APPLYING LOGISTICS AND SUPPLY CHAIN MANAGEMENT STRATEGY TO IMPROVING OPERATION EFFICIENCY IN FACILITY MANAGEMENT AND MAINTENANCE

by

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ABSTRACT

The strategies of Logistics & Supply Chain Management and Collaborative Planning Forecasting Replenishment (CPFR) need to increasing business effectiveness collaborations to obtain profits by the common objectives of Facility Management & Maintenance (FMs) are investigated in this paper. In this paper, the logistics and supply chain management of FMs and relevant business was review. Findings from the review identified that logistics and supply chain management helps FMs company to execute strategic purchasing and supplying for sustainable market position in a rapidly changing and competitive environment. FMs will be effectively managed by adopting strategic CPFR in logistics and supply chain management with FMs suppliers through service delivery, increase in level of service efficiency and cost savings. The study presents experiences case study with the design method and implementation including monitoring of a FMs. This context also discusses problems and obstacles in implementation which are based on an actual application in FMs business Case study of implementation of applying logistics and supply chain management in to FMs company in Thailand are also discussed.

KEYWORDS
Facilities Maintenance and Management, Logistics, Supply Chain Management, Service Efficiency, Cost Saving

INTRODUCTION

Facility management (FM) is concerned with operating and maintaining commercial and industrial properties. This function may be performed by in-house corporate staff or by an outside firm specializing in facilities management. Facilities may include sports complexes, hospitals, hotels, and retail establishments, but in business the term is used most often to describe office buildings and factories. Responsibilities include providing janitorial and maintenance services, security, engineering services, and managing telecommunications and information systems. The facility manager's job is to create an environment that encourages productivity, is safe, is pleasing to clients and customers, meets building regulations, and is efficient. (Tuveson 1998, Cotts 1998 and Cook 1999)

International Facility Management Association (IFMA, 1999) indicated that “the second biggest budgetary spending (after staffing) is on buildings and assets? Regardless of its size and scope, it is a vital that every business implements tailored solutions to help it to control the business environment and monitor where expenditure emphasis lies. It is calculated by experts that appropriate maintenance of buildings and assets - through facilities management- can help to save companies millions each year.” Therefore, facilities management and maintenances (FMs) is one of the fastest growing global industries and, managed effectively, can be one of the most significant cost saving activities in business, is responsible for the maintenance of the buildings and assets that support businesses and organizations in any industry.

Outsourcing FMs is preferred by industry, is transferring business processes from one company to another. The concept is to have the management or day-to-day execution of one or more business functions performed by a third-party service provider who is already in sourcing those same business processes. A parent company uses the outside firm to provide a business function that could have been done in-house. The aim of
outsourcing is to make the business or organization more competitive by staying focused on its core competencies. So, the goals of a comprehensive of FMs outsourcing are selected as 1) Creates flexibility with the facilities to even provide support in times of industry uncertainty; 3) Risk reduction due to reliance on experts and infusion of new technology; 4) Project enhancement and effective cost management; 5) Renewed opportunities for employees with skill upgrade and focus to newer skills; Visible cost reduction and avoidance of capital investment; 6) High efficiency of asset utilization. 7) Value and savings gained. This occurs during initial transfer from in- to outsource as they do the job much more cheaply because of the availability of huge manpower and similarly larger global business; 8) Reduction of overhead and fringe benefit for employer; and 9) Reduce capital repairs, Reduce unscheduled shutdowns and repairs, Extend equipment life, thereby extending facility life, Realize life-cycle cost savings, and Provide safe, functional systems and facilities that meet the design intent. (as shown in Figure 1)

FIGURE 1
BENEFIT OF FMS OUTSOURCING

Source: HTCS Group (201)

However, FMs outsourcing service provider deals with verities of equipments and spare parts FM ranges from corporate level, in which it contributes to the delivery of strategic and operational objectives on day-to-day basis, intend to avoidable burden stock of equipments and spare parts. For example, There are verities manufacturers (brands) (Philips, Econowald, Osram etc) and specification of electrical spare-parts such as shown in figure 2 (Noor 2009) to assure the minimum operating capacity and performance of the workplace and to allow for undiminished income generation. Therefore, the efficient and effective movement of spare part, purchasing planning, and inventory is critical in today.s competitive environment. Approximately 10% of the gross domestic product is devoted to supply-related activities. Supply chain management entails not only the movement of spare parts but also decisions about (1) where is suppliers, and how much to supply at each site, (2) what quantity of spare parts to hold in inventory at each stage of the process, (3) how to share information among parties in the process and finally.
Therefore, effective management of FMs with supply chain management and collaborative planning forecasting and replenishment will be represented in this paper.

