

## CHAPTER 2

### LITERATURE REVIEW

#### INTRODUCTION

This chapter is intended to relate some academic literature to approach the subject of logistics both on maintenance and logistic management in the RMN. Academic explorations would provide a more structured and holistic approach into the subject. Since there are limited academic literatures specific on RMN Logistics (maintenance and supply support), the researchers had to rely on interviews, discussions and surveys to gather primary and secondary sources of data. For the secondary sources other than the available documents, reports and the academic references in libraries, the author also used the Internet to bring in the latest issues. Having gone through these literatures, the approach the authors took was to apply the concepts and framework in operations management from various business and management literature to understand and subsequently identify areas or issues in RMN logistics. These areas include organizational structure, studying various processes with special emphasis on concepts like work measurement methods, performance measurement, quality issues, human resources management, suppliers and customer relationship.

A fleet is dynamic. It must be continuously reviewed, renewed and progressive. The logistic support system and operators objective is collectively to ensure readiness and sustainability of ships in all situation may it be defensive or offensive operations. To achieve these, there are great challenges ahead. Task to prepare the fleet (Cdr Ahmad Abdullah et al, 2001), in the eyes of the fleet's populace as follows:

- Maintaining the quality and morale of the personnel in the fleet. One of the greatest strength of the fleet is the calibre of its officers and

sailors. However, recruiting, training and retaining the right people will always be a great challenge.

- Preserving readiness of equipment for war-fighting and keeping and war-fighting edge by incorporating advanced technology and innovative operational concepts.
- Improve or change the work process to facilitate ships' repair and maintenance. Actions are required to change the process, working towards solving the problems consistently over time and ultimately elimination barriers that make process less efficient.

## **RMN Fleet Readiness**

According to Cdr Ahmad Abdullah et al (2001), readiness in the naval context is an assessment of the preparedness of a naval platform (ship) and its crew to successfully conduct an assigned task, role or mission. Some operations require merely the presence of the ship at sea, performing work safely and in observance of good seamanship. This, for example, would include routine patrol and surveillance work in Malaysian Territorial Waters (MTW) and Exclusive Economic Zone (EEZ). Other operations would require certain sensors and weapons to be manned and available for immediate use such as during exercise and intelligence gathering or monitoring missions. Given the multitude of potential missions to which the fleet can be assigned, readiness is benchmarked against the ability to operate in a conflict. In trying to predict future readiness of the fleet, the operations department staffs collect data in an attempt to quantify readiness impacts. The key areas that the fleet address are the ships steaming days for operations and exercises, urgent defects (URDEF) and maintenance, personnel and technology.

## Maintenance Support

Kamarulzaman's research paper evaluated or examined the effectiveness of FMD's maintenance management activities and provided necessary recommendations. However, other than FMD, there are also other organizations that are either directly or indirectly involved in providing maintenance support to RMN ships. This include the Navy Headquarters (HQ) that provide policy and directions on maintenance philosophy, Fleet System Command (FSC), which implement maintenance policy for RMN ships, shore bases and also organization like Fleet Supply Depot (FSD) that provide spares to facilitate effective maintenance. Issues that impact the overall performance of ship self-maintenance and FMD maintenance support will also be explored and discussed. This paper is intended to further explore the effectiveness and efficiency of the logistic support system in maintaining a mission ready fleet by analyzing it through the end user perspective and use Integrated Logistics Support (ILS) concept as benchmark. The evaluation of the maintenance management activities is a new research area for the RMN logistics organization. Having served in RMN both in the fleet and shore bases, researchers had and continuously interact with key stakeholders in the organisations. It is very clear to the researchers that there have been several reports written about the various problems that the organisations had encountered. There were also proposals that the RMN units had forwarded to higher management as part of the effort on continuous improvement. However, most of these reports addressed in isolation. Some of the reports were in the form of correspondences that were produced in bits and pieces to address specific issue. Most were not researched in an academic manner in the sense of relating them to concepts and theories and more importantly supported with data analysis (Kamarulzaman, 2002).

