MANEKSHAW PAPER No. 46, 2014

Performance Measurement
A Model for the Department of Defence Production

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New Delhi

KNOWLEDGE WORLD
KW Publishers Pvt Ltd
New Delhi

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www.kwpub.com

Published in India by

Kalpana Shukla
KW Publishers Pvt Ltd
4676/21, First Floor, Ansari Road, Daryaganj, New Delhi 110002
Phone: +91 11 23263498 / 43528107 email: knowledgeworld@vsnl.net • www.kwpub.com

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Chapter 1
Indian Defence Industrial Base

To be prepared for war, is one of the most effectual means of preserving peace.
— George Washington

Introduction

The establishment of the Gun and Shell Factory at Cossipore in 1801 initiated the creation of the Indian defence industrial base. The country's defence industry has since grown manifold. India today possesses one of the world's largest and most diverse defence industrial bases, which comprises 41 Ordnance Factories[1] (OFs), 9 Defence Public Sector Undertakings (DPSUs), over 50 defence research and development laboratories, and a nascent but fast growing private sector. The public component of the defence industrial base employs over two lakh employees and has an annual yield of Rs 46,105 crore. Hindustan Aeronautics Limited (HAL), OFs (all combined together) and Bharat Electronics Limited (BEL) ranked 40th, 47th and 74th in the Stockholm International Peace Research Institute's (SIPRI's) list of top 100 arms producing companies in the world for the year 2012[2].

The defence industrial base, less the research and development component, is administered by the Department of Defence Production (DDP). The DDP was set up under the Ministry of Defence in November 1962, with the objective of developing a comprehensive production infrastructure for the defence of the nation. The department deals with the indigenisation, development and production of arms, ammunition and defence equipment, in both the public and private sectors, with a view to achieve self-reliance for the armed forces of India. It exercises direct administrative control over the public instruments of production, viz. the OFs and the DPSUs, and also facilitates the growth of the private sector through policy initiatives. The largely public owned defence industrial base of the country consumes colossal resources, and the defence potential of the nation, to a large extent, depends on its output. Therefore, monitoring and evaluating its performance assumes utmost significance. However, prior to addressing the aspect of performance

evaluation, it is essential to develop an understanding of the manner in which the defence industry has evolved to its current state.

Evolution of the Defence Industrial Base

The evolution of the defence industrial base has been shaped by many historic events, which include World War II, India's independence, the wars of 1962, 1965 and 1971, the break-up of the Soviet Union, liberalisation of the economy, and the Kargil War. Accordingly, its evolution can be studied in four distinct phases, with each having its own set of peculiarities.

- **Phase I – Pre-Independence:** The Indian defence industrial base, on the eve of independence, comprised 18 OFs, two Public Sector Undertakings (PSUs) and a private shipyard. The initial OFs that were set up by the British included the Harness and Saddlery Factory at Kanpur (1864), Ammunition Factory at Kirkee (1889), Metal and Steel Factory at Ishapore (1900), Rifle Factory at Ishapore (1901), Gun Carriage Factory at Jabalpur (1904) and Cordite Factory at Arvankadu (1904), besides the first factory at Cossipore. Nearly half the factories that we possessed at the time of independence owe their existence to World War II and were primarily created to sustain the allied war effort. Hindustan Aircraft Limited (HAL), Mazagon Docks Limited (MDL) and Garden Reach Workshop were the face of the public sector/private industry and their capabilities were limited to overhaul/repair of aircraft/ships. The cumulative value of the defence production at the time of independence was estimated to be Rs 70-80 lakh[3].
- **Phase II – Post-Independence to Early Sixties:** The post-independence growth of the defence industry was influenced to a large extent by the report of the British scientist, PMS Blackett, to the then Prime Minister, and steered by the first Industrial Policy Resolution of 1948. Blackett advised India to restrict its defence budget to less than 2 per cent of the Gross Domestic Product (GDP) and produce large quantities of non-competitive technologically simple weapons in the light of its weak economy and low technological base. This, he considered, would stimulate the economy and trigger industrialisation[4]. The first Industrial Policy Resolution of 1948, consequently revised under the Second Five-Year Plan in 1956, placed core industries, including munitions, aircraft, shipbuilding, iron and steel, heavy

machine tools, heavy electrical plants, atomic energy and similar others under the exclusive control of the central government[5]. The notable addition to the defence industrial base during the period was the establishment of Bharat Electronics Limited in 1954, the first post-independence PSU, and the Defence Research and Development Organisation (DRDO) in 1958. The self-sufficiency model adopted by the government coupled with low budgetary allocation and absence of technology infusion dampened the pace of growth of the defence industry in this phase.

- **Phase III – Period of Licensed Production:** The wars of 1962 and 1965, forging of close defence ties with the Soviet Union and the war of 1971 brought in a phase of increased attention to defence matters, enhanced budgetary allocations and plenty of licensed production. Consequently, the manufacturing base increased in size; however, increased licensed production reduced the demand for design and development capabilities. The OFs grew to a strength of 39, with the laying of the foundation of the medium and heavy calibre ammunition factory in the Bolangir district of Orissa in October 1984. Almost 20 factories were added during the period. In spite of accretions, dependence on the Soviet Union increased, and by the end of the Cold War, the country was 100 per cent dependent on the Soviet Union for ground air defence, 75 per cent for fighter aircraft, 60 per cent for ground attack aircraft, 100 per cent for tracked armoured vehicles, 80 per cent for tanks, 100 per cent for guided missile destroyers, 100 per cent for conventional submarines and 70 per cent for frigates[6].
- **Phase IV – Indigenised Designing, Collaboration and Privatisation:** The mid-eighties saw a shift in our approach to defence manufacturing. The break-up of the Soviet Union, liberalisation of the economy and the Kargil war influenced the defence industrial base in a big way. Indigenous design and manufacturing, and co-production made a remarkable beginning with the sanction of the Integrated Guided Missile Development Programme in 1983. In 1986, the OFs were permitted to make sales in civil trade and exports. The focus shifted from licensed production to co-production. The agreement for joint production of Brahmos with Russia in 1998 was the first successful initiative in this direction. It was followed by inter-governmental agreements for co-development and co-production of transport and fighter

aircraft with Russia in 2007, and for surface-to-air missiles with Israel and France. The phase also witnessed opening up of the defence sector to the private industry and permitting of Foreign Direct Investment (FDI) of up to 26 per cent.

An Overview of the Production Agencies

The OFs function under the aegis of the Ordnance Factories Board, which was formed on April 2, 1979. The OFs are divided into the undermentioned five operating divisions, based on the main product/technologies involved:

- Ammunition and Explosives (A&E) - 10 Factories
- Weapons, Vehicles and Equipment (WV&E) - 10 Factories
- Materials and Components (M&C) - 8 Factories
- Armoured Vehicle (AV) - 6 Factories
- Ordnance Equipment Group of Factories (OEF) - 5 Factories

In the year 2011-12, the OFs employed 96,547 personnel and made an annual sale of Rs 10,880.87 crore to their customers. The Army is the principal customer of the OFs, accounting for 78.80 per cent of the total sales. Civil trade and exports accounted for one-sixth of the OFs sales, amounting to Rs1,758.21 crore. Sales to civil industry (excluding the Ministry of Home Affairs and State Police Departments) amounted to Rs 499.89 crore (4.6 per cent of annual sales) and exports netted a revenue of Rs 46.08 crore (0.42 per cent of annual sales). Sales to the other two Services were just 4 per cent of the annual sales fixed[7].

In terms of responsiveness, production targets were fixed for 547 items (56 per cent) in the year 2011-12, against a demand of 982 items and there was a shortfall of 64.35 per cent in meeting of targets so fixed. Further, with respect to productivity, the *output per person* engaged by the OFs is Rs 11.27 lakh. The OFs *output per person* is almost one-fourth of the *output per person* engaged by the domestic industry, which stands at Rs 43 lakh[8]. The OFs utilise about three-fourths of their capacity, and approximately 34 million machine hours could not be utilised in the production year 2011-12.

The nine defence DPSUs, in comparison to the OFs, enjoy relatively more operational and financial freedom. In terms of size, they are much

larger than the OFs and they operate in the high-end technology spectrum such as aerospace, electronics and warships. The DPSUs have a workforce of approximately 75,000 and their combined annual sale is more than Rs 28,337 crore[9]. Hindustan Aeronautics Limited (HAL) is the biggest entity which accounts for nearly 51 per cent of the total annual sales of the DPSUs, followed by Bharat Electronics Limited (BEL) which accounts for a 22 per cent share. HAL and BEL have been accorded *Navratna* status and the balance PSUs, with the exception of Hindustan Shipyard Limited, are *Mini-Ratnas*.

The average *output per person* of the nine DPSUs is nearly three-fourths that of the domestic industry. Further, in the year 2010-11 the import dependency of production for HAL was 69.65 per cent and that of BEL was 33.96 per cent[10]. In the year 2012-13, approx 85 per cent of the raw materials, spare parts and components used by the HAL were imported.

The Indian private sector is the latest but very enthusiastic entrant in the field and companies of the likes of Ashok Leyland, Bharat Forge, Mahindra and Mahindra, Larsen and Toubro, Reliance Industries, Tata Consultancy Services, Tata Motors, Tata Power Strategic Electronic Division, Pipavav and Wipro, amongst many others, are keenly competing for the space.

