Issue Brief

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Challenges in Managing the Defence Inventory

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Introduction

Inventory has often been labelled as a necessary evil. It is necessary to hold inventory to meet the user's requirement uninterruptedly, despite demand and supply side variability. It is evil because there are costs associated with inventory. Purchasing costs, ordering costs, inventory carrying costs, stock-out costs, costs of quality, and shrinkage costs make holding of inventory a very costly proposition. It is these costs associated with inventory which motivated industry to experiment with and move towards *Just in Time* and *Make to Order* systems. Many industries have tried to be like Dell, but the truth is that in most scenarios the necessity of holding has prevailed, and organisations continue to deal with inventory.

Managers in the private sector use the *Economic Order Quantity Model* amongst many others to arrive at ordering quantities. The model considers only the Inventory Carrying Costs and Ordering Costs, and by minimising the sum of these two relevant costs determines the order size. The model assumes that stock-outs do not exist and the basis of this assumption is that the cost of stock-outs is so high that managers maintain adequate inventory to prevent them[1]. The *Newsvendor Model* on the other hand addresses the 'too much and too little challenge' by balancing cost of left over inventory and the opportunity cost of a stock-out. The ground reality is that cost minimisation leads to profit maximisation, and therefore the private sector has continually strived to evolve and optimise costs associated with inventory.

The reason for the defence to hold inventories is not very different. The military holds inventories to avoid stock-outs that may impact mission-critical functions. The technological complexity of the equipment coupled with the fact that at times the sources of supply are in foreign lands, the military tends to engage in life time buys of inventory. There is an excessive tendency to hold insurance stocks to cater for unforeseen contingencies.

The Services' inventories have characteristics quite different from those of the majority of commercial inventories. Major points of difference are[2]:

- Predominance of technologically complex items.
- Slow stock turnover rates for many items in view of the main equipment population they support.
- Overseas sources of supply and inherently long lead times. Most of the times, the imported equipment is already phased out of service in the country of origin.
- Large number of complex items which are no longer in production.
- Extremely large service life spans of main equipment which create maintenance and up-gradation challenges (MIG-21 FL was decommissioned after being in

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service for 50 years and the T-72 tank is only 44 years old).

- Over assuming importance of avoiding stock-outs for critical items.

Apart from the above cited differences, the defence inventory comes at an enormous cost to the state, does not generate any revenue, but on the contrary, demands further expenditure in terms of holding costs. Notwithstanding all above, investment in defence inventory builds military capability. It is for these reasons that the efficiency and effectiveness of the inventory management systems in the recent years have been reviewed in most of the defence forces by their respective country's audit machinery. The present paper presents a comparative profile of such performance reviews carried out in the last two decades in respect of the defence inventory of the Australian, Indian, United States and British defence forces. The paper summarises the observations and recommendations of the audit authorities with respect to their defence forces, and draws relevant deductions for the Indian Defence Forces.

Australian Defence Force (ADF)

The Australian National Audit Office (ANAO) did some really pioneering work in the field of defence inventory management while it undertook a performance audit of the country's Department of Defence and presented a report titled '*Performance Management of the Defence Inventory*' to the Parliament in Oct 1997. The ANAO in its report acknowledged the criticality of having the '*right inventory, at the right time and at the right place*' on preparedness of the ADF and highlighted that there are significant opportunities to improve the management of the defence inventory in light of the following observations:

- The level of operating stocks was far too high, which, as per the audit, was a reflection of '*Just in Case*' culture.
- Scant attention is paid to the overall management of the performance and costs of the supply chain, including inventory carrying costs. As per the report, a 10% reduction in inventory could lead to annual savings of $47.16 million and free up $393 million worth of capital (for onetime, as per valuations made in 1997).
- Defence managers not provided with adequate information or incentives to ensure that their decisions are based upon considerations of efficiency and effectiveness of the total supply chain.
- Considerable one-off savings ($100 million to $140 million) and annual savings ($61 million to $89 million) could be accrued through adoption of commercial management practices such as Vendor-held stock.
- The ANAO also noted that the defence would benefit from focusing on the analysis and management of each component of procurement lead times.
- Though there have been a few worthwhile but isolated attempts to improve the management practices applied to the defence supply chain, *a cultural change is needed* to bring defence practices closer to those identified as best practice.

