CANADIAN FORCES COLLEGE / COLLÈGE DES FORCES CANADIENNES
CSC 31 / CCEM 31

EXERCISE/EXERCICE NEW HORIZONS

A Performance Measurement Framework for the Defence Supply Chain: Supporting Effective Decision Making

By /par LCdr/capc Alex Inch

29 April 2005

Abstract

All organizations need to know how well they are performing and many implement a Performance Measurement System (PMS). The goal of a PMS is to provide the right information to the right people at the right time in order to allow them to take effective decisions. Unfortunately, the Canadian Forces' Defence Supply Chain (DSC) currently does not have such a system. The goal of this paper is to assist, in some way, in the process of implementation of an effective DSC PMS.

Following a review of research conducted in the PMS field, it is clear that any successful PMS must be centrally driven and implemented from the top-down, and it must recognize the innate conflict between effectiveness and efficiency. If these principles are followed, the resulting PMS will foster effective decisions that will in turn improve the processes within the organization, maximizing customer satisfaction and minimizing costs. Until an effective PMS is fully operational, decisions affecting the performance of the DSC will be sub-optimal and, as such, support to the CF will also be sub-optimal.

Introduction

The Canadian Forces (CF) recently installed a new national Material Management Information System (MIMS). The new system is designed to provide the much needed flexibility in information manipulation that was unavailable in the legacy system. With this upgrade in software, senior Department of National Defence (DND) management have realigned the organizations involved in material management under a centrally controlled operation entitled the Defence Supply Chain (DSC). According to its governance policy, "DSC represents the integration of materiel management and distribution across the department, based on a common policy and process framework …."[1] The leadership within the material support process is now in a position to create the needed improvements in the process. The first step will be to determine how the process performs and how it will react to decisions made in the future. The concept of performance measurement is not new to the CF or DND. Over the past few years, the Business Planning Process has forced the entire department to grapple with the need to measure its performance with the aim to provide Canadians with a meaningful report on how well their tax dollars are being spent and whether changes are required.

Performance measurement of the DSC is the topic of this paper. The goal of performance measurement is to provide the right information to the right people at the right time in order to allow them to take effective decisions. This information must be current, relevant and understandable to be useful. This basic tenet is demonstrated by the effort all western forces make in providing intelligence and surveillance information to operational commanders. Unfortunately, a similar level of information regarding the performance of the DSC *pipeline* is

---

[1] Shelley Ganderton, "Governance: Managing the Defence Supply Chain," undated; http://www.forces.gc.ca/admmat/cosmat/masop/docs/governance_supply_chain_mar05_e.pdf; Internet; accessed 17 March 2005.

not currently available to allow DSC managers to take the most effective decisions on support and sustainment matters. The owner of the DSC, the Director General Materiel Systems & Supply Chain (DGMSSC), is in the process of designing a performance *management* system for the DSC that will incorporate a Performance Measurement System (PMS). However, there is little published as to its specific design at this time. It is hoped that this paper will assist in this process by contending that, in order to take effective material management decisions, the DSC must have a strategically focused, top-down driven PMS that provides meaningful command information, is simple to use and understand and can be easily integrated within the DSC organization. In order to further assist in the development of this system, a strategic level framework will be proposed for consideration.

In order to understand what a PMS is and the requirement for it to be a strategic, yet simple tool, the definition of *performance* and the goals of a PMS will be explored. This will be followed by a review of the recent academic analysis of the problems facing PMS in the private sector and the ability of the DSC organization to utilize a private sector PMS. From this analysis, key principles that will be necessary in a PMS for the DSC will be described. With these principles in hand, the paper will conclude with a proposed PMS framework for the DSC.

The Renewal of Performance Measurement

Not new to both private sector firms and military material managers is the requirement to measure performance. As the saying goes, "You can't manage it if you can't measure it."[2] But, what is this *performance* that must be managed and, by consequence, measured? The creation of an organization-specific definition of performance is the first principle of performance

measurement, according to Austin and Gittell.[3] The dictionary definition of performance is "…execution … carrying out, doing …."[4] Unfortunately, this definition certainly does not inspire the creation of an organizational measurement system. Lebas and Euske also came to this conclusion and, after much research, realized that "… performance refers simultaneously to the action, the result of the action, and to the success of the result compared to some benchmark."[5] It then stands to reason that performance measurements must be taken from specific actions (hereafter referred to as *processes*), large or small, as well as the results of the individual processes. These measurements are then compared to some target in order to assess the performance. While this seems relatively simple, the practical application has been fraught with difficulties.