The Strategic Gap

India has invested a fair share of its national resources in the establishment of a vast defence industrial base over a considerable period of time. The country today is one of the few in the world that has developed or is in the process of developing a fourth plus generation fighter aircraft, an aircraft carrier, a nuclear submarine, a main battle tank, and an intercontinental ballistic missile[11]. However, the ultimate goal of being self-reliant remains a distant one. The country still imports a majority of its defence needs. Many high powered committees on national security have been commissioned in the recent years to address the systemic shortcomings. The Kelkar Committee towards strengthening self-reliance, NS Sisodia Committee for improving defence acquisition structures, Rama Rao Committee on redefining the DRDO, and Naresh Chandra Committee on national security have studied our systems and given numerous recommendations/suggestions which are all well known. These include revitalising the state owned production agencies, sharing of long-term

acquisition plans, increased private sector participation and public-private partnership, creation of Raksha Udyog Ratnas (RUR), increasing the limit of permissible FDI, maximisation of offsets, and many others. Some of the recommendations have been accepted and implemented and others are probably under the consideration of the executive.

Necessity of Performance Measurement

The desire for achieving self-reliance and extreme focus on increasing the indigenised content of procurement in defence production has to an extent drawn attention away from the core performance issues of the defence industrial base. *The production agencies need to be responsive to the requirements of the Services and should meet them on time, in the most cost-effective manner, with quality products. The production agencies also need to strike a balance between effectiveness and efficiency.* This can happen only if the performance of the production agencies under the DDP is monitored and evaluated on a regular basis.

The other argument which emerges in support of continuous performance measurement is the reactionary nature of the evolution of our defence industrial base. Had it not been for the war in 1962, may be we would have continued longer on the Nehru-Blackett model of self-sufficiency. Had the Soviet Union not disintegrated, we would have still not given up on the easier option of licensed production. Had the economy not liberalised and Kargil not happened, we may still be a closed defence economy today. The normal reaction to events of such nature is convening of a high powered committee on matters of defence, which is invariably constituted of non-defence members, and whose reports may or may not be implemented. A shift from the reactionary approach to progress can occur only if the stakeholders are always aware of our present state and capability on a real-time basis and for that, regular performance measurement is the only answer.

Lastly, performance evaluation is used today by the best in the world, in both the private and public sectors, as a tool for strategy implementation. The path to aligning the organisation to its strategic objectives is only through performance measurement. This realisation is very visible in modern armies like those of the US, UK and Australia. The US Department of Defence

has been persistently reviewing the performance of the Defence Logistics Agency and the entire defence industrial enterprise. They have extensively exploited several models to include the Balanced Score Card and the Supply Chain Operations Reference Model. The Government of India has also taken to performance monitoring and evaluation in a big way, details of which are given in the next chapter.

Chapter 2
The Existing Performance Measurement Framework

What's measured improves…

— Peter F. Drucker

Introduction to Performance Measurement

Performance has been defined as the accomplishment of a given task measured against pre-set known standards of accuracy, completeness, cost, and speed[12]. The importance of performance needs no emphasis, and the same is the case with measurement. Lord Kelvin once said, "*If you cannot measure it, it does not exist*". But measuring performance is not an easy task. Measurement is complex, frustrating, difficult, challenging, important, abused and misused[13]. 'What to measure', 'how much to measure', and 'how often to measure' are very difficult decisions required to be taken while designing performance measurement frameworks. The task was comparatively easier for the corporates in the pre-1980 era, when traditional financial measures like sales and costs were all that mattered to survive in a seller's market. However, as the markets became competitive, the realisation came about that yesterday's accounting results speak nothing about the factors that actually help growth in market share and profits – things like customer service, innovation, Research and Development (R&D) effectiveness, the per cent of first-time quality, and employee development[14]. With this realisation came the development of numerous models and frameworks for performance measurement. Indian industry has also been influenced by the performance revolution. As per a study, the Balanced Score Card (a popular performance management framework) adoption rate is 45.28 per cent in corporate India which compares favourably with 43.90 per cent in the US[15].

The Government of India, way back in June 2009, established a structured mechanism for monitoring and evaluating the government's performance on a regular basis. The Performance Management Division (PMD) of the

government, which is a part of the Cabinet Secretariat, is the driver behind the mission of being a learning and knowledge sharing organisation that continuously strives to improve the functioning of government machinery, and making it an example of international best practice. On September 11, 2009, the Prime Minister approved a Performance Monitoring and Evaluation System (PMES) for the departments of the Government of India. The PMES was formed with a vision of *creating result-driven government machinery that delivers what it promises*[16].

The Performance Monitoring and Evaluation System

The performance Monitoring and Evaluation System (PMES), as the name suggests, is a system which *evaluates* and *monitors* the performance of government departments. Evaluation involves comparing the actual achievements of a department against the annual targets, and monitoring involves keeping a tab on the progress made by a department towards its targets on a periodic basis. PMES, as per its mandate, takes a comprehensive view of the departmental performance by measuring the performance of all schemes and projects and all relevant aspects of expected departmental deliverables such as: financial, physical, quantitative, qualitative, static efficiency (short run) and dynamic efficiency (long run). The system is designed to provide a unified and single view of departmental performance.

At the heart of the PMES lies a document called the Results-Framework Document (RFD) which contains the priorities set out by the Minister concerned, the agenda as spelt out in the party manifesto, if any, the President's Address, and announcements/agenda as spelt out by the government from time to time. The RFD seeks to address three basic questions, which are, "what are department's main objectives for the year?", "what actions are proposed to achieve these objectives?" and "how to determine progress made in implementing these actions?" Each of these questions is significant. To answer these questions, the RFD is structured into six sections, as detailed below[17]:

- Ministry's vision, mission, objectives and functions.
- *Inter se* priorities among key objectives, success indicators and targets.
- Trend values of the success indicators.
- Description and definition of success indicators and proposed measurement methodology.

- Specific performance requirements from other departments that are critical for delivering agreed results.
- Outcome/impact of activities of department/ministry.

The PMES/RFD system in its first phase covered 59 departments in 2009-10. In the fifth year of its implementation, in 2013-14, the system was extended to 80 departments/ministries and some 800 responsibility centres (attached offices/ subordinate offices/ autonomous organisations)[18]. What is most commendable is that the DDP has taken part in this initiative and three RFDs have since been prepared by the department, commencing from the year 2011-12. It is praiseworthy and creditable for the DDP because previous endeavours of such nature have been avoided by the Ministry of Defence (MoD). In most cases, national security has been cited as a convenient explanation to avoid adoption of contemporary management techniques. A case in point is the implementation of the Outcome Budget, which has become an integral part of the budgeting process since 2005-06. The defence Services (including capital outlay), OFs and the DRDO continue to remain specifically exempted from the purview of the Outcome Budget as per the Guidelines for the Preparation of the Outcome Budget 2013-14. It is also pertinent that two out of the other three departments under the MoD, namely the Department of Defence (DoD) and the Defence Research and Development Organisation (DRDO) do not find mention on the Performance Management Division's website.

Performance evaluation of the DDP also assumes significance since it controls the entire domestic industrial base, which besides having immense repercussions on the nation's defence capability, has an annual turnover of Rs 46,105 crore[19] (figures for financial year 2012-13). The annual turnover of the Ordnance Factories Board (OFB) and the Defence Public Sector Undertakings (DPSUs) is much more than the expenditure incurred by most of the ministries of the union government. To put things in perspective, the Ministry of Health and Family Welfare spends Rs 25,133.30 crore, Ministry of Women and Child Development spends Rs 17,035.72 crore and Ministry of Agriculture spends Rs 15,854.39 crore (figures quoted are actuals for the year 2012-13)[20]. It is apparent that substantial resources of the union government are allocated to the organisations under the DDP

and, therefore, their continuous performance evaluation is essential to ensure that they satisfy the end users' needs in the most responsive and cost-effective manner.

Vision and Mission of DDP

The PMES defines vision as an idealised state for the ministry/department. It is the big picture of what the leadership wants the department to look like in the future. The DDP's vision is *to achieve self-reliance in production of state-of-the-art weapon platforms, arms, ammunition, equipment and other material required for the defence of our nation.* As per the PMES, the department's mission is the nuts and bolts of the vision. The mission is the 'who, what and why' of the department's existence. The vision represents the big picture and the mission represents the necessary work. The DDP's mission, as contained in RFD 2013-14, is to *facilitate enhancement of capability and capacity through policies, initiatives and incentives for improving quality and timely delivery of defence equipment for the armed forces and encourage R&D efforts in Indian defence industries for self-reliance and improve the functioning of the OFB and DPSUs for transforming them into global leaders*[21].

Vision and mission statements help organisations to focus on what really matters and ensure that the workforce never forgets what is important, while discharging its day-to-day functions. They also provide the employees with a succinct overview of the organisation and what it wants to achieve. These statements generate a sense of common purpose and interest, and bind people together to help them achieve objectives which are on the path to materialisation of the grand vision. A few natural and pertinent observations on the DDP's vision and mission statements are appended below for deliberation/consideration of the policy-makers:

- The DDP has crafted a vision and mission which does not find any mention of the end user, "*the soldier in the field*"! Ideally, the DDP and the entire extended defence supply chain should never lose sight of the ultimate customer, the sole reason for which the department exists. The end-user satisfaction is the supreme requirement. The rest of the requirements which find mention in the vision and mission statements are, and should remain, secondary to this requirement. This is a fact which should be included in the vision/mission statements in some form and should at all

times be in the back of the minds of the 96,547 employees[22] who work in the 39 OFs and 75,000 plus staff of the nine DPSUs[23].