RMN is adopting *best practice* as both private and public sectors have been pressured on cost cutting (Kamarulzaman 2002). He identified that RMN

has to better manage its Human Resources (HR) and face challenges on quality issues in achieving *organizational excellence*.

## Life-Cycle Costs

Life-Cycle Costs (LCC) which may be categorised in many different ways, depending on the type of system and the sensitivities desired in the cost-effectiveness measurement. LCC involves all costs with the system life cycle, includes research and development (R & D), production and construction cost, operation and maintenance cost and system retirement and phase-out cost (Blanchard, 1998). The understanding of each is as follows:

- **Research and Development Cost.** This includes the cost of feasibility studies; system analyses; detail design and development, fabrication, assembly and test of engineering models; initial system test and evaluation; and associated documentation.
- **Production and Construction Cost.** The cost of fabrication, assembly and test of operational systems (production models); operation and maintenance of the production capability and associated initial logistic support requirements (example, test and support equipment development, spare/repair parts provisioning, technical data development, training, entry of item into the inventory, facility construction and etc).
- **Operation and Maintenance Cost.** The cost of sustaining operation, personnel and maintenance support, spare/repair parts and related inventories, test and support equipment maintenance, transportation and handling, facilities, modifications and technical data changes.

- **System Retirement and Phase-out Cost.** The cost of phasing the system out of the inventory due to obsolescence, wear-out and subsequent equipment recycling, disposal and reclamation as appropriate.

Majority of RMN procurement of ships and systems are based on 'commercial off-the-shelf', some partially 'design and configure' and all of the equipments and systems are commercial off-the-shelf. As such, the cost of ownership and measurement of supportability is based on the operational and disposal phase of the platform and system life.

## **Maintainability Factors**

Maintainability is an inherent design characteristic dealing with ease, accuracy, safety and economy in the performance of maintenance function. Maintainability defined in the broadest sense, can be measured in terms of a combination of elapse times, personnel labour-hour rates, maintenance frequency, maintenance cost and related logistic support factors (Blanchard, 1998). Maintenance can be classified into two categories:

**Corrective Maintenance.** Is the unscheduled actions, initiated as a result of failure (or a perceived failure), that are necessary to restore a system to its required level of performance. Such activities may include trouble-shooting, disassembly, repair, remove and replace, reassembly, alignment and adjustment, check-out and so on. Additionally, this includes all software maintenance that is not initially planned; e.g. adaptive maintenance and perfective maintenance.

**Preventive Maintenance.** Is the scheduled action necessary to retain a system at a specified level of performance. This may include periodic inspections, servicing, calibration, condition monitoring, and/or the replacement of designated critical items.

Maintenance constitutes the act of diagnosing and repairing, or preventing system failures. Maintenance time is made up of individual task times associated with the required corrective and preventive maintenance actions for a given system or product. Maintainability is a measure of the ease and rapidity with which a system can be maintained, and is measured in terms of the time required to perform maintenance tasks.

**Mean Corrective Maintenance Time.** Each time a system fails, a series of steps is required to repair or restore the system to its full operational status. These steps include failure detection, fault isolation, disassembly to gain access to the faulty item, repair and so on. Completion of these steps for a given failure constitutes a corrective maintenance cycle.

**Mean Preventive Maintenance Time.** As what has been mentioned of preventive maintenance, the mean preventive maintenance time is the average elapse time to perform preventive or scheduled maintenance on an item. Preventive maintenance can be performed when the system is fully operational or could result in down time. This measurement does not include logistic delay and administrative delay time.

**Mean Active Maintenance Time.** It is the mean or average elapse time required to perform schedule (preventive) and unscheduled (corrective) maintenance. It excludes logistics delay time and administrative delay time.

**Logistic Delay Time.** It is the maintenance down time that is expended as a result of waiting for spare parts to become available, waiting for availability of an item of test equipment in order to perform maintenance, waiting for transportation and also waiting to use a facility required for

maintenance. It does not include active maintenance time but does **constitute a major element of total maintenance time.**

**Administrative Delay Time.** This refers to downtime during which maintenance is delayed for reason of administrative nature; personnel assignment priority, labour strike or organisational constraint.