In the 1980s, academia and practitioners warned of a "… measurement myopia - … we were measuring the wrong things."[6] The majority of measurements were mere reports of historical performance that focused on accounting data or productivity. While good for financial statements, they did not give managers insight into how to improve future performance in a changing environment. The result was the introduction of a host of new measurement frameworks, such as *Balanced Scorecard* and *Activity Based Costing*, which flooded the private and public sector in the 1990s. The consequence is that now many academic writers in the field

---

2 Scott A. Elliff, "Grading Your 3PL," *Journal of Commerce*, 2 August 2004; http://proquest.umi.com; Internet; accessed 30 August 2004.

3 Rob Austin and Jody H. Gittell, "When It Should Not Work But Does: Anomalies of High Performance," in *Business Performance Measurement: Theory and Practice,* (Cambridge: Cambridge University Press, 2002), 81.

4 Concise Oxford English Dictionary, First ed. F.G. and H.W. Fowler, Seventh Edition ed. J.B. Sykes, (Oxford: Oxford University Press, 1982), 762.

5 Michel Lebas and Ken Euske, "A Conceptual and Operational Delineation of Performance," in *Business Performance Measurement: Theory and Practice,* (Cambridge: Cambridge University Press, 2002), 68.

6 Andy Neely and Rob Austin, "Measuring Performance: The Operations Perspective," in *Business Performance Measurement: Theory and Practice,* (Cambridge: Cambridge University Press, 2002), 42.

are warning that the pendulum has swung too far. "[S]ociety is obsessed with measurement [and] … it is no longer clear to many people where the organization's priorities lie."[7] Neely and Austin suggest that perhaps organizations have forgotten Albert Einstein's statement that "… not everything that counts can be counted, and not everything that can be counted counts …."[8] Academics and practitioners are now beginning to rediscover the *essence* of performance measurement.

The essence of performance measurement can be summarized as follows: "Performance measures are an organized, consistent process of linking an organization's desired future performance with current information that is predictive of logical and consequential results."[9] The metrics chosen to measure the processes should be comparable against themselves, over time, or against similar processes elsewhere (*Benchmarking* for example).[10] In any case, "[m]easurement systems should focus on providing management with the feedback they need to monitor or improve key processes. Good results can only come from good processes."[11]

In practice, PMSs have been designed to establish performance objectives and measure the results, guide employee actions and improve accountability.[12] In the past, the measurements themselves (hereafter referred to as *metrics*) have ranged from a typical income statement to a

---

7 Neely and Austin, "Measuring Performance: The Operations Perspective", 42-43.

8 Albert Einstein, Unknown Source. Quoted in Andy Neely and Rob Austin, "Measuring Performance: The Operations Perspective," in *Business Performance Measurement: Theory and Practice,* (Cambridge: Cambridge University Press, 2002), 43.

9 Canadian Institute of Chartered Accountants, *Guide To Implementing Performance Measurement Systems,* (Toronto: The Canadian Institute of Chartered Accountants, 2000), 81.

10 Neely and Austin, "Measuring Performance: The Operations Perspective", 48.

11 Joseph F. Castellano, Saul Young and Harper A. Roehm, "The Seven Fatal Flaws of Performance Measurement," *The CPA Journal* 74, no. 6 (June 2004): 32-35; http://proquest.umi.com; Internet; accessed 30 August 2004

customer's verbal or written feedback. The information gathered was used to gauge the performance of the firm and seek avenues for improvement. However, these PMSs have begun to show their warts in the current hyper-competitive private and public sectors. "Performance measures have been misunderstood and misused in most companies today."[13] Many PMSs are simply ignored by decision makers. Castellano, Young and Roehm point to several flaws that most organizations succumb to in their PMSs.[14] One specific criticism of current performance metrics is that "[t]here are too many of them."[15] Marshall Meyer notes that "[i]t is commonplace for firms to have 50 to 60 top-level measures …"[16] and warns that "…cognitive limits will be exceeded and information will be lost."[17] Youngblood and Collins also warn that "… too many metrics can overwhelm a decision maker, resulting in a lack of clarity."[18] In other words, "[i]nformation must be of the right kind … so that valuable resources are not wasted collecting meaningless data while important data go unrecorded."[19] Another common pitfall is that "… some firms manage only those activities or processes that are easy to measure. The correct method is to identify what is important to manage, then develop measures for these activities or

---

12 *Ibid*.