- The DDP's output is delivered largely through the OFB and the DPSUs. The OFB's mission and vision statements interestingly, have no mention of "self-reliance" and in their present form, they are incapable of delivering it. Similarly, the vision and mission statements of six out of nine DPSUs do not include any mention of self-reliance[24]. Moreover, self-reliance requires extensive participation of the DRDO, which is not under the control of the DDP. Interestingly, the vision and mission statements of the DRDO also do not make any mention of self-reliance. Therefore, the department's grand vision of self-reliance, which has not been embraced by the responsibility centres under the department, appears to be mere rhetoric. The department should, in some manner, elaborate upon the nuts and bolts of achieving self-reliance and define specific objectives for achieving it.
- Lastly, the DDP's mission and vision statements do not seem to give costs much significance. The resources at the disposal of even the world's most resourceful nation's defence forces are limited. The fact is that within the production possibility frontier, the guns will always come at the cost of butter. Therefore, with a finite set of resources, simply producing state-of-the-art equipment is not enough; what we produce has to be cost effective as well.

Objectives, Actions, Success Indicators and Weightages in the RFD

The RFD contains a series of prioritised objectives for which actions, success indicators, weights and target/criteria values are defined. The RFD document presents these details in a tabular fashion (refer to Table 1). The current objectives of the DDP and their respective success indicators and target/criteria value are discussed in this section of the paper in the order of priority as contained in the RFD 2013-14.

The understanding of the interplay between objectives, actions, success indicators, weights and target/criteria value is pivotal to the success of PMES. An integrated set of actions needs to be defined to achieve the desired objective. This integrated set of actions comprising nothing but the

bullet points of the department's strategy to achieve the objective. Success indicators are nothing but Key Performance Indicators (KPI) whose actual measurements need to be compared with the targets approved by the Minister in charge. Further, strategic actions/initiatives need to be prioritised and given weights as per their importance/contribution towards achieving the objective. Mismatch in orientation of objectives, actions, success indicators and their relative weightages can lead to different kinds of disconnects, such as:

- *Incorrect, incomplete or missing set of actions*. This shall obviously not help in achieving the desired objectives.
- *Incorrect choice of success indicators*. Success indicators are expected to indicate movement towards achieving the objective and if their values increase despite no movement towards the objective, then the evaluator is deriving satisfaction from failure.
- *Incorrect assignment of weightages*. The department has finite resources; therefore, it needs to deploy these as per priority. Incorrect assignment of weightages can lead to dissipation of resources on low priority objectives/actions.

Table 1: Format for RFD (Source PMES for Government Department, Cabinet Secretariat, Government of India)

Column 1	Column 2	Column 3	Column 4	Column 5	Column 6					
Objective	Weight	Action	Success Indicator	Unit	Weight	Target / Criteria Value				
						Excellent 1000%	Very Good 90%	Good 80%	Fair 70%	Poor 60%
		Action 1								
Objective 1		Action 2								
		Action 3								
		Action 1								
Objective 2		Action 2								
		Action 3								
		Action 1								
Objective 3		Action 2								
		Action 3								

Objective I – Timely Delivery

The foremost objective of the DDP in RFD 2013-14 is *timely delivery of arms/ ammunition and equipment of quality standards to the armed forces as per their requirements.* The weightage assigned to this objective is 30 per cent. The aspect of timely delivery of equipment was Priority II in the first RFD (2011-12)[25], and weightage assigned to it was 20 per cent. The rise in priority and increase in weightage suggests that the production agencies of the department have failed to deliver products in time, and, therefore, the issue has become the chief concern for the DDP. Further, the phrase *"quality standards"* has been introduced only in the RFD 2013-14, and this aspect was not included in the earlier RFDs.

The actions required to achieve this objective are delivery of a given quantum of ammunition, armoured vehicles, Pinaka rockets, AK-630M gun, missiles, ships, aircraft, ULSB Mk-II, passive night vision devices and RADARS due for delivery by March 31, 2014. Each of these 10 items is assigned an equal weightage of 3 per cent. The success is measured in terms of delivered monetary value in the case of ammunition and in terms of numbers delivered in the case of the rest of the items. The following issues pertaining to choice of actions chosen for the Priority I objective merit debate:

- Is timeliness important only for the 10 sets of items included in the RFD? In the year 2011-12, the Services placed a demand for 982 items on the OFB, against which targets were fixed for only 547 items (58 per cent) and only 195 (20 per cent of the indented items) were manufactured in time[26]. The issue of timeliness cannot be resolved by monitoring the progress of just 10 items/category of items. These ten items/set of items are neither exhaustive nor do they in any manner truly represent all the items which are demanded by the Services. Do these items cover the performance of all 39 OFs and 9 DPSUs with regard to timeliness? Actions listed out in the RFD do not address the root causes of the problem which lie embedded in the organisation's culture and inherent weakness in core operating processes.
- The objective statement includes the phrase *"quality standards"*. However, there is neither any action nor any qualifying success indicator detailed for achieving quality standards in the entire RFD. Quality is conformance to standards, a job which the production agencies perform along with the

Director General of Quality Assurance (DGQA). Its success has many indicators like decrease in defect reports in the case of main equipment, premature failures/accidents in the case of ammunition, and customer feedback. Longitudinal data on the aforesaid issues is available with the Service Headquarters (HQ) and the same can establish trends with regard to quality.

- The objective statement also includes the phrase "*as per their (armed forces) requirements standards*". Again, neither is there any action nor any success indicator for responsiveness. The Services' requirements in terms of reduced production lead times, range and depth required and quality have to figure in the RFD and be accepted as standards against which the yield of OFB and DPSUs need to be compared.

As regards the choice of success indicator and weightages is concerned, the following is pertinent:

- The success indicator chosen for the objective is volumes delivered in terms of cost/numbers by the end of the financial year. The cost/volume-based approach of performance measurement is archaic and was given up long ago by the industry, which has been dissatisfied by the use of lagging indicators (financials). In many companies, non-financial indicators such as quality, customer satisfaction, cycle-time, and innovation are recognised[27].
- The success indicator in this case could have been the production lead times or cycle-time to order fulfilment. The RFD quantifies delivery of ammunition worth Rs 5,870 crore by May 31, 2014, as the target, on achievement of which the department's performance is graded as excellent. What it does not tell us is that when the order for this ammunition was placed, what was the quantum ordered, what was the expected delivery time, when and how much was finally delivered, and at what rates of capacity utilisation. The current approach is an absolute non-indicator of performance, as it is a mere summary of production backlogs, whose completion is being monitored through the RFD. Performance for timeliness needs to be judged by comparing average actual production lead times against the standard production lead times. The standard deviation value of the actual lead times would indicate the variability in production processes.

- The RFD 2011-12 and 2012-13 indicate the target/criteria value for Pinaka rockets as 1,100. The target is revised to 1,400 for RFD 2012-13. Table 2 shows issue against targeted supply of rockets since commencement of production against a planned capacity of 1,000 rockets[28]. Apparently, the capacity in later years is more as a consequence of delivery backlogs.

Table 2: Supply of Rockets against Target (Source - CA No. 16 of 2012-13 (Defence Services))

Year	Rockets RHE		Rockets PF	
	Target	Issue	Target	Issue
2007-08	240	306	762	-
2008-09	204	-	816	101
2009-10	162	160	864	84
2010-11	100	204	900	706
Total	706	670	3342	891

- Assigning equal weightage to ten completely different items belonging to different Services appears to be an arbitrary allocation without reference to *inter-se* priorities and user expectations. Delivery of ammunition worth Rs 5,870 crore, 187 armoured vehicles and 500 ULSB Mark II can never have the same weightage as 10 ships and 68 helicopters/aircraft. Users' inputs need to be considered while finalising weightages.

Objective II – Increase Share of Indian Products in the Procurement for our Defence Needs

The Priority II objective is increasing the share of Indian products in defence procurement and is assigned a weightage of 30 per cent. This objective was Priority I in RFD 2011-12 with a weightage of 20 per cent. The following actions have been listed in the RFD to achieve the objective of increased share:

- **Increase in Number of Manufacturing Vendors:** An increase of 6 per cent over the previous year is seen as a target for excellent performance. Weightage for this action is 6 per cent.

- **Encourage Private Participation:** The number of No Objection Certificates (NOCs) recommended for an industrial licence to private sector companies and operationalisation of licences/granted up to March 31, 2012 (preceding RFD), are the two success indicators for encouraging private participation. Total weightage for these two is 6 per cent.
- **Indigenisation** of T-90 tanks (from the present level of 65 per cent to a cumulative 73 per cent), Shakti engine (from 25 per cent to 29 per cent), Sukhoi aircraft (from 41 per cent to 47 per cent), P-15A (increase from the present level by 4 per cent) and ARV WTZ-3 (from 26 per cent to 30 per cent). Weightage for these actions is 18 per cent.