**EFFECTIVE MANAGEMENT OF FMs WITH LOGISTICS AND SUPPLY CHAIN MANAGEMENT**

Effective FMs must vigorously pursue the efficient utilization of labor, material planning & purchasing, service delivery. Improvement of labor productivity should be a major and continual concern of those who are responsible for cost control of FMs. Material planning, which includes procurement, inventory, and field servicing, requires special attention for cost reduction and increase customer satisfaction.

Chen, I. and Paulraj, A. (2004); Lehtonen and Salonen (2005) and Noor and Pitt (2009) indicate that the level of innovation in the FMs supply chain management, Supply chain of FMs creating and maintaining buyer-supplier relationships effectively in a service-based organization such as FM is a complex process since the complex and verity of service characteristics and the ongoing buyer-supplier interaction process that takes place in procuring services is unique when compared to the product or manufacturing sector (as shown in Figure 3)

**FIGURE 3**

RELATION OF SUPPLY CHAIN IN FMS

Source: Vacore (1993)
Due to variety of service level, material supply, supplier, logistics and supply chain management is key technique to make efficiency in FMs. Therefore, the guidelines for effective management for FMs are represented to:

1. Apply logistics management into analyse the process of planning, preparing, implementing, and evaluating all logistics functions that support an operation or activity.
2. Apply logistics technique into all functions are executed in a unified manner to reduce costs, ensure appropriate support actions, and decrease delivery time. Individual logistics functions and associated sub-functions include:
   a. Materiel Management. Requisitioning, ordering, and sourcing (requirements processing); acquisition; asset visibility (resource tracking); receipt; storage and handling; security; accountability; inventory; deployment; issue and distribution; recovery; reuse; and disposition;
   b. Property Management (Personal Property). Accountability, inventory, disposal, and record processing;
   c. Facility Management. Facility selection and acquisition, building services, information systems, communications, fleet management, safety and health, and physical security; and
   d. Transportation Management. Transportation prioritizing, ordering, sourcing, and acquisition; time-phasing plans; and movement coordination and tracking.

Materials management is an important element in project planning and control. Materials represent a major expense in construction, so minimizing procurement or purchase costs presents important opportunities for reducing costs. Poor materials management can also result in large and avoidable costs during construction. First, if materials are purchased early, capital may be tied up and interest charges incurred on the excess inventory of materials. Even worse, materials may deteriorate during storage or be stolen unless special care is taken. For example, electrical equipment often must be stored in waterproof locations. Second, delays and extra expenses may be incurred if materials required for particular activities are not available. Accordingly, insuring a timely flow of material is an important concern of project managers.

Materials management is not just a concern during the monitoring stage in which construction is taking place. Decisions about material procurement may also be required during the initial planning and scheduling stages. For example, activities can be inserted in the project schedule to represent purchasing of major items such as elevators for buildings. The availability of materials may greatly influence the schedule in projects with a fast track or very tight time schedule: sufficient time for obtaining the necessary materials must be allowed. In some case, more expensive suppliers or shippers may be employed to save time.

Materials management is also a problem at the organization level if central purchasing and inventory control is used for standard items. In this case, the various projects undertaken by the organization would present requests to the central purchasing group. In turn, this group would maintain inventories of standard items to reduce the delay in providing material or to obtain lower costs due to bulk purchasing. This organizational materials management problem is analogous to inventory control in any organization facing continuing demand for particular items.

Materials ordering problems lend themselves particularly well to computer based systems to insure the consistency and completeness of the purchasing process. In the manufacturing realm, the use of automated materials requirements planning systems is common. In these systems, the master production schedule, inventory records and product component lists are merged to determine what items must be ordered, when they should be ordered, and how much of each item should be ordered in each time period. The heart of these calculations is simple arithmetic: the projected demand for each material item in each period is subtracted from the available inventory. When the inventory becomes too low, a new order is recommended. For items that are non-standard or not kept in inventory, the calculation is even simpler since no inventory must be considered. With a materials requirement system, much of the detailed record keeping is automated and project managers are alerted to purchasing requirements.