13 Terry Wireman, "Benchmarking or Performance Measurement: Which is Right For Your Plant?" *Plant Engineering* 58, no. 5 (May 2004); 54-56; http://proquest.umi.com; Internet; accessed 30 August 2004.

14 Castellano, Young and Roehm, "The Seven Fatal Flaws of Performance Measurement".

15 Scott Dickinson, "Time For a Sharper Focus on Our Goals," *Regeneration and Renewal* (July 30, 2004); 12; http://proquest.umi.com; Internet; accessed 30 August 2004.

16 Marshall W. Meyer, "Finding Performance: The New Discipline in Management," in *Business Performance Measurement: Theory and Practice,* (Cambridge: Cambridge University Press, 2002), 53.

17 Meyer, "Finding Performance: The New Discipline in Management", 52.

18 Alisha D. Youngblood and Terry R. Collins, "Addressing Balanced Scorecard Trade-off Issues Between Performance Metrics Using Multi-Attribute Utility Theory," *Engineering Management Journal* 15, no. 1 (March 2003): 12.

processes."[20] In this vein, many PMSs fail to adequately consult the customer. Organizations "… can not satisfy their customers' expectations if there is no agreement with the customers' definition of performance."[21]

Some systems elicit counter productive behaviour from employees. Those employees who have the ability to affect a performance metric, on which their salary bonus is based, may ignore the long-term objectives of the organization in favour of a short-term distortion of performance. By focusing on measurements, and not processes, employees will "… disconnect from the larger purpose of the firm and do only what is required and measured."[22] The recent "… financial reporting disasters at Enron, Sunbeam, WorldCom, and many others provide ample evidence [of this] …."[23]

Other flaws belong in the category of statistical variation analysis.[24] In the past management has attempted to place numerical targets on unstable processes (where the variations are erratic and uncontrollable), resulting in frustration as the variations naturally continue unabated because the underlying process remains unstable. At the other end, management can be tricked into (over) reacting to normal variations if the PMS focuses on single point rather than trend analysis.

---

19 Sunil Chopra and Peter Meindl, *Supply Chain Management: Strategy, Planning and Operation,* (Upper Saddle River: Prentice-Hall Inc., 2001), 337.

20 Allen W. Kiefer and Robert A. Novack, "An Empirical Analysis of Warehouse Measurement Systems in the Context of Supply Chain Implementation," *Transportation Journal* 38, no. 3 (Spring 1999): 26; http://web21.epnet.com; Internet; accessed 30 August 2004.

21 James S. Keebler, "The State of Logistics Measurement," *Supply Chain and Logistics Journal* 3, no. 2 (Spring 2000): 13.

22 Castellano, Young and Roehm, "The Seven Fatal Flaws of Performance Measurement".

23 *Ibid*.

24 *Ibid*.

Many of the flaws noted above stem from a single overarching misconception, that the organization is nothing more than the sum of its seemingly independent operating units and processes. In this *bottom-up* framework, it is normal practice to treat each unit or process independently, setting performance measurements and targets that are designed to optimize the single unit or process. The rationale is that the organization will be optimized if all units and processes are optimized. However, almost all organizations are made up of units and processes that are intertwined and interdependent.[25] The whole is more than the sum of the parts. Therefore, a top-down view must be the overriding focus for any PMS. This approach would also help produce performance measurement targets that would more appropriately guide employee actions toward the ultimate organizational goals. The top-down approach ensures that "… all performance indicators must be tied to long-range corporate business objectives. If a corporate indicator highlights a weakness, then the next lower level of indicators should give further definition and clarification. It will then be up to the responsible manager to take action to correct the problem condition."[26]

The drive to overhaul and produce a meaningful PMS is one of the current developments in the private sector aimed at improving competitiveness in the global economy. Summed up well by Youngblood and Collins, performance measurement must be strategy driven (top-down), process based, dynamic and team developed.[27] With good measures of performance, decision makers can work to attain the relevant goal, be it long-term future profit maximization or long-

---

25 *Ibid*.

26

term future cost minimization. The question now is if the private sector renewal of performance measurement can be incorporated into the unique military DSC.