It is apparent from the actions and their success indicators in the RFD that the department is attempting to measure the achievable. The above approach will lead to a small incremental improvement and will not materialise the vision of self-reliance. Relevant success indicators for Objective II should have been the cumulative increase in the following:

- Procurement from the Indian private industry as a percentage of the net defence procurement (say PI).
- Procurement from the OFB and DPSUs as a percentage of the net defence procurement (say OD).
- Procurement (other than raw material) by the OFB and DPSUs from the Indian private industry as a percentage of OFB and DPSU sales.
- Ratio of PI to OD. This needs to be assigned much higher weightage than the rest.

The department needs to list and execute substantial measures and actions which can cause significant improvement in the above listed success indicators.

Objective III – Enhance Manufacturing/Mapping Capabilities in the Defence Domain

The objective is assigned an overall weightage of 15 per cent and includes execution of following actions:

- Overall programme of modernisation of OFs and DPSUs. The success indicator is expenditure incurred. If the DPSUs spend Rs 1,388.70 crore

and the OFs Rs.1,020 crore within financial year 2013-14, then their performance is rated as excellent. Weightage for this action is 4 per cent.

- Partial completion of works by March 31, 2014, in two OFs and four DPSUs, in which key modernisation projects are in progress, accounts for the balance weightage of 11 per cent. To illustrate, the "Completion of Civil Works" in Key Modernisation Projects in the OFB for "Creation of Capacity for Spares for T-72, T-90 OH for OFB" is one of the actions. Criteria value of 100 per cent is awarded if the work is completed by March 03, 2014, and with each week of delay, the criteria value is decreased by 10 per cent, resulting in an award of 60 per cent if the work is completed by March 31, 2014.

Expenditure of funds is no measure of success for enhancing manufacturing/mapping capabilities. This is something which the department has indulged in ever since its creation. True success lies in effectiveness of the expenditure. Ordnance Factory Korwa is a perfect example. The project for the establishment of a new ordnance factory at Korwa, Amethi, by October 2010, at an estimated investment of Rs 408.01 crore was sanctioned to meet the operationally urgent need for acquisition of new generation carbines without finalisation of the new generation carbines to be produced in the factory. Colossal funds have been booked, civil works have been completed, plant and machinery are being ordered without finalisation of the product to be manufactured. Consequentially, till date there has been no resultant contribution to the nation's capability.

A true success indicator for this objective is the proportion of defence inventory (in terms of main equipment only) which can be produced by the Indian defence industry. Relevant success indicators for Objective III could have been the cumulative increase in the following ratios:

- Numbers of main equipment indigenously manufactured and procured from the Indian private industry as a percentage of the total range of main equipment.
- Numbers of main equipment indigenously manufactured and procured from the OFB and DPSUs as a percentage of the total range of main equipment.

Objective IV – Streamlining Institutional Architecture for Defence Related Research and Development (R&D)

The weightage assigned to this objective is 3 per cent. There are six R&D projects (one each of BEL, BDL, HAL, MDL and two of the OFB) listed as actions for this objective, each of which is assigned a weightage of 0.5 per cent. The low weightage assigned to this objective further strengthens the argument that the current objectives and actions are incapable of driving towards the vision of self-reliance. The success indicators included in the RFD are partial completion of six different and independent projects which are currently in different stages of execution. Partial completion of these projects in no manner reflects achieving of the stated objective of "*Streamlining Institutional Architecture for Defence Related Research and Development.*" Apparently, the RFD is designed to measure the achievable.

In the earlier RFDs for the years 2011-12 and 2012-13, the objective framed in respect of R&D was "*Taking up more R&D Projects and Increasing Allocation for R&D.*" The R&D allocations for the defence is made to three organisations, namely DRDO, DPSUs and the OFB, totalling to approximately Rs13,500 crore[29] for the current financial year. The organisations under the DDP account for about 12 per cent of the R&D expenditure, and achieving self-reliance through this share is a tall order. However, the department can encourage the private industry to invest in defence R&D through policy formulation. In India, private investments into R&D are estimated at only half of that of the public sector, in contrast to the developed and emerging economies, where the private:public investments into R&D are generally in the range of 2:1[30]. Table 3 outlines an approximate phasing of investment of the public and private sectors into R&D during the 12th Plan.

Fig 1 : Expenditure Share of R&D (figures for OFB and DPSUs have been taken from projected targets in RFD 2012-13 and those for DRDO are from the Interim Budget)

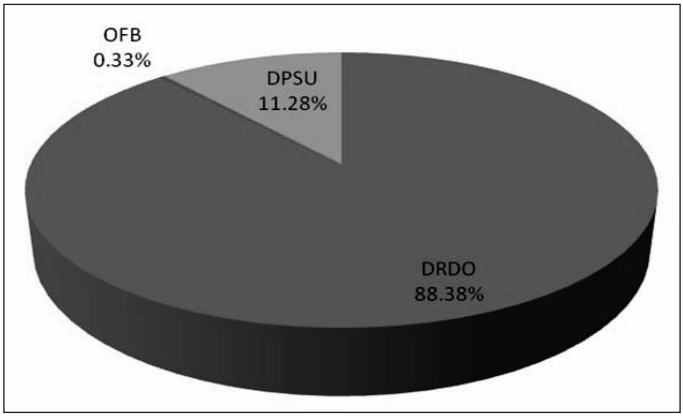


Table 3 : Phasing of Investment of Public and Private Sectors into R&D during the 12th Plan

Year	2011	2012	2013	2014	2015	2016
Share of public investment as % of R&D investment in the public sector	76%	73%	67%	61%	56%	50%
Share of industry sector investment as % of R&D investment	24%	27%	33%	39%	44%	50%

(Source: Report of the Steering Committee on Science and Technology (S&T) for the formulation of the 12th Five-Year Plan)

The DDP, therefore, needs to find ways to ensure that the private sector spends Rs 6,750 crore on defence R&D, which is in tune with the national trend on share of private expenditure. The DDP also needs to align the private sector expenditure in defence R&D with projections for industry as indicated in Table 3, and strive to achieve the ratio of 50-50 by the year 2016. Such a target should be worth pursuing.

Other Objectives

The first four objectives account for 78 per cent of the weightage. The objectives which are assigned the balance weightage are as follows:

- Facilitating and guiding improvements in the functioning of DPSUs, OFB and all three responsibility centres.
- Monitoring of offset policy.

- Efficient functioning of the RFD system.
- Transparency/service delivery of ministry/department.
- Administrative reforms.
- Improving internal efficiency/responsiveness.
- Ensuring compliance to the financial accountability framework.

Outcomes of the DDP's Strategy

The last section of the RFD contains broad outcomes and the expected impact the department has at the national level. This section essentially captures the very purpose for which the organisation exists and is included to keep reminding the department of the purpose of its existence and also the rationale for undertaking the RFD exercise[31].

Table 4 illustrates the outcomes which the DDP is monitoring. The first two outcomes relate to the net *turnover* of OFs and DPSUs respectively. Is the purpose of the DDP only to increase the turnover of the OFs and DPSUs? Is the entire exercise of RFD undertaken only to increase the turnover of OFs and DPSUs? Is 10 per cent growth in the turnover of OFs and 4 per cent in that of the DPSUs in financial year 2012-13, and that too, in nominal terms, a satisfying outcome? The third outcome in respect of the department is the *percentage growth in vendor base*. Can we derive satisfaction by mere growth in the number of registered vendors? The real satisfaction should ideally come from increase in the quantum and share of production of the domestic private industry. The fourth and last outcome is the *timely study / review of the signed offset contracts*. This is one of the most curious outcomes which the DDP is pursuing. Study/ review of the signed offset contracts is a function of the department. It is a well-known fact that offsets are no free lunches, as there is an economic cost to them. In a survey conducted in the UK, it was concluded that purchases with offsets cost more than off-the shelf purchases and, not surprisingly, that vendors seek to include most of it as premium in the selling price[32]. As per the existing policy, offsets can be discharged by vendors through investments in Indian defence infrastructure or through export of Indian items. Therefore, there could have been two outcomes in relation to execution of offsets. The first could be related to enhancement of self-reliance through transfer of technology and the second could be related to promotion of defence exports. The DRDO has listed out 26 critical defence technology areas for acquisition through offsets which include

nano technology-based sensors and displays, miniature Synthetic Aperture Radar (SAR) and Inverse Synthetic Aperture Radar (ISAR) technologies, fibre lasers, EM Rail Gun technology amongst many other areas (comprehensive list is attached as Appendix A). It would be worthwhile for the DDP to make fructification of this wish list a desired outcome rather than a study / review of offset contracts.

Table 4 : DDP's Outcomes as Tabulated on the Performance Management, Cabinet Secretariat website

Overview	Objectives	Outcomes						
Outcome/impact of department/ ministry	Jointly responsible for influencing this outcome/impact with the following department (s)/ ministry (ies)	Success indicator	Unit	FY 11/12	FY 12/13	FY 13/14	FY 14/15	FY 15/16
1. Turnover of Ordnance Factories	Armed Forces, DGQA, QEMs	Turnover	Rs. in crore	11,700	12,935	13,581	14,260	14,973
2. Turnover value of production of Defence PSUs	OEM, Armed Forces, DGQA	Turnover	Rs. in crore	31,950	33,170	34,829	36,570	38,398
3. % Growth in vendor base	Private Sector, Services and various government set-ups	% growth	%	-	6	6	6	6
4. Monitoring offset policy	Services, Public/ Private Sector	Timely study/ review of signed offset contracts	N0	-	-	20	20	20

Outcomes should ideally reflect desired change resulting from a particular set of programmes or activities; and achieving of outcomes should contribute towards long-term impact. The DDP could have considered choosing outcomes related to customer satisfaction on account of quality and timeliness, improvement of OF/DPSU brand perception, increase in range of products being manufactured, share of domestic private industry; measurement of which would have given better sense of movement towards the vision and mission of the department.