**Maintenance Down Time.** This constitutes the total elapsed time required to repair and restore a system to full operating status.

These 'times' have great impact on the readiness of the platform as if not carefully studied for a particular system or equipment will effect maintainability and also reliability of the said system or equipment. Major issue in RMN is the logistic delay time, administrative delay time and maintenance down time.

## **QUALITY**

Quality in logistic can be translated to as a total integrated management approach that addresses the system or product quality during all phases of the life cycle and at each level in the overall system hierarchy. It should provides before-the-fact orientation to quality and its focuses on system design and development activities, as well as production, manufacturing, assembly, construction, logistic support and related functions (Blanchard, 1998).

However, in many cases, the transformation process in adopting the above concept or approach are usually treated as a "black box" where what needed to achieve the outcome is usually not known or clearly understood. Therefore, although these concepts may be used by these organizations but, in reality they are not often practiced or embedded as part of their working culture.

# Organization Excellence Framework

Kamarulzaman's study has a focus on organisation excellence. He quoted an article from The Star, Business Section (2002) stating that organization in the private sector today can no longer take for granted their survival as competition is becoming more intense. They must review, adjust, and change their managerial practices to suit to the new business requirement. To facilitate organization for the quest of excellence, they need to adopt Malaysia's Prime Minister Quality Award Model for Organizational Excellence. This model of creating an excellent organization serves as a guide and roadmap for organizations to improve their overall performance. This model hinges on seven crucial elements acting as enablers to achieving excellence and the desired outcome.

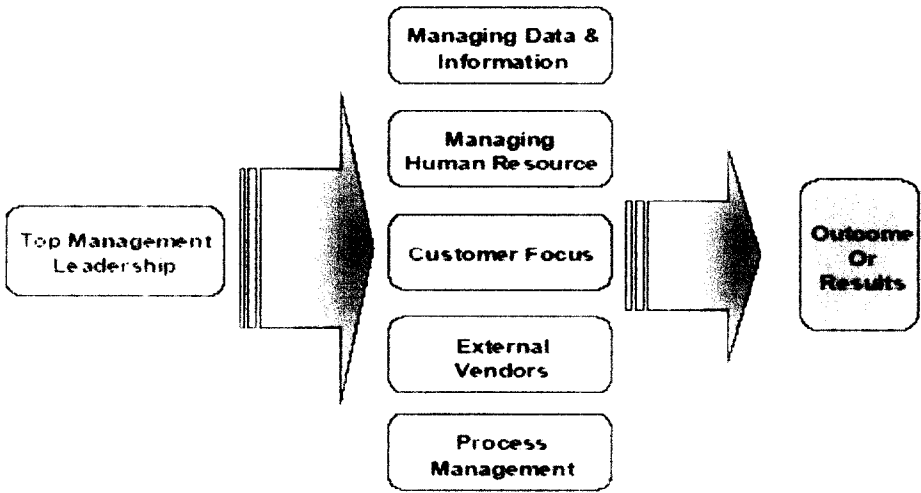


Figure 2 1 - Malaysia's PM Quality Award Model for Organizational Excellence  
Source: The Star, 5 Aug 2002



## **Top Management Leadership**

The first element is management, which has been the single most important factor that drives organizational excellence. This drive is reflected through management commitment in providing time and energy, and setting out clear goals and directions for quality initiatives. This commitment also calls for employees to be pro-active, initiate leadership at their own levels, and act as a solution provider to customers, giving attention to details as required by their customers, manage internal business processes effectively, efficient data and information management, and maintaining a close working relationship with suppliers.

