost reduction. It is almost impossible to transfer all the elements of risk to vendors without any cost to DPSUs. However, our endeavors need to be always directed at exploration and development of a robust vendor base offering a reduced cost structure compared to in-house manufacture at DPSUs.

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