The ANAO in its report made a total of 22 recommendations, and some of the important ones are summarised below:

- Development of a coherent logistics performance management strategy and framework, incorporating supply chain management, which provides for an integrated, consistent and balanced set of performance measures, cascaded throughout defence.
- Identification of single points of authority with responsibility for the end-to-end cross-functional performance of each key supply chain process.
- Development and implementation of a methodology enabling inventory management decisions to be supported by wider consideration of relevant costs; a quality assurance program to monitor adherence to the methodology and the effectiveness with which cost information is used to make trade-offs within the logistic system.
- Development and implementation of an activity-based management methodology to support the integrated management of the defence supply chain. Australian Navy's work on the said methodology was appreciable.

- Development of a logistics executive information system to support consistent, coordinated performance management of the defence supply chain.
- Development and promulgation of a defence logistics benchmarking policy that clearly identifies the processes and procedures to be followed.

Inventory practices of the Indian Army

The Comptroller and Auditor General (CAG) of India undertook a special system wide review of the inventory management policies, practices and procedures with the complete involvement and full cooperation of the Army. The CAG published its report titled '*Review of Inventory Management in Ordnance Services*' (7A of 2000). The key concerns highlighted in the report are appended below[3]:

- Rather lavish nature of scales, contributing to excessive inventories.
- Large accumulation of surplus stores leading to sluggishness in supply chain.
- Excessive lead times, both internal and external.
- Poor quality of human resource particularly the civilian workforce.
- Lack of standardisation of equipment.
- Mounting repairables, insufficient rate of repair and non-involvement of civil industry in liquidating the same.
- Abnormal delays and repeated slippages in computerisation of the provision functions/processes.

The CAG in its report made the following major recommendations:

- Automation of the provision processes, introduction of selective inventory control techniques, timely receipt of inputs both from policy formulating authorities and associated agencies, coupled with the up-gradation of human resource standards.
- De-layering of the multi-echelon structure and increase in scope of regional and local procurement, making the chain flexible and responsive.
- Timely publishing of the scales, preferably with the involvement of Director General of Quality Assurance, Ordnance and Finance.
- Curtail Interim Period (Lead Time) in respect of Director General of Ordnance Factories and Public Sector Undertakings.
- Outsource maintenance/overhaul of civil end use vehicles/equipment to trade. Encourage trade participation in indigenous manufacture and supply of defence stores.
- Enhance stock visibility through an appropriately designed Management Information System to avoid extraction of large number of wrong demands, and for timely issue of stores to the users.
- Initiate standardisation of vehicles, general stores and clothing items to reduce the cost of inventory and ensure better control thereof.
- Review all the repairable holdings to reassess their utility and arrange for repair/disposal.
- Giving up of '*Just in Case*' attitude and timely declaration of surpluses.
- A system of maintaining priced inventory by modifying the formats of basic records like receipt vouchers and account cards to capture the data with regard to purchase rates should be introduced.

United States Department of Defence

In January 1990, the US General Accounting Office (GAO) started a drive to review and report on federal government program areas that were considered '*high risk*'. The GAO identified areas that are especially vulnerable to waste, fraud, abuse, and mismanagement. GAO identified 17 federal program areas that had weaknesses in internal controls (procedures necessary to guard against fraud and abuse) or in financial management systems (which are essential to promoting good management, preventing waste, and ensuring accountability)[4]. Inventory management of the Department of Defence (DoD) was then identified as *high risk,* and interestingly the categorisation continues as on date (the nomenclature has since changed to Supply Chain Management). The very fact that the US DoD has not been able to get rid of the audit's observations, in entirety, for more than two decades is a testimony of the

magnitude of complexities involved in the issue at hand.

The GAO's initial report in 1993 on Defence Inventory Management (GAO/HR-93-12) identified the problem area as:

- The defence bought more than it needs and failed to apply standards of economy or efficiency to the purchase, maintenance, and distribution of its inventories. DoD's excess inventory was estimated to about $40 billion (DoD's inventories of spare and repair parts clothing, medical supplies, and other support items costed about $100 billion).
- The DoD not only wasted billions of dollars on excess supplies, but burdened itself with the need to maintain them, and failed to acquire the tools or expertise to manage them effectively.
- The inventory managers used inadequate data, failed to use new techniques that would allow lower inventory levels, and believed that keeping large inventories is the way to ensure that they shall always be able to fill orders.
- The DoD's inventory determination is based on faulty and unintegrated data extracted from non-standard, redundant, and overlapping computer systems.
- The DoD has traditionally failed to stress the importance of proper inventory management or to provide its personnel with the needed tools and incentives to promote satisfactory performance.