**Managing Data & Information.** Usage of data and information is paramount to any activity or business undertakings. Effective decisions are made based on facts and figures. In a situation where customers' needs are important and fulfilling them requires effective and efficient processes, organizations must be able to utilize data and information that are available. In today's business that counts on speed, effective information management can be a competitive strategy. This may seem straightforward in private sector as it is profit driven but it is a serious challenge to the public sector like the Armed Forces since the driving factor is not tangible and attractive. As in the case of RMN, there are vast amounts of data on ship maintenance that have been collected and compiled over many years. However, it is disheartening that little or no analysis has been done to harness valuable information that could have assisted in improving processes. The implications to this are that we tend to repeat the same mistakes and this means wastage in cost, time and energy. Technical data, information and systems database is an element of logistic support.

**Managing Human Resource.** Bohlander (2001) identified that there is a relationship between satisfied employee and delighted customer. Satisfied employees being the internal customers strive to ensure their external customers are happy with the products produced or services delivered. They are focused

employees who are willing to give careful attention to each and every customer interaction. However this practice cannot be achieved by accident. Therefore, it must be planned and properly executed. At the same time, organization must adopt suitable human resource strategies and policies to develop their human resources, understand and most importantly, attend to their feedback. Blanchard (1998) listed human resources under two element of logistic support, that is maintenance support personnel and training.

**Customer Focus.** Organizations exist because of customers. Thus, all processes must take into consideration customers' needs and requirements. These processes cannot be developed in isolation from the customers' needs; it must be developed according to those needs (Kamarulzaman, 2002). Organizations cannot develop their work or business processes based on the nature of their work set-up and the many constraints that they are facing. In the United Kingdom (UK), customer focus is given serious attention by the UK Defence Industries. The National Defence Industries Council (NDIC) for example even published special Code of Practice to demonstrate their commitment in providing the best possible customer support for either products or services. The code of practice and the related guide to performance standards set out in clear and simple terms the standard of service they aim to supply in term of quality, reliability, and customer satisfaction (Ministry of Defence UK, 2002). However, many organizations in the Government fail to understand this and as a result their business or work processes cannot support the customers' needs. Equally important in managing business is getting to understand your customers. Products or services must be delivered and feedback must be sought from the customers to understand how they feel about the work that have been done on their ship or equipments. These feedbacks are invaluable to close the "loop" and facilitate continuous improvements of activities towards enhancing quality. Successful organization views this initiative seriously especially to understand their customers, their concerns and needs, and take steps to address them effectively.

**External Suppliers or Vendors.** Many of today's business operations are done on a networking basis. Simply put, companies or organizations 'have to work' with or outsource their work activities to other organizations to save costs and be more effective. This scenario calls for better working relationship between these key stakeholders. Effectively the management of vendors or suppliers is crucial to provide a positive and effective relationship to achieve synergy. This relationship should be based on a professional approach and not based on sentiment, emotions and most importantly based on personal interest which may be very damaging especially when it involves costs, business ethics, moral values and most importantly when it has implications to safety, especially in the context of RMN, the safety of its ship's crew.

**Process Management.** Another important element in this framework is the ability to effectively manage processes. Products or services are delivered through various processes in organization such as R&D, understanding customer's requirements, production, packaging, delivery, and after sales service. These processes must be efficient, effective, well documented and continuously updated. What could be delivered today using the current business processes may no longer be effective and efficient 12 months later. According to the RMAF (2000), the demand for business process improvement has accelerated and the impact of changes in the way maintenance activities are conducted has become magnified. In addition, the emergence of new processes will place a greater demand for an integrated approach. Excellent organizations put in extra effort to manage their processes effectively and continuously seeking opportunity for process improvement. In the service sector, the interface with customers is the moment where services are provided. These processes that are important to customers must be identified and improved to enhance the organization's performance. The advancement in Information and Communication Technology (ICT) especially in computing must be optimized fully to reduce time, effort, material and more importantly costs. Many

conservative approaches in processes must be reviewed by embracing technology and this also helps in interfacing with other functions within the organization.