From a study of twenty heavy construction sites, the following benefits from the introduction of materials management systems were noted:

- In one project, a 6% reduction in craft labor costs occurred due to the improved availability of materials as needed on site. On other projects, an 8% savings due to reduced delay for materials was estimated.
A comparison of two projects with and without a materials management system revealed a change in productivity from 1.92 man-hours per unit without a system to 1.14 man-hours per unit with a new system. Again, much of this difference can be attributed to the timely availability of materials.

Warehouse costs were found to decrease 50% on one project with the introduction of improved inventory management, representing a savings of $92,000. Interest charges for inventory also declined, with one project reporting a cash flow savings of $85,000 from improved materials management.

Against these various benefits, the costs of acquiring and maintaining a materials management system has to be compared. However, management studies suggest that investment in such systems can be quite beneficial.

**Material Procurement and Delivery**

The main sources of information for feedback and control of material procurement are requisitions, bids and quotations, purchase orders and subcontracts, shipping and receiving documents, and invoices. For projects involving the large scale use of critical resources, the owner may initiate the procurement procedure even before the selection of a constructor in order to avoid shortages and delays. Under ordinary circumstances, the constructor will handle the procurement to shop for materials with the best price/performance characteristics specified by the designer. Some overlapping and rehandling in the procurement process is unavoidable, but it should be minimized to insure timely delivery of the materials in good condition.

The materials for delivery to and from a construction site may be broadly classified as: (1) bulk materials, (2) standard off-the-shelf materials, and (3) fabricated members or units. The process of delivery, including transportation, field storage and installation will be different for these classes of materials. The equipment needed to handle and haul these classes of materials will also be different.

Bulk materials refer to materials in their natural or semi-processed state, such as earthwork to be excavated, wet concrete mix, etc. which are usually encountered in large quantities in construction. Some bulk materials such as earthwork or gravels may be measured in bank (solid in situ) volume. Obviously, the quantities of materials for delivery may be substantially different when expressed in different measures of volume, depending on the characteristics of such materials.

Standard piping and valves are typical examples of standard off-the-shelf materials which are used extensively in the chemical processing industry. Since standard off-the-shelf materials can easily be stockpiled, the delivery process is relatively simple.

Fabricated members such as steel beams and columns for buildings are pre-processed in a shop to simplify the field erection procedures. Welded or bolted connections are attached partially to the members which are cut to precise dimensions for adequate fit. Similarly, steel tanks and pressure vessels are often partly or fully fabricated before shipping to the field. In general, if the work can be done in the shop where working conditions can better be controlled, it is advisable to do so, provided that the fabricated members or units can be shipped to the construction site in a satisfactory manner at a reasonable cost.

As a further step to simplify field assembly, an entire wall panel including plumbing and wiring or even an entire room may be prefabricated and shipped to the site. While the field labor is greatly reduced in such cases, "materials" for delivery are in fact manufactured products with value added by another type of labor. With modern means of transporting construction materials and fabricated units, the percentages of costs on direct labor and materials for a project may change if more prefabricated units are introduced in the construction process.

In the construction industry, materials used by a specific craft are generally handled by craftsmen, not by general labor. Thus, electricians handle electrical materials, pipefitters handle pipe materials, etc. This multiple handling diverts scarce skilled craftsmen and contractor supervision into activities which do not directly contribute to construction. Since contractors are not normally in the freight business, they do not perform the tasks of freight delivery efficiently. All these factors tend to exacerbate the problems of freight delivery for very large projects.

The freight delivery system for the Alaska pipeline project was set up to handle 600,000 tons of materials and supplies. This tonnage did not include the pipes which comprised another 500,000 tons and were shipped through a different routing system.
The complexity of this delivery system is illustrated in Figure 4-2. The rectangular boxes denote geographical locations. The points of origin represent plants and factories throughout the US and elsewhere. Some of the materials went to a primary staging point in Seattle and some went directly to Alaska. There were five ports of entry: Valdez, Anchorage, Whittier, Seward and Prudhoe Bay. There was a secondary staging area in Fairbanks and the pipeline itself was divided into six sections. Beyond the Yukon River, there was nothing available but a dirt road for hauling. The amounts of freight in thousands of tons shipped to and from various locations are indicated by the numbers near the network branches (with arrows showing the directions of material flows) and the modes of transportation are noted above the branches. In each of the locations, the contractor had supervision and construction labor to identify materials, unload from transport, determine where the material was going, repackage if required to split shipments, and then re-load material on outgoing transport.