Chapter 3
Case Studies for Identification of the Right Metrics

Measurement is the first step that leads to control and eventually to improvement. If you can't measure something, you can't understand it. If you can't understand it, you can't control it. If you can't control it, you can't improve it.

— H. James Harrington

Quality

Quality of products and conformity to standards does not find any mention in the RFD till the year 2012-13. The phrase quality standard was included in the RFD 2013-14, but no actions or success indicators were detailed for quality. Is there a requirement to address the quality performance of the OFB and DPSUs through the RFD mechanism? A few instances related to ammunition, which demands highest quality standards, are detailed herein with a view to bring out the magnitude of the problem[33].

- The Army indented for 4,752 Pinaka rockets, which were to be delivered during the period 2007-12, against which OF Chanda supplied only 1,561 rockets (33 per cent of the target) till March 2011, that too without proof clearance. During proof firing of the rockets in December 2008, an accident occurred. Post analysis of the reasons for the accident, 407 rockets (26 per cent of the consignment) were rendered unserviceable due to quality issues related to the propellant. The loss amounted to Rs 44.51 crore worth of rockets and propellant valuing Rs 4.25 crore.
- A total of 33 lots of armour piercing incendiary ammunition valuing Rs 6.04 crore were rendered unserviceable as a result of investigations which were ordered after accidents at Central Ammunition Depot, Pulgaon, and at another Army unit. Recurring accidents and analysis of their causes indicated defective manufacture of primers at OF Khamaria and deficient quality control mechanism in the factory leading to supply of ammunition with loose primers.

- OF Khamaria produced 3,77,887 detonators during January 2008-October 2009 out of which 1,33,443 detonators (35.31per cent) costing Rs 4.64 crore were rejected on quality issues. The investigations revealed the reasons for rejection as use of vintage components supplied by the Ammunition Factory Kirkee and barium chromate procured from trade, with deviated specifications.
- The Ordnance Factory Katni issued 7.62mm brass cups with manufacturing defects, because of deficient quality control, to Ordnance Factory Varangaon which used these brass cups to produce ammunition. This resulted in rejection of the brass cups and ammunition worth Rs 7.42 crore[34].

While the contemporary private sector is striving to achieve a defect rate of 3.4 parts per million (six sigma), our primary defence suppliers are struggling with ranges of 26-35 per cent. The problem is not restricted to ammunition. Inefficient manufacture and inadequate quality control by the factories of the Ordnance Equipment Factories Group (OEFG) led to increased 'Returned for Rectification' (RFR) at the quality assurance stage. RFR beyond 20 per cent and up to 100 per cent was noticed in 72 out of 266 instances during 2008-12. The final rejections of five items in two factories of OEFG amounted to Rs 11.66 crore during 2009-11. Apart from regular customer complaints, the OEFG also faced rejections worth Rs 10.42 crore at the users' end though the products were passed by the quality assurance agencies[35].

Apart from the very tangible financial loss, the Army suffers immensely on account of adverse impact on the morale of troops, who not only tend to lose confidence in their weapon system/equipment but also at times suffer physical repercussions of the accident. Other intangible adverse impacts include lowering of operational readiness, availability of equipment/ ammunition for training, and lower levels of reserve. Given the state of the products and the consequences of inadequate quality products, it is essential that the aspect of delivering high quality products is included as a high priority objective and actions, success indicators and target/criterion value defined for it. In fact, quality should take priority over other aspects of timeliness, responsiveness, increase of share of domestic defence production.

Responsiveness to the Service Demand

The Services placed a demand of 3,650 items on the Ordnance Factories Board during the five-year period from 2007 to 2012. On an average, targets for 30 per cent of the indents could not be fixed, only 38 per cent of the items indented were manufactured as per target, and for the balance 32 per cent, targets could not be met in time. Further, trends indicate that indents manufactured as per target decrease by 7 per cent every year. *Apparently, the OFB is operating in a sellers' market with captive clients and, therefore, it enjoys the freedom of choosing what to deliver, and when to deliver* (see Figs 2, 3 and 4). There is a crying need to institutionalise the processes for ensuring that indents are mutually accepted in a reasonable timeframe and delays are dealt with by application of appropriate liquidated damages. In view of the current state of responsiveness of the key defence suppliers, it is important that this aspect be monitored, evaluated and included in the RFD as an objective.

Fig 2 : OFB Responsiveness Profile 2007-12

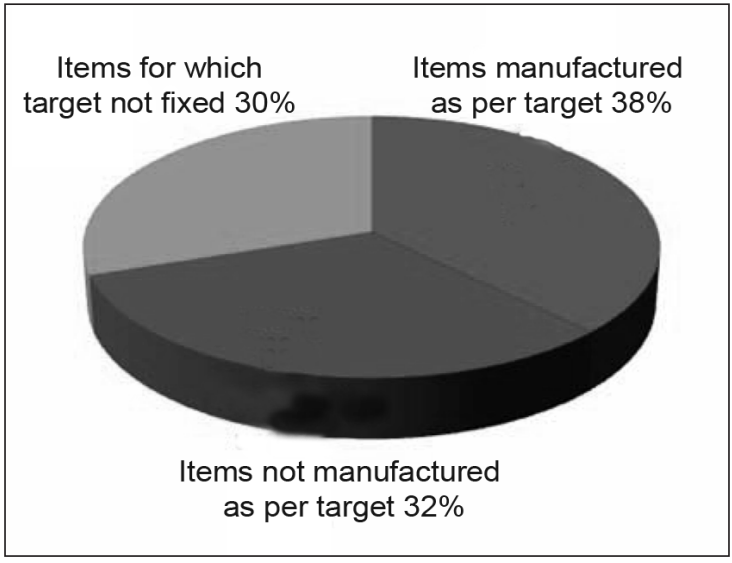


Fig 3 : % Items Manufactured as per Target

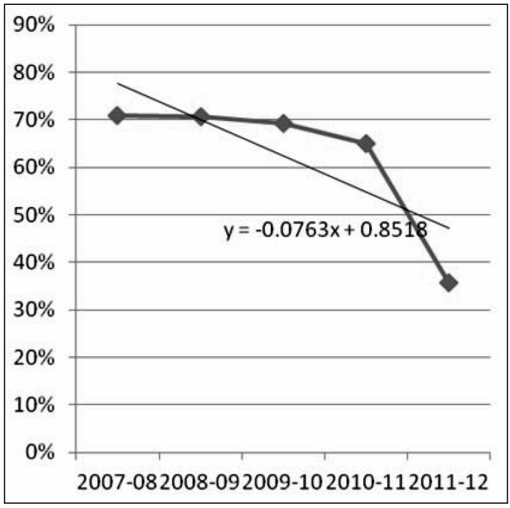
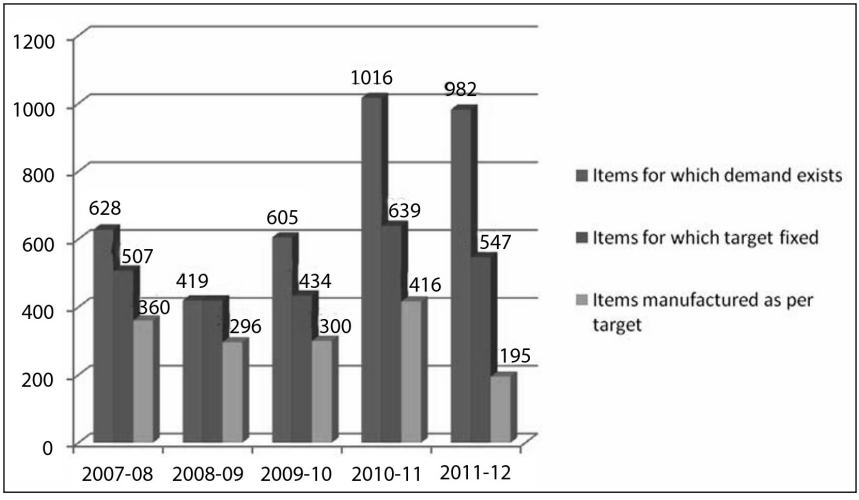


Fig 4 : Details of Demand, Targets Fixed and Shortfall in Achievement of the Targets by the OFB (Source – CA No. 30 of 2013, Defence Services)



Delivering Products at the Right Cost

Instructions demand that the ordnance factories recover from the armed forces the actual cost of issues. However, the price charged has often varied

from the actual. The timing of debiting the Services has also been questionable at times. A few instances are detailed below:

- Under-recovery of Rs 55.30 crore due to acceptance of issue prices lower than the estimated cost in 12 cases of 2010-11 vintage, pertaining to OF Khamaria, Chanda and Badmal.
- In 21 other cases of the same vintage, the factories fixed issue price was abnormally higher than the estimated cost, resulting in an abnormal profit of Rs 449.35 crore.
- Accounts officers of 13 OFs, in violation of the instructions issued by the Chief Controller of Defence Accounts, in October 2007, accepted advance issue vouchers submitted to them by the factories on the last day of the financial year viz. March 31, 2011, and debited the armed forces Rs 2,210.48 crore towards issue of stores, despite the fact that these items were physically issued in the next financial year between April 2011 and August 2011.
- Ammunition Factory Kirkee / Ordnance Factory Dehu Road procured Tail Unit 8A from the Ordnance Factory Kanpur (OFC) despite the OFC's material cost being higher than the total trade cost of Tail Unit 8A which led to avoidable extra expenditure of Rs 24.79 crore[36].