In the world of high-pressure, global competition, any advantage that can be gained over competitors could make the difference between success and bankruptcy. The development of business models based on a sound corporate strategy and core competencies in the 1980s gave many firms a lean and focused edge. The 1990s saw this concept extend out beyond the firm itself to incorporate its suppliers and customers into symbiotic partnerships (*supply chains*), sharing information and the resulting profits. Firms that got it right prospered and extended their reach around the globe.

This *business model* refinement strategy and *supply chain* revolution has been able to migrate, to some extent, into the public domain since public services are simply private firms with a twist. The twist is that the public goal is not to maximize long-term future profits; rather it is to minimize long-term future costs, given a prescribed service level. The two sectors grapple equally with the trade-offs between cost and service. Efficiency (the cost to serve) is continuously at odds with effectiveness (the ability to serve). "… [E]xcellence is a matter of striking the right balance …"[28] between these two criteria.

The adoption of business practices in the public sector has also been seen in the military, most notably in the provision of material support. Defence supply and warehouse managers have for decades used basic inventory management algorithms developed in the private sector. In the performance measurement field, military supply systems have utilized typical measurements found in the warehousing and transportation industries such as stock-out rates and order-fill rates. Therefore, there are no structural or statutory impediments to applying the

principles of a renewed performance measurement system and they should be adopted by the DSC.

Principles of a Proper Framework

Given that fundamental flaws exist in many PMSs, it is necessary to outline a generic strategic level framework designed to counter the negative aspects while focusing on the lessons derived from current literature. The PMS must also be capable of operating in both the private and public sectors. At the higher level, the PMS should follow three basic principles.

Principle 1 - The implementation of the system must be top-down, strategically driven and designed to optimize the long-term organizational goals.

The need to clearly define the long-term strategy and goals of the organization cannot be understated. These statements are essentially the product of what the customer desires and must govern all actions in the organization. Therefore, implementing a bottom-up system designed to measure the performance of the organization will not succeed in providing an optimal organization-wide measurement of effectiveness and efficiency. By approaching the implementation from the top-down, management can apply measurements at each level that clearly support the measurements at the level above. Measurements that do not support the higher level goals should not be implemented. In this way, even the lowest level metrics will be integral to the overall organizational goals.

Principle 2 - The entire system must be simple, manageable and minimal.

Whether measuring efficiency or effectiveness at any level of the organization, the metrics must embrace certain attributes. If the metric is not universally understandable and free from bias, it

---

[28] Jim Bunker and Karl B. Manrodt, "Make-To-Cash: A New Logistics Measure," *Supply Chain and Logistics Journal* 3, no. 4 (Fall 2000): 9.

will not elicit a consistent response from management and both efficiency and effectiveness will suffer.[29] This concept can be summed up in a word: *simplicity*. Simplicity will give management at all levels a clear view of the performance of the organization and all its individual processes. Equally, the basic data must be must be constantly accessible and the resulting metric must be reliable and consistent given the same situation. Finally, the fewer the metrics, the better will management be able to focus on those that truly reflect the organization's performance.

Principle 3 - The structure of the system must recognize both efficiency and effectiveness goals and be hierarchical with roll-up and drill-down capability.

The structure of the PMS is as crucial as the definition of the organizational goals and the refinement of the performance metrics. It must recognize the conflict between efficiency and effectiveness. In private enterprise, the organization can meet whatever goals the customer desires as they include both effectiveness (product and service) and efficiency (price) segments. Thus, there is a need to dissect the overall organization goals into efficiency and effectiveness *sub-goals* and ensure each are clearly represented without overly complicating the system. Flowing down from each sub-goal, the performance measurement framework should contain "… cascading features that allow a user to look at the performance measurement system in progressive waves of detail."[30] Each measurement must be overtly linked to the overall organizational goals or it is essentially wasted effort.

---

[29] Canadian Institute of Chartered Accountants, *Guide To Implementing Performance Measurement Systems,* 83.

[30] Canadian Institute of Chartered Accountants, *Guide To Implementing Performance Measurement Systems,* 92.

A PMS is, at its core, metrics – the numbers and word pictures that describe the performance of the organization as a whole, and of the processes within the organization. But, applied without a strategically designed structure that is compatible with the structure of the organization, the metrics would be at best meaningless.