**INVENTORY CONTROL**

Once goods are purchased, they represent an inventory used during the construction process. The general objective of inventory control is to minimize the total cost of keeping the inventory while making tradeoffs among the major categories of costs: (1) purchase costs, (2) order cost, (3) holding costs, and (4) unavailable cost. These cost categories are interrelated since reducing cost in one category may increase cost in others. The costs in all categories generally are subject to considerable uncertainty.

**PURCHASE COSTS**

The purchase cost of an item is the unit purchase price from an external source including transportation and freight costs. For construction materials, it is common to receive discounts for bulk purchases, so the unit purchase cost declines as quantity increases. These reductions may reflect manufacturers' marketing policies, economies of scale in the material production, or scale economies in transportation. There are also advantages in having homogeneous materials. For example, a bulk order to insure the same color or size of items such as bricks may be desirable. Accordingly, it is usually desirable to make a limited number of large purchases for materials. In some cases, organizations may consolidate small orders from a number of different projects to capture such bulk discounts; this is a basic saving to be derived from a central purchasing office.

The cost of materials is based on prices obtained through effective bargaining. Unit prices of materials depend on bargaining leverage, quantities and delivery time. Organizations with potential for long-term purchase volume can command better bargaining leverage. While orders in large quantities may result in lower unit prices, they may also increase holding costs and thus cause problems in cash flow. Requirements of short delivery time can also adversely affect unit prices. Furthermore, design characteristics which include items of odd sizes or shapes should be avoided. Since such items normally are not available in the standard stockpile, purchasing them causes higher prices.

The transportation costs are affected by shipment sizes and other factors. Shipment by the full load of a carrier often reduces prices and assures quicker delivery, as the carrier can travel from the origin to the destination of the full load without having to stop for delivering part of the cargo at other stations. Avoiding transshipment is another consideration in reducing shipping cost. While the reduction in shipping costs is a major objective, the requirements of delicate handling of some items may favor a more expensive mode of transportation to avoid breakage and replacement costs.

**ORDER COST**

The order cost reflects the administrative expense of issuing a purchase order to an outside supplier. Order costs include expenses of making requisitions, analyzing alternative vendors, writing purchase orders, receiving materials, inspecting materials, checking on orders, and maintaining records of the entire process. Order costs are usually only a small portion of total costs for material management in construction projects, although ordering may require substantial time.
HOLDING COSTS

The holding costs or carrying costs are primarily the result of capital costs, handling, storage, obsolescence, shrinkage and deterioration. Capital cost results from the opportunity cost or financial expense of capital tied up in inventory. Once payment for goods is made, borrowing costs are incurred or capital must be diverted from other productive uses. Consequently, a capital carrying cost is incurred equal to the value of the inventory during a period multiplied by the interest rate obtainable or paid during that period. Note that capital costs only accumulate when payment for materials actually occurs; many organizations attempt to delay payments as long as possible to minimize such costs. Handling and storage represent the movement and protection charges incurred for materials. Storage costs also include the disruption caused to other project activities by large inventories of materials that get in the way. Obsolescence is the risk that an item will lose value because of changes in specifications. Shrinkage is the decrease in inventory over time due to theft or loss. Deterioration reflects a change in material quality due to age or environmental degradation. Many of these holding cost components are difficult to predict in advance; a project manager knows only that there is some chance that specific categories of cost will occur. In addition to these major categories of cost, there may be ancillary costs of additional insurance, taxes (many states treat inventories as taxable property), or additional fire hazards. As a general rule, holding costs will typically represent 20 to 40% of the average inventory value over the course of a year; thus if the average material inventory on a project is $1 million over a year, the holding cost might be expected to be $200,000 to $400,000.

UNAVAILABILITY COST

The unavailability cost is incurred when a desired material is not available at the desired time. In manufacturing industries, this cost is often called the stockout or depletion cost. Shortages may delay work, thereby wasting labor resources or delaying the completion of the entire project. Again, it may be difficult to forecast in advance exactly when an item may be required or when an shipment will be received. While the project schedule gives one estimate, deviations from the schedule may occur during construction. Moreover, the cost associated with a shortage may also be difficult to assess; if the material used for one activity is not available, it may be possible to assign workers to other activities and, depending upon which activities are critical, the project may not be delayed.

CONCLUSION

Literature review identified six dominant decision-making variables, which affects the performance of maintenance works. The result of associative test shows two significant correlations between the decision-making factors and cost variance. This indicates that the maintenance performance suffered from inaccuracy decision made in the maintenance cost allocation. The significant factors are “existing building condition” and “complaint received regarding building performance.”

REFERENCES