The problem resulted from DoD's culture that believed it was better to overbuy items than to manage with just the amount of stock needed[5]. The culture prevented DoD from using effective inventory management and control techniques and modern commercial inventory management practices that would allow lower inventory levels. The GAO reported that the solution to these problems lies in shifting of DoD's organizational culture toward economical and efficient inventory practices.

The key recommendations of the GAO starting from 1992 to 2013 are appended in the succeeding paragraphs:

- Change in organizational culture to eliminate overstocking and instil appropriate priorities, incentives, and attitudes among its supply managers and users.
- Adopt modern commercial inventory practices that have found success in the private sector.
- The DoD should develop and implement improved performance measures that stress cost-effectiveness and inventory reduction.
- Establishing goals, objectives, and milestones for determining where outsourcing logistics functions represents a cost-effective and efficient alternative to traditional methods.
- Providing inventory managers with automated, integrated accounting and management systems necessary to manage its inventory.
- Improvement in *material requirements forecasts, distribution of material, and asset visibility* were jointly identified as the three key focus areas almost a decade back.
- The DoD needs to develop enterprise-wide performance metrics and incorporate these into efforts aimed at improving the effectiveness and efficiency of supply chain management.

United Kingdom - Ministry of Defence

Key facts as presented in NAO report of 2012
£40.3 billion of inventory (supplies and spares) at gross value was held by the Department at December 2011
£2.9 billion was spent by the Department on purchasing inventory (supply and spares), in 2010-11
£16.8 billion is the net value of the inventory (supplies and spares) after depreciation at December 2011
710 million items of inventory were held by the Department of Defence
900,000 different types of inventory were held by the Department
£4.2 billion is the gross value of inventory held, which has had no demand in the last two financial years
£277 million is the cost to hold and manage inventory items centrally in 2010-11
£1.4 billion is the gross value of inventory the Department identified for disposal between 2010 and 2011

The National Audit Office (NAO) on 28 Jun 2012 presented a report titled 'Managing the Defence Inventory'. The key findings included in the report on whether the Department (Ministry of Defence) is buying and holding the right quantity are appended below[6]:

- Defence inventory holdings increased in value by 13 per cent between the end of March 2009 and December 2011. The four major reasons for the surge are - increase in operational activity, acquisition of new equipment, purchase of more inventory than what was consumed and lastly recording of more inventories on the IT systems.
- The Department holds £4.2 billion of inventory that has not moved in over two years and a further £2.4 billion of holdings sufficient to cover five years of use. However, it spent £1.5 billion in 2009-10 and 2010-11 on consumable inventory that it has not used.
- Holding inventory that may not be used imposes a cost on the Department. The estimated costs of storing and managing inventory were at least £277 million in 2010-11. Further, there is an opportunity cost for the Department, if it stores inventory that will never be used.
- The logistics strategy does not discourage over-ordering and therefore risks increase in inventory levels despite actions to reduce levels of unnecessary inventory.
- The Department has set few efficiency targets that encourage buying and holding of inventory in the right quantities. In line with the strategy, targets are focused on ensuring that there is sufficient inventory to meet requirements, rather than minimising over-ordering or managing inventory already being stored.
- No incentives exist for procurement agencies to consider the full impact of their decision-making. Reduction in order quantity as well as inventory holding costs are not rewarded in any manner.
- The Department does not understand the full cost of holding and managing inventory and does not use known costs as part of its day-to-day decision-making. There is no comprehensive analysis of the costs of inventory management available, which makes it difficult for teams to make value for money judgements on whether to buy, retain or dispose of inventory
- There is an inadequacy of suitably qualified staff which seriously impairs efficient and effective inventory management. At the end of November 2011, 20 per cent of inventory management posts were vacant, and of those staff in post, 13 per cent had not obtained the appropriate qualifications.