Performance Measurement and the DSC

The DSC is a large, geographically dispersed and complex system of people, facilities and information that is responsible to "… support the fighting capability of the CF by delivering to operational commanders the right materiel in the right place at the right time."[31] The DSC manages "… an inventory of 1.2 million NATO stock numbers worth $10 billion … [in 2003 and] $1.2 billion in annual national procurement flows through the supply chain."[32] Since the CF operates in Canada and around the world, and under operational tempos ranging from static and peaceful to dynamic peacemaking and combat in all three environments, the DSC is required to perform under an astounding array of circumstances.

The DSC is organized primarily along functional lines applied in a national, regional and local hierarchy. The functional divisions are typical of traditional material management organizations. The functions (inventory, warehousing, transportation and information processing) are practiced at each level of the hierarchy, from the national coordination cell down to the local operations:

---

[31] Department of National Defence, "Material Acquisition and Support (MA&S) Concept of Operations: Corporate Reporting Version 1.0," (Ottawa: DND Canada, 16 July 2003), 4.

[32] Neville Russell, "Command and Control of the Canadian Forces Supply Chain," (Toronto: Canadian Forces College Advanced Military Studies Course Paper, 2003), 11.

- Inventory consists of all processes involving the actual items and equipments within the DSC. This mainly revolves around the purchase of the items from the manufacturer. The purchasing process also includes the decisions taken on how many to purchase, from which manufacturer, which and what quantity of spare parts are purchased and where the inventory is to be delivered. Thus, this function controls the number, quality and initial location of the inventory in the DSC;
- Warehousing involves the processes of inventory handling including receiving, storing, picking and packaging. It also includes the maintenance of the inventory for its shelf life and any necessary repairing;
- Transportation consists of the movement of the inventory from the manufacturer, between warehouses and to the final consumer. It also involves the return movement of used inventory to either repair or disposal; and
- Information management is crucial as it allows all the other functions of the DSC to operate. It controls inventory, warehouse and transportation operating data and conducts the processes of data input, manipulation, storage and retrieval. It can also act as the customer interface.

The PMS should be similarly structured to give all levels of management (national, regional and local) the functional information necessary to take sound decisions. As seen from the study of the shortcomings of past PMSs above, the DSC PMS must be developed centrally from the top to ensure the optimization of the entire DSC. However, the system cannot be comprised solely of grand statements of national performance standards. Without the appropriate hard data, the assessment of the DSC's performance will be, at best, subjective.

Therefore, there must be some specifics and metrics drawn from the four DSC functional processes. The next step is to define what exactly is to be measured.

Coyle, Bardi and Langley suggest that organizations such as the DSC should focus on three established objectives (cost, productivity and service) within each of the four main supply functions.[33] Cost and productivity fall under the efficiency (cost to serve) criterion mentioned above. The cost objectives, such as cost per tonne-mile and cost per processed order, and productivity objectives, such as orders filled and tonnes shipped which are described against an input to the functional process (eg. labour hours, warehouse space), must be carefully coordinated to ensure that cost reductions in one function do not cause cost increases in other functions. "[A]t a given level of customer service, management should minimize total logistics costs, rather than attempt to minimize the cost of individual activities … as [r]eductions in one cost [warehouse, transportation or inventory] invariably result in increases in one or more of the others."[34] As well, cost or productivity reductions must not be allowed if they impact negatively on the service objective.

In the DSC organization, the chief objective must be service; the effectiveness (the ability to serve) criterion. Lambert, Stock and Ellram agree that "[t]he output of successful logistics is the level of customer service provided …."[35] This is even more accurate when one considers that the DSC supplies the CF in combat. The need to ensure a given level of service can simply be a matter of life or death. However, service comes at a cost and all CF requirements are not as critical. This conflict highlights the need for a comprehensive and well thought out

---

[33] John J. Coyle, Edward J. Bardi and C. John Langley Jr, *The Management of Business Logistics,* 6th ed. (St. Paul: West Publishing Company, 1996), 533.