The aforesaid acts, notwithstanding whether they were advertent or inadvertent, should have had a very positive impact on the balance sheet of the OFB and, at the same time, would have adversely affected the buying capacity of the Services to some extent. However, the end user in most cases, and the Service Headquarters, in many cases, remain unaware of the facts. What is more disturbing is that such cases recur year after year. Similar cases observed in Compliance Audit Report No 24 of the Comptroller and Auditor General (CAG) for the year 2011-12 are tabulated below in Table 5 and those observed in the OEFG are presented in Table 6.

Table 5 : Variations in Actual Cost and Issue Price per Unit
(Source – CA No. 24 of 2011-12, Defence Services)

Name of the item	Qty supplied (in numbers)	Factory Involved	Estimated Unit cost (₹ in Lakh)	Actual Unit cost (₹ in lakh)	Issue Price per unit (₹ in lakh)	Profit (₹ in lakh)
Final Stage (stage-wise indigenised T-90 tanks)	24	HVF	1,434-35	44.33	175.50	3,148.05
Proof Firing (stage-wise indigenised T-90 tanks)	24	HVF	1,427.46	39.02	351.00	7,487.52
PTA-M	1,075	OPF	0.83	0.72	7.20	6,966.00
14.5 Artillery Trainer	53	MTPF	8.71	7.94	11.45	186.03
Final Stage (stage-wise MBT)	35	HVF	1,876.39	34.41	226.88	6,736.45
Proof Firing (stage-wise MBT)	21	HVF	1,862.63	107.74	453.76	7,,266.42
					Total	**31,790.50**

Table 6 : Price Variation Cases of the OEFG
(Source – CA No. 24 of 2013)

Item	Factory	Material cost (₹)	Percentage of variation	Labour cost (₹)	Percentage of variation	Overhead cost (₹)	Percentage of variation
2008-09							
Parachute SD & SM	OEFH	2,690.13	3	1,442.26	16	2,163.39	37
	OCFA	2,783.82		1,678.27		2,953.76	
Tent 4M	OEFC	18,935.88	1	1,758.97	131	2,708.81	194
	OPF	19,172.16		4,064.92		7,967.24	
2009-10							
Tent 2M	OEPC	18,495.70	4	2,628.10	104	4,237.16	17
	OPF	19,225.52		5,373.35		4,940.79	
Tent 4M	OEFH	409.16	5,581	5,121.55	29	589.19	998
	OEFC	23,242.63		3,970.46		6,471.86	
Parachute SD 8.5M	OCPA	2,392.74	113	2,508.00	66	2,897.74	154
	OEFH	5,100.11		4,156.81		2,897.74	

Trouser Combat	OEFH	221.42	52	351.54	52	318.84	93
	OCFA	336.00		533.50		616.20	
Jacket Combat	OEFH	158.41	81	291.38	48	228.12	119
	OCFA	286.51		432.05		499.02	
2010-11							
Tent 4M	OEFC	26,152.40	51	5,284.62	1500	6,771.95	1121
	OEFH	39,477.46		328.54		554.85	
Trouser PV DD OG	OEFH	195.72	19	55.31	456	93.47	269
	OCFS	164.65		307.80	456	344.69	
Trouser Combat	OCFA	324.70	34	522.02	22	580.80	26
	OEFH	433.99		428.95		729.21	
Parachute SD 8.5M	OEFH	3,227.27	6	1,591.75	41	2,703.86	10
	OCFA	3,412.21		2,241.91		2,970.68	
Fly outer of Tent 4M	OCFA	6,207.38	13	90.35	3,039	159.84	2,174
2011-12							
Jacket Combat	OEFH	47.63	824	238.15	101	414.12	20
	OCFA	440.02		479.79		498.98	
Fly outer of Tent 4M	OEFC	7,019.90	7	3,011.47	2,490	3,880.60	1797
	OEFH	7,489.24		116.29		204.58	
Net Mosquito	OCFS	162.66	97	163.80	516	238.29	716
	OEFC	321.13		26.61		29.22	
Bag Kit universal	OEFH	236.01	169	10.40	2,145	17.68	1,670
	OEFC	635.97		233.49		312.93	

Source: Annual Accounts of Ordnance and Ordnance Equipment Factories.

A perusal of prices indicated in Table 6 brings forth inexplicable variations in labour and overhead costs. The labour cost of the Fly Outer of Tent 4M manufactured by the Ordnance Clothing Factory at Avadi (OCFA) is Rs 90.35, whereas the Ordnance Equipment Factory Kanpur (OEFC) charges Rs 2,836.21 (3,039 per cent of OCFA cost) for the same item, in the same production period. Similarly, the production overheads charged by the OCFA are Rs 159.84 and that of OEFC for the same item in the same production year are Rs 3,634.45, a variation of 2,174 per cent. Further, in Ordnance Equipment Factory Hazratpur (OEFH), the material cost for Tent 4M increased from Rs 409 in 2009-10 to Rs 39,477 in 2010-11.

The performance of the OFs pricing mechanism is a cause of concern and needs to be streamlined and its efficacy monitored so that the users pay only for the right cost and that too, post acceptance of stores.

Productivity

The average *output per person engaged* for the domestic industry as per the Annual Survey of Industries 2011-12 is Rs 43,00,851. The figures for 2011-12 and the preceding four years are depicted graphically at Fig 6. Evidently, the output has grown very steadily at the rate of approximately 12 per cent per annum and, consequently, *output per person engaged* in the domestic industry has increased by approximately Rs 4 lakh every year. The *output per person engaged* of the OFB is Rs 12,90,769 or about 30 per cent of the domestic civil industry in the years 2010-11 / 2011-12 and was even less in the preceding years (see Fig 7). What it simply means is that if the wages of the OFB and the civil industry are assumed to be at par, then the direct labour cost for the manufacture of a single unit of any commodity will be 330 per cent higher in the case of the OFB. Labour cost in actuality would be much more, as the average wage in private industry is Rs 95,662 which is much less than the total emoluments of the lowest Pay Band (PB-1) in the government. *Therefore, it does not make any financial sense to procure low technology items from the OFB, unless it improves its productivity.*

The average productivity of the DPSUs is about 69 per cent of the industry average. Details for the year 2012-13 are depicted graphically in Fig 8. It is evident that the DDP needs to address the causes that lead to low productivity and it would be only prudent to include the aspect of productivity enhancement in the RFD.

Fig 5: Output Per Person Engaged in Indian Domestic Industry and the OFB

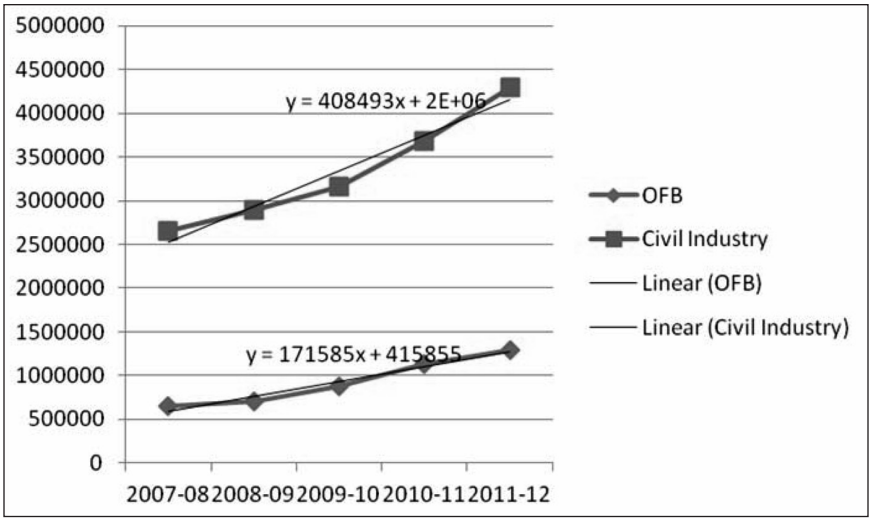
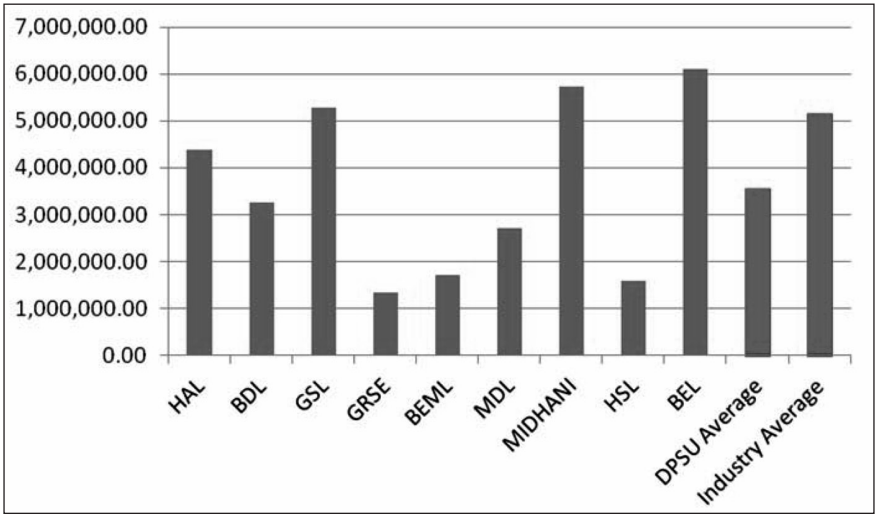