The NAO acknowledged the Department's plans and initiatives for improvement which include spending £1.1 billion on information systems that should enable improvements in inventory management, and outsourcing of procurement of commodities, such as clothing, and its central warehousing and distribution for non-explosives. With a view to achieve value for money from its inventory management, the NAO recommended that the Department should:

- Develop a coherent and comprehensive strategy for the size, value and composition of inventory that needs to be retained, and use this as a basis for setting coherent targets and management approaches.
- Expand its financial information and use it to improve cost-effective decision-making. The Department needs to make informed decisions based on full cost of managing inventory and evaluate whether it is achieving value for money from these decisions. Costs should include that of holding and managing stock by the armed forces.
- Reduce the amount it spends each year on inventory where it already holds sufficient stocks.
- Set up management and accountability structures that incentivise good inventory management.
- Address its problems in managing inventory before it outsources some of its warehousing, distribution and commodity procurement functions.

Universal challenges in Defence Inventory Management and imperatives for India

It is apparent from the observations of the audit agencies of different nations spread over a span of almost two decades that there is a commonality in issues which

plague the management of defence inventory. Further, in almost all defence forces very valid and serious issues have remained unresolved for a considerable period of time. These issues are summarised in the succeeding paragraphs, along with recommendations which are considered pertinent for the Indian Army.

Cultural Transformation. Traditionally the defence forces across nations suffer from excessive reliance on *Just in Case* stocking systems. The focus is largely on effectiveness, mostly at the cost of efficiency. Culturally, managers at all levels tend to ignore costs and focus only on availability and order fill rates. The culture stems from the unique predicament that defence material managers face. While on one hand non-availability of mission critical requirements can attract severe penalties, on the other, there are neither any penalties for socking more than the requirement, nor any incentives for keeping stocks to the minimum required level.

This culture has been responsible for slow paced adoption of new management practices, technologies, and logistics systems. Audit authorities across nations have observed that there is a need to transform the management culture by taking advantage of new management practices, technologies, and logistics systems so that inefficiencies in the system can be eliminated.

The need for cultural change in management practices is very relevant in the Indian context as well. The army realises the need for transformation of its business processes. However, the same has been linked to the induction of an enterprise resource planning system, which has been delayed inordinately for a variety of reasons. *The army therefore needs to consider de-linking the two, and should prepare plans to achieve cultural and business process transformation by adoption of new practices*. Training institutions can, and should play a vital role in this transformation.

Over Ordering and Surplus Stocks. The problem of over ordering also has its root in the organisations culture and is omnipresent in defence forces discussed in this paper. Surplus stocks are an obvious consequence. There is a onetime investment related to over ordering, but surplus stocks lead to a sizeable recurring inventory holding costs.

The army needs to re-engineer its demand yielding processes and adopt commercial models available for arriving at the orderg quantity to provide the desired service level within the available resources. Surplus stock disposal has been undertaken by the army in spurts, in the past. However, lately, it is attempting to institutionalise the process by making it a continuous and ongoing function. This is an absolute necessity and the formalisation of the process needs to be done at the earliest opportunity.

Lack of incentives for being cost efficient. There are tangible and intangible costs associated with inventory. Inventory models in the commercial world ensure that intangible costs are not ignored and force quantification of such costs. However, in defence, most of the times, even tangible costs are overlooked. All that matters to the commanders in field is that mission critical requirements must be met.

On September 10, 2001, U.S. Secretary of Defense Donald Rumsfeld warned in a speech to Pentagon officials of an adversary that poses a "serious threat" to the United States — one that is far more "subtle and implacable" than was the former Soviet Union. He was not referring to the Al Qaeda, but to an enemy within. Rumsfeld was talking about the Pentagon's bureaucratic inefficiencies — which at times led to procurement of $700 toilet seats and $400 hammers. In his speech he noted that half of DoD's resources go to supporting its infrastructure and overhead using "costly and outdated" systems and procedures that stifle innovation and drain resources from war-fighters[7].