[34] Douglas M. Lambert, James R. Stock and Lisa M. Ellram, *Fundamentals of Logistics Management,* (Boston: Irwin/McGraw-Hill, 1998), 469.

organizational goal. One of the key pitfalls of logistics management is the "... [i]nadequate definition of customer service."[36] Most firms define their customer service in terms of "… time, accuracy, consistency, and damage."[37] Generally speaking, the DSC management must negotiate a definition of customer service and its allowed cost with the Combat Arms leadership and set appropriate targets, keeping in mind this constant trade-off between efficiency (cost) and effectiveness (service). It is interesting to note that the US DoD has recognized the need for a customer service driven PMS and is "… moving toward customer-focused integrated processes enabled by output metrics, performance agreements and contemporary information systems."[38]

A Proposed Performance Measurement Framework

With the application of the new principles of performance measurement into the relatively unique circumstances of the DSC, it is possible to craft a strategic level performance measurement framework that could be used to guide the implementation of an operational system. As a reminder, the basic principles of a performance measurement system that were developed above are: the system must be top-down, strategically driven and designed to optimize the long-term organizational goals; the entire system must be simple, manageable and minimal; and the structure of the system must be hierarchical with roll-up and drill-down capability.

Fortunately, management at DSC seem to understand that performance *management* (of which performance measurement is an integral part) is a strategic tool and "… an overall

---

35 *Ibid*., 485.

36 *Ibid*., 530.

37 Coyle, Bardi and Langley Jr, *The Management of Business Logistics,* 534.

38 Jacques S. Gansler, "Transforming DoD Logistics For the 21st Century," *Logistics Spectrum* 34, no. 3 (July-September 2000): 7-8; http://proquest.umi.com; Internet; accessed 30 August 2004.

management system …."[39] However, it must be stressed that both the management and measurement systems must be designed and implemented from the top-down in a comprehensive and as complete a manner as possible to avoid the flaws noted above.

As well, it is necessary to review the fact that the performance of a system such as the DSC must be measured against the two conflicting objectives of effectiveness and efficiency. Therefore, there should be two distinct performance measurement structures that meet at the top with top management (including the customer) deciding on the balance between the two. While it may be possible to construct a single performance measurement structure that would combine the two, the resulting complexity would result is an inflexible and potentially unintelligible system. As can be seen from the analysis above, this is nothing more than a recipe for failure.

This issue has certainly been recognized by individuals responsible for designing the proposed DSC performance *management* system, if perhaps for the wrong reasons. Given the current limited capability of the information management systems in use throughout the DSC, it is necessary to phase in the performance measurement system. The initial phase will focus on effectiveness measures first, while awaiting "… visibility into facility activities …" to measure efficiency.[40]

In order to begin drafting the framework, the overriding organizational goal must be crafted to take into account the dual concepts of efficiency and effectiveness. This goal could take the form:

Achieve and maintain a 95 percent customer satisfaction rate while minimizing cost; or

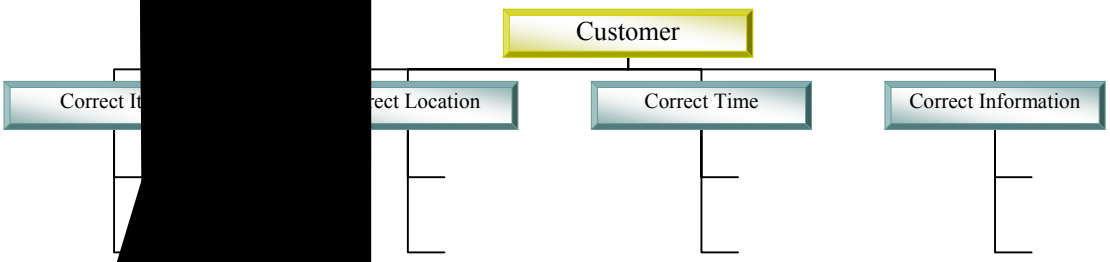
Maximize customer satisfaction while keeping costs below $500 million.

---

[39] Richard Quinn, "Supply Chain Performance Management System: General Implementation Plan," Draft Proposal to J4 Mat/DG Log (July 2004), 9.