Fig 6: Output Per Person Engaged in DPSUs and the Indian Industry Average



Capacity Utilisation

The average capacity utilisation during the five-year period from 2006 to 2011 was 75 per cent. In aggregate terms, 205.5 million machine hours went

unutilised during the period. In the year 2010-11 alone, 51.9 million machine hours couldn't be utilised. Also the slope of the capacity utilisation curve is negative indicating an average drop in utilisation of approximately 1.8 per cent every year.

Fig 7: Machine Hours Available and Utilised by OFs
(Source – CA No. 30 of 2013, Defence Services)

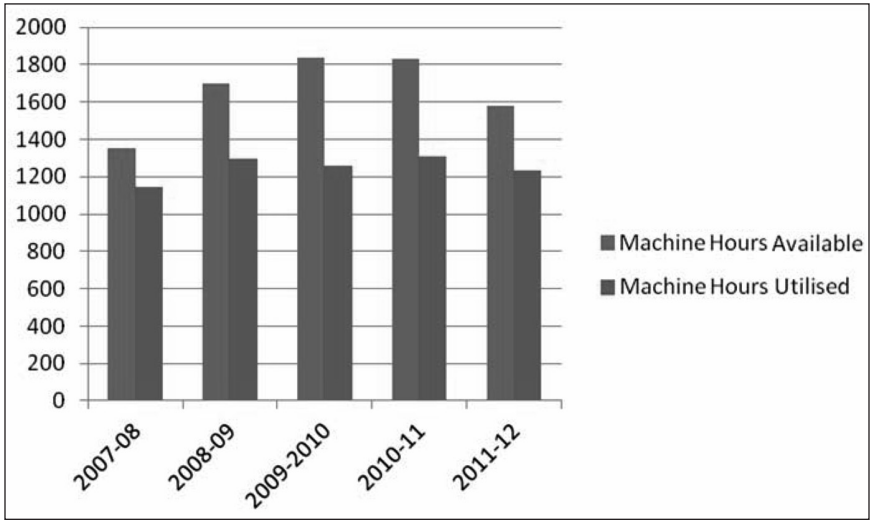
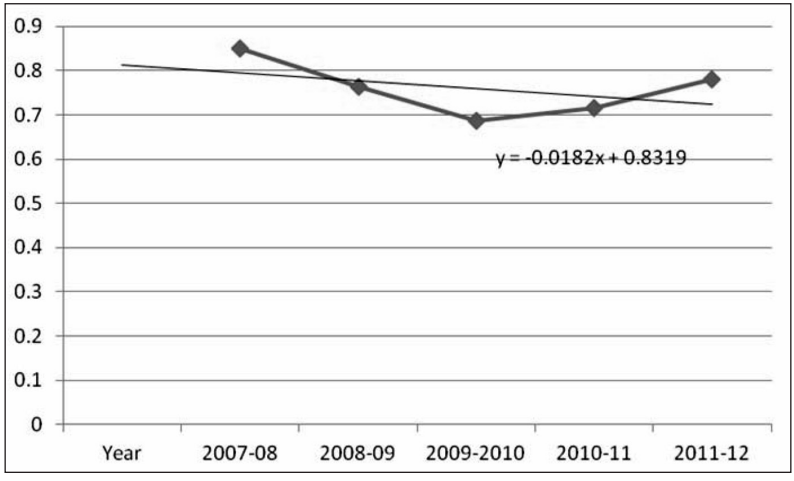


Fig 8: Percentage Utilisation Curve



The underutilisation can have many causes but there are many peculiar contradictions in the case of the Ordnance Factories. Three such cases are detailed below:

- The Vehicle Factory Jabalpur, post Transfer of Technology (TOT), manufactures only 17.46 and 16.63 per cent of the assemblies for the Stallion and LPTA vehicles respectively, even after nine-and-a-half years from the planned period of completion, as against the planned target of 59.04 and 51.58 per cent respectively. As a consequence, during the period 2008-11 major assemblies, sub-assemblies and components worth Rs 498.86 crore (approximately) were procured from the collaborators and trade. Further, 33 out of 59 machines commissioned between March 2000 and July 2008 remained underutilised by 35 to 70 per cent[37]. To sum it up, the defence budget was utilised for making payments for TOT to the Original Equipment Manufacturer (OEM), for building and maintaining in-house capacity and for procurement of assemblies/components from trade in spite of TOT and in-house capacity.
- In five factories of the Ordnance Equipment Factories Group (OEFG), despite availability of unutilised standard man-hours, the factory managements allowed overtime payments of Rs 48.68 crore to the Industrial Employees (IEs) in excess of actual requirement in 2008-12. Besides, the factories made an additional payment of Rs 10.91 crore towards piece work profit to IEs in 2011-12[38].
- Similarly, the factories of OEFG apparently indulged in outsourcing when in-house capacity existed (see Table 7)[39] and despite that, the issues are less than the target.

Table 7: Trade Assistance Despite In-House Capacity

Item	Capacity	Target	Trade Assistance		Issue
			Quantity	Value(Rupees in Lakhs)	
OCFS(2010-11)					
Coat ECC	50,000	50,000	35,000	224	25,000
Cap FS	1,50,000	1,00,000	3,00,000	38.4	10,000
Jersey DBG/V OG	2,60,000	2,45,000	21,000	17.85	2,35,000

Blanket	4,00,000	3,50,000	80,000	493.12	2,60,000
OCFS(2011-12)					
Coat ECC	80,000	80,000	59,018	309.84	27,000
OCFA (2009-10)					
Overall Greenish Khaki	41,425	41,425	35,000	22.05	41,425
Total				1,105.26	

(Source – CA No. 24 of 2013)

- It is also a fact that despite availability of production capacity, a total of 27,525 production jobs amounting to Rs 2,297.06 crore were work-in-progress in OFs as on March 31, 2011, of which 21,957 warrants pertained to 2010-11 and the balance 5,568 pertained to the years prior to 2010-11, the oldest being of 1993-94 vintage.

The OFs do not utilise one-fourth of their capacity despite significant user demand and pending work-in-progress jobs. Outsourcing/trade procurement is resorted to despite availability of in-house capability and issues to the services are less than the demand even after seeking of trade assistance. The underutilisation leads to increased cost of production, as it increases the share of fixed overheads. Therefore, it is essential, that the aspect of capacity utilisation is measured routinely and the details thereof included in the RFD.

Chapter 4
Recommended Model for the DDP

In God we trust, all others bring data.

— W. Edwards Deming

Evolution of Performance Measurement Frameworks

Performance measurement has its roots in early accounting systems. Researchers have identified two distinct phases of the evolution of Performance Measurement Systems[40]. The first phase spans nearly a century, commencing from the late 1880s till the late 1980s and was characterised by its cost accounting approach. The late 1970s and 1980s, saw a general dissatisfaction with traditional backward looking accounting-based performance measurement systems, their shortcomings were highlighed and a need for change arose. This dissatisfaction led to the development of "balanced" or "multi-dimensional" performance measurement frameworks. These new frameworks placed emphasis on non-financial, external and future looking performance measures[41]. Mid-1980 was a turning point in the performance measurement literature as it marked the beginning of the second phase[42]. Thomas Johnson and Robert Kaplan highlighted many of the deficiencies in the way in which management accounting information is used to manage businesses[43]. They highlighted the failure of financial performance measures to reflect changes in the competitive circumstances and strategies of modern organisations. The cost focus of financial performance measures provides a historical view, giving little indication of future performance and encouraging short termism[44] (Neely, 2002). The second phase witnessed development of integrated performance measurement systems, mixing of financial and non-financial measures and alignment of performance measurement systems to overall business strategy.