The Indian army needs to take firm and immediate actions in this regard. *Firstly, there is a requirement to choose/design models for assessing tangible as well as intangible costs associated with inventory. Secondly, these costs need to be recorded and incorporated in all inventory decision making processes. Thirdly, they need to be monitored and made available to staff, as well as commanders at all levels. Lastly, there have to be incentives for providing the desired service level at the least possible*

cost. The Army can take a clue from *Hammer Awards* instituted by former US Vice President Gore. The award was in response to bureaucratic processes that yielded $400 hammer. Fittingly, the award consists of a $6.00 hammer, a ribbon, and a note from the then Vice President Gore, all in an aluminium frame[8].

Inaccurate data spread over different systems which do not talk. A single application and a central database for the entire defence enterprise is on the wish list of almost all modern defence forces, and the reality is that the even most technologically advanced and resource rich nations have also not been able to materialise the wish till date. The defence forces are plagued with multiple systems which do not talk, problems of inaccurate data, and challenges of migration of data from legacy systems. Those involved in building information systems have invested huge resources to acquire the capability. The British Department of Defence is spending £1.1 billion on an 11 year contract with Boeing for information systems, while the net value of its inventory is £16.8 billion. The investment in Information Systems is approximately 6.5% of its inventory value and in Rupee terms equal to approximately INR 11,192 Crores. The Department of Defence is expected to have true end-to-end visibility of its supply chain by March 2015[9].

Investments in enterprise wide applications which provide end to end visibility have a phenomenally high return of investments. The Indian Army needs to make rich investments in setting up an *enterprise-wide computer system* to handle its inventory. *The army needs to move beyond the Defence Procurement Procedure and enter into a strategic partnership with a capable and experienced System Integrator who can deliver the desired system within a realistic time-frame.*

Skills. It clearly emerges from the audit reports that the defence inventory management lags behind the commercial world in terms of efficiency and effectiveness. The aforesaid has been accepted even by almost all defence forces of the world. The defence forces world-over are trying to reduce the gap by induction of commercial best practices in the field of Supply Chain and Inventory Management. The quality of human resource skilled in inventory management in defence forces across the world is also a cause of concern for obvious reasons.

The Indian Army needs to enhance its interaction with the academia as well as the corporate, with the view to absorb the latest tools of Inventory Management.

Performance Management. Performance Management is another common thread that runs through the recommendations of almost all audit authorities who have reviewed defence inventory management practices. The need to have a limited set of enterprise wide performance metrics which monitor the effectiveness as well as efficiency of the entire supply chain has remained unfulfilled in most of the defence forces even as on date. The genesis of the problem lies in the fact that public sector in general is not tied to a contractual standard performance.

Given the vitality, cost and ever increasing complexity of the army's inventory, there is a desperate need that the performance of the functional processes in the weapons, equipment and munitions supply chain is measured through a customised performance measurement framework which includes deliberately chosen key performance indicators, such that the framework presents a realistic and balanced snapshot of its state. The army at present does not have a frame work for tackling the issue at the enterprise level, but has tools which provide a fragmented picture of the health of isolated logistic units which constitute its internal supply/distribution chain. The requirement, however, is to develop a framework which is able to measure the efficiency and effectiveness of the functional processes at the enterprise level.

Conclusion

The Defence Forces across the globe have limited resources at their disposal. The same is true for Indian Army as well. In fact, resource availability for Indian Army is shrinking every year. The Planning Commission in its approach paper to the 12th plan has said that defence expenditure as a percentage of GDP will come down by 0.05 percentage points each year.

... the Defence Inventory

Further, the ratio of capital to revenue expenditure of the Defence forces is also undergoing a steady change in favour of Capital expenditure. The share of revenue expenditure in the 9th Defence Plan was 73.65%; and the same has decreased to 61.43% in the 11th Defence Plan. The stores budget is a subset of the revenue budget, and is therefore adversely impacted by such shrinkage. Reality is that the stores budget has grown by just 1.72 times in the last 14 years while the Pay and Allowances budget has grown by 4.57 times in the same period. While the resources are declining, the end-customer has become more and more demanding in terms of service levels.

The Army therefore faces the challenge of providing higher service levels with declining resources. To do this, it needs to evolve a *cost conscious, cost efficient, and cost effective* inventory management strategy. The army needs to establish the right skills, absorb best practices in the field, and engineer efficient and effective processes; and ensure that these processes are supported by an appropriate organisation, quality data, strong governance and effective performance measures.

Notes

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