The ch goals would depend on whether efficiency or effectiveness was the domin ussed above. From this point, the two goals are split into separate perfor nt frameworks as described below.

ble description of the effectiveness segment of the performance measu . It begins with the identification of *Customer Satisfaction* as the organi m there, and following agreement with the customer, the



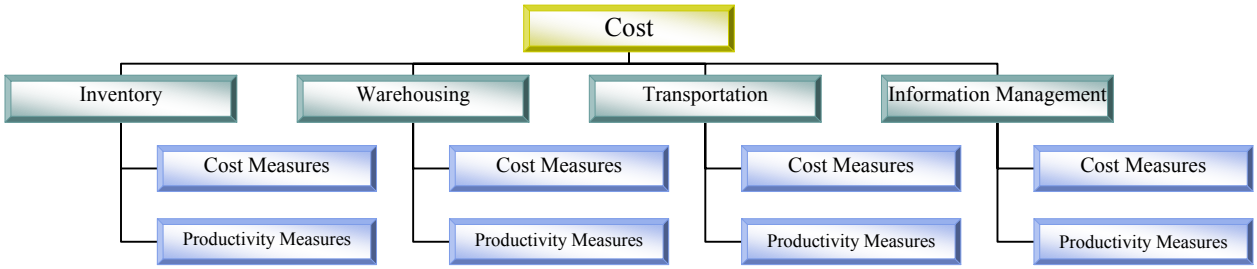


Figure 2 – Efficiency Performance Measurement Framework

With these two frameworks supporting the two sub-goals of customer satisfaction maximization and cost minimization, management will be able to clearly view the performance of the DSC.

Conclusion

The goal of the *DSC* is to support the CF with the right item at the right place at the right time, minimize costs and to keep operational commanders informed of support matters that could affect their decisions. The goal of a *PMS* is to provide the right information to the right people at the right time in order to allow them to take effective decisions. If the PMS is effective, the right people will have the right information to take the right decisions that will improve the processes within the organization and, thus, maximize customer satisfaction and minimize costs. Many decades past, the private sector realized this requirement and a plethora of PMSs were developed. Based on accounting systems and operational management techniques, these systems either overloaded management capacity or led management to take decisions that were detrimental to the organization. As has been documented here, recent studies have shown that the fundamental cause of these failures has been the lack of a top-down implementation approach. A PMS that is centrally driven and implemented from the top-down, and recognizes

the innate conflict between effectiveness and efficiency, will provided information that is relevant and understandable. The system structure must blend with the organization's functional processes and cascade down through the organization. Unfortunately, the DSC currently does not have such a system and DSC managers are not able to take the most effective decisions on support and sustainment matters.

The first phase in any process such as this is to define the need and the concept by which the need will be satisfied. This has been the focus of this paper. The next step involves consultation with top management to determine the specific information required to take decisions. Then, succeeding levels of management down the DSC can be consulted to solicit their individual information needs but, more importantly, to determine from where the information required by top management will come. Once the required information and its sources have been established, it only remains to devise methods by which to extract and report it in a timely manner.

Until an effective PMS is fully operational, decisions affecting the performance of the DSC will be sub-optimal and, as such, support to the CF will also be sub-optimal. It is hoped that this paper will assist in the definition of the need and concept phase of the development and implementation of an effective DSC PMS.

BIBLIOGRAPHY

Austin, Rob and Jody H. Gittell. "When It Should Not Work But Does: Anomalies of High Performance." Chap. 6 in *Business Performance Measurement: Theory and Practice*. Cambridge: Cambridge University Press, 2002.

Bunker, Jim and Karl B. Manrodt. "Make-To-Cash: A New Logistics Measure." *Supply Chain and Logistics Journal* 3, no. 4 (Fall 2000): 8-10.

Canada, Department of National Defence. "Material Acquisition and Support (MA&S) Concept of Operations: Corporate Reporting Version 1.0." Ottawa: DND, 16 July 2003.

Canadian Institute of Chartered Accountants. *Guide To Implementing Performance Measurement Systems*. Toronto: The Canadian Institute of Chartered Accountants, 2000.

Castellano, Joseph F., Saul Young and Harper A. Roehm. "The Seven Fatal Flaws of Performance Measurement." *The CPA Journal* 74, no. 6 (June 2004): 32-35; http://proquest.umi.com; Internet; accessed 30 August 2004.

Chopra, Sunil and Peter Meindl. *Supply Chain Management: Strategy, Planning and Operation*. Upper Saddle River: Prentice-Hall Inc., 2001.

Coyle, John J., Edward J. Bardi and C. John Langley Jr. *The Management of Business Logistics*. 6th ed. St. Paul: West Publishing Company, 1996.

Davidson, Susan A. "Where is the Battle Line For Supply Contractors?" Air Force Journal of Logistics 23, no. 2 (Summer 1999) 10-14; http://web21.epnet.com; Internet; accessed 30 August 2004.