A number of different frameworks/models for performance evaluation emerged during the second phase of evolution of the Performance Measurement

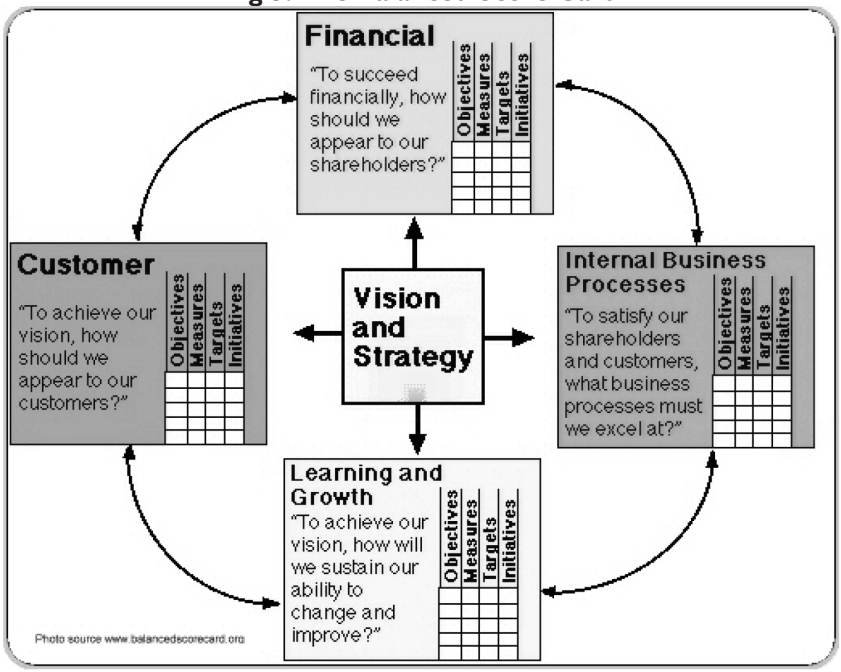
Systems. Popular ones are the Balanced Score Card, Supply Chain Operations Reference Model, and Performance Prism amongst many others.

Balanced Score Card

Robert Kaplan and David Norton from the Harvard Business School first presented the "Balanced Score Card" in an article "The Balanced Score Card – Measures that Drive Performance", published in the *Harvard Business Review* of January-February 1992. The balanced score card allows managers to look at business from four important perspectives, and provides answers to four basic questions:

- Customers' perspective: how do customers see us?
- Internal perspective: what must we excel at?
- Innovation and learning perspective: can we continue to improve and create value?
- Financial perspective: how do we look to shareholders?

Fig 9: The Balanced Score Card



The underlying mechanics of the Balanced Score Card (BSC) are no different from the PMES but the four perspectives forces balance in measuring performance and growth. The imbalance in the objectives chosen in the RFD of the DDP cannot be more visible, as it ignores the customers' perspective in its entirety, and has a very limited focus on the lag indicators. The RFD measures process efficiency (timeliness) in terms of financials (production targets), but as such does not have any financial objectives. On the other hand, the BSC encourages balance between short-term objectives and long-term objectives, financial measures and non-financial measures, lag indications and lead indicators and internal performance and external performance perspectives. The Balanced Score Card has been used by both the private and public sectors as it works well for profit as well as non-profit organisations.

Recommended Framework for Performance Measurement

A framework based on the discussion in this paper has been evolved for a balanced and objective performance evaluation of the DDP by using the Balanced Score Card as proposed by Kaplan and Norton. The objectives in the four perspectives have a causal relationship. The *Customers' Perspective* and the *Financial Perspective* include what is also referred to as the lag indicators or the outcomes. The *Internal Processes Perspective* and the *Learning and Growth Perspective* include the lead indicators and the objectives herein are the drivers for the desired outcomes.

Customers' Perspective

The primary objective of the DDP in this perspective should be to enhance customer satisfaction with respect to quality, availability, timeliness, price and product functionality. The production agencies also need to learn from the corporates with regard to establishing connect with the end customers by offering them after issue services on as required basis. The responsibility of overhaul needs to rest with the production agencies rather than the Services. Most importantly, the OFs and the DPSUs need to work on the objective of improving brand perceptions. This needs to be assigned the highest weightage. The products of the OFs/DPSUs often compete with those of the foreign OEMs, for example, the INSAS rifle and the Kalashnikov. How the customer

perceives the brand DDP (OFs and DPSUs) needs to be monitored and its improvement should be an objective of the DDP.

Financial Perspective

The investment made in establishing the defence industrial base has been colossal and, therefore, the objectives in this perspective should be such that they enhance the net return on investment. The objectives recommended are improved asset utilisation, improved cost structures, increased exports and civil trade and increased private investment in defence R&D. However, the highest weightage needs to be accorded to the objective of increasing the share of private and public components in the overall defence procurement expenditure. A self-reliance index which indicates the current contribution of the domestic industrial base in the overall defence procurement, should be the measure of this objective.

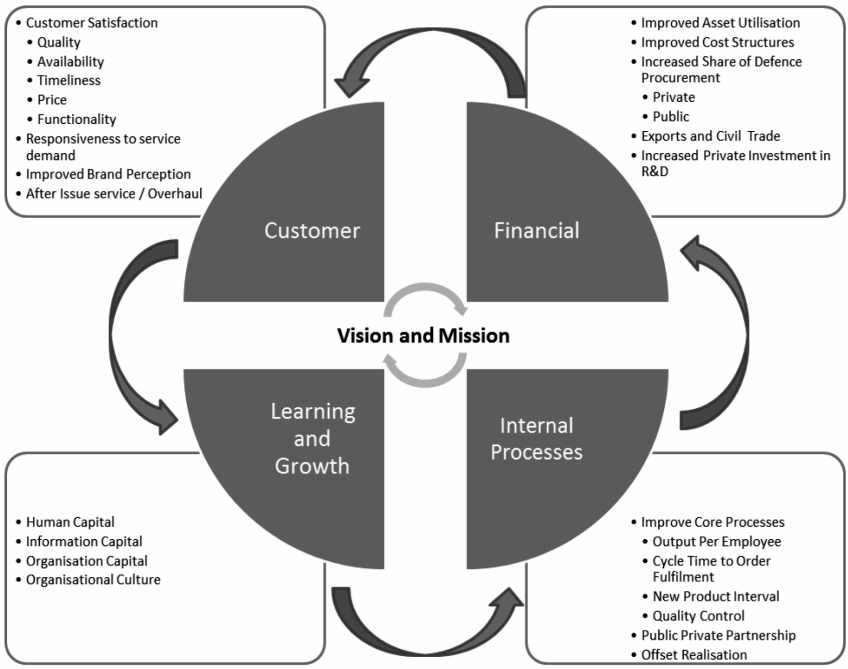
Internal Processes Perspective

The primary objective under this perspective should be to improve the core operational processes of the production agencies by adopting contemporary best practices. The production agencies need to increase output per employee, reduce cycle time to order fulfilment, reduce occurrence of defects and increase their range of offers and concurrently reduce new product interval. Enhancement of Public-Private Partnership (PPP) and realisation through offsets are the other objectives in this perspective which deserves high weightage.

Learning and Growth Perspective

The public sector employs over two lakh personnel whose entry level qualitative requirements are fairly high. The employees, particularly the industrial categories, are paid much better and enjoy many more privileges in comparison to their counterparts in the civil. Yet, the public sector *per person employed* output is only a fraction of what the domestic industry produces. The improvement of the human, information and organisation capital should be the primary objective in this perspective. However, the highest weightage needs to be given to creating a paradigm shift in the organisations culture with a view to bring in innovation, enhanced productivity and accountability at all levels.

Fig10: Recommended Performance Evaluation Framework for the DDP



Conclusion

To quote Einstein who said, "….not everything that counts can be counted, and not everything that can be counted counts…" would be most apt to describe the predicaments involved in designing of a meaningful performance evaluation framework. Researchers have argued that there are two main reasons why measurement initiatives fail. The first is that measurement systems are often poorly designed and the second is that they are difficult to implement. Therefore, these two aspects need special attention. The framework for performance measurement should in any case not remain static, it needs to be continually refined and aligned to the realities of the operating environment and the overall strategy of the department. Above all, it needs to adopt a balanced approach.

Notwithstanding, an excellent beginning has been made by the department in implementing the PMES, which other departments in the MoD need to emulate. The RFD 2013-14, itself has come a long way from its first *avatar*.

Transparent and objective evaluation of the department's performance shall bring in functional efficiency, reduce costs and ultimately help in achieving the goal of satisfying the Indian soldier in field in terms of quality, cost-effectiveness, responsiveness and range of offer, while the defence industrial base of the country strives to achieve self-reliance.

If you can measure it, you can manage it...

Appendix A

List of Critical Defence Technology Areas and Test Facilities for Acquisition by DRDO Through Offsets

- MEMs based sensors, actuators, RF devices, focal plane arrays.
- Nanotechnology based sensors and displays.
- Miniature SAR and ISAR technologies.
- Fibre laser technology.
- EM rail gun technology.
- Shared and conformal apertures.
- High efficiency flexible solar cells technology.
- Super cavitations technology.
- Molecularly imprinted polymers.
- Technologies for hypersonic flights (propulsion, aerodynamics and structures).
- Low observable technologies.
- Technologies for generating high power lasers.
- High strength, high modulus, carbon fibres, mesophase pitch-based fibre,

Carbon Fibre Production Facility

- Pulse power network technologies.
- THZ technologies.
- Surface Coated Double Base (SCDB) propellant.
- FSAPDS technologies.
- HESH ammunition technologies.
- Muzzle reference system.

- Composite sabot manufacturing technology.
- MET projectiles.
- Titanium casting, forging, fabrication and machining.
- Precision guided munitions.
- Shock hardened sensors.
- Gun barrel technologies.
- Advanced recoil system.

Notes

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23. The strength of the DPSUs has been calculated based on figures endorsed in the annual reports.
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