

## ABSTRACT

Logistic is defined as the moving materials and equipment to where they will be used. In construction, the efficient management of logistic give impact of the quality in construction. Therefore, in managing the logistic its depend on the activities schedule and suppliers. The delivery of all materials and equipment on site should be arrived at the right time and placed at the right location. The effectiveness of logistic flow and