**Outcome or Business Results.** For any business establishment, the bottom line is profit or to make money. However, in the public or government sector especially for defense organization this is not the case. In this regard, measuring the business results in dollars and cents is very simple. However, according to Sutarji (2002), measurement of public sector is not an easy task because profit is not an ultimate objective. But, it is important to measure performance so that you can help to detect problems. Challenging but achievable targets can be set to achieve the desired outcome. A successful outcome or more appropriate excellence is dependent upon balancing and satisfying the needs of all relevant stakeholders including the employee, customers and suppliers. In the case of RMN Logistic Support System, their customers are the ships and the higher management.

### **The Importance of Quality**

One of the most significant changes in international business is the recent movement toward quality awareness. Although still new in the Malaysian defense environment, acceptance of the importance of quality and reliability is being recognized as a critical success factor for the provision of services in any operations and in organizational performance. The understanding of quality is the product or services would be consistent and the quality could be continuously improved. Despite all the talk about the importance of quality, the basics of good quality practices continue to be widely ignored especially in service-type operations. Effectively, in organizations that are truly dedicated to the quality concept, customers are the focus of every thing the company does.

## **RMN Approach to Quality**

There are many initiatives adopted by organizations to address or manage quality issues. RMN direction towards quality is through Total Quality Management (TQM). It is a holistic approach and address issues based on strategic planning. TQM is the way to improve the competitiveness, effectiveness and flexibility of a whole organisation - a way of planning, organizing and understanding each activity and it depends on each individual at each level. TQM is also a way of bringing everyone into the processes of improvement. The approach on TQM in the Ministry of Defense was initiated following a workshop organized by the Manpower Administrative Modernization Planning Unit (MAMPU) in December 1991. The RMN formally embarked on TQM strategy on 2 May 1992 with the promulgation of RMN General Memorandum No. 5/92.

## **Principles of Quality Management**

Organizations that focus on quality rely on the same basic management principles for success, no matter what kind of product or service they provide. Ishikawa (1985) identifies six facets in the transformation of an organization towards total quality, the Japanese way:

- Quality first – not short term gain.
- Customer orientation – think from the standpoint of the other party.
- Next process is your customer – customer focus.
- Manage by data – utilization of statistical methods.
- Total employee involvement – respect for humanity as management philosophy.
- Cross functional management – establish cross function committees.

The Malaysian Government through MAMPU also formulated its own version of Quality Management Principles to create quality and conducive work environment to support the TQM initiative in government departments. It effectively improves on Ishikawa's six principles where customer focus, enhance employees participation and data management still remain the focus while adding on strategic quality planning, top management support, quality assurance and performance management. MAMPU emphasizes on seven management principles as depicted in Figure 2.2.



Figure 2.2: Principles of Quality Management in Government Departments

Source: MAMPU Administration Development Circular 1/92

## THE CYCLE OF FAILURE

Schlesinger and Heskett (1991) as cited from Kamarulzaman (2002) suggest that there is a self-perpetuating “cycle of failure” linked to service management. It appears to assure continued deterioration of service quality, managerial

headaches and long term decreases in sales and profits. In most cases, the cycle of failure will result into a vicious cycle or spiral, which will end up with quality of service being affected and the outcome will be dissatisfied customers and subsequently lost of income. The strategy for breaking this "cycle of failure" is by ensuring that all stakeholders within the organization gives high priority on quality and remain focus of the objectives and committed to achieve these objectives. Having said that, there must be a clear direction and requirement on how these objectives should be achieved. At a lower level, business or work processes must not just be available but more importantly adhered to, easily measured and periodically reviewed for continuous improvement.

In conclusion Schlesinger and Heskett (1991) stated that service levels and economic performance will deteriorate in firms that fail to engage in a fundamental rethinking of the employee-organization customer relationship. The point where the customer judges the service provided is referred to as "moment of truth". Where customers receive a service less than expected they are dissatisfied. If the service meets expectations, the customer is indifferent. But if the service exceeds expectations, the customer is satisfied or even delighted.

## **SUMMARY**

In summary the authors reviewed literature research on maintenance management that covers on best practices by earlier researcher. These includes the used of proven frameworks such as the Organizational Excellence Framework and the Cycle of Failure. Concepts on quality, which are vital in any successful organisations, are also discussed.