Dickinson, Scott. "Time For a Sharper Focus on Our Goals." *Regeneration and Renewal* (July 30, 2004); 12; http://proquest.umi.com; Internet; accessed 30 August 2004.

Elliff, Scott A. "Grading Your 3PL." *Journal of Commerce*, 2 August 2004; http://proquest.umi.com; Internet; accessed 30 August 2004.

Gansler, Jacques S. "Transforming DoD Logistics For the 21st Century." *Logistics Spectrum* 34, no. 3 (July-September 2000): 7-8; http://proquest.umi.com; Internet; accessed 30 August 2004.

Keebler, James S. "The State of Logistics Measurement." *Supply Chain and Logistics Journal* 3, no. 2 (Spring 2000): 12-17.

Kennerley, Mike and Andy Neely. "Performance Measurement Frameworks: A Review." Chap 9 in *Business Performance Measurement: Theory and Practice*. Cambridge: Cambridge University Press, 2002.

Kiefer, Allen W. and Robert A. Novack. "An Empirical Analysis of Warehouse Measurement Systems in the Context of Supply Chain Implementation." *Transportation Journal* 38, no. 3 (Spring 1999): 18-27; http://web21.epnet.com; Internet; accessed 30 August 2004.

Kristensen, Kai, Anne Martensen and Lars Gronholdt. "Customer Satisfaction and Business Performance." Chap 17 in *Business Performance Measurement: Theory and Practice*. Cambridge: Cambridge University Press, 2002.

Lambert, Douglas M., James R. Stock and Lisa M. Ellram. *Fundamentals of Logistics Management*. Boston: Irwin/McGraw-Hill, 1998.

Lebas, Michel and Ken Euske. "A Conceptual and Operational Delineation of Performance." Chap. 5 in *Business Performance Measurement: Theory and Practice*. Cambridge: Cambridge University Press, 2002.

Meyer, Marshall W. "Finding Performance: The New Discipline in Management." Chap. 4 in *Business Performance Measurement: Theory and Practice*. Cambridge: Cambridge University Press, 2002.

Murray, Elspeth and Peter Richardson. "The Critical Few: First Among Equals As Parameters of Strategic Effectiveness." Chap. 10 in *Business Performance Measurement: Theory and Practice*. Cambridge: Cambridge University Press, 2002.

Neely, Andy and Rob Austin. "Measuring Performance: The Operations Perspective." Chap. 3 in *Business Performance Measurement: Theory and Practice*. Cambridge: Cambridge University Press, 2002.

Perloff, Jeffrey M. *Microeconomics.* New York: Addison, Wesley, Longman, Inc., 1999.

Quinn, Richard. "Supply Chain Performance Management System: General Implementation Plan." Draft Proposal to J4 Mat/DG Log (July 2004): 1-9.

Reed, Carla. "Benchmarking: A Journey, Not a Destination." *Supply Chain and Logistics Journal* 2, no. 2 (Summer 1999): 20-22.

Russell, N. "Command and Control of the Canadian Forces Supply Chain." Toronto: Canadian Forces College Advanced Military Studies Course Paper, 2003.

Schechter, Damon and Gordon Sander. *Delivering the Goods: The Art of Managing Your Supply Chain*. Hoboken: John Wiley and Sons, Inc., 2002.

Solis, William M., Director Defense Capabilities and Management. "Several Actions Are Needed to Further DLA`s Efforts to Mitigate Shortages of Critical Parts." FDCH Government Accounts Reports, Aug 01, 2003; http://web21.epnet.com; Internet; accessed 30 August 2004.

Walker, David M., Office of the Comptroller General of the United States. "Major Management Challenges and Program Risk: Department of Defense." FDCH Government Account Reports, Jan 17, 2001; http://web17.epnet.com; Internet; accessed 30 August 2004.

Wireman, Terry. "Benchmarking or Performance Measurement: Which is Right For Your Plant?" *Plant Engineering* 58, no. 5 (May 2004); 54-56; http://proquest.umi.com; Internet; accessed 30 August 2004.

Youngblood, Alisha D. and Terry R. Collins. "Addressing Balanced Scorecard Trade-off Issues Between Performance Metrics Using Multi-Attribute Utility Theory." *Engineering Management Journal* 15, no. 1 (March 2003): 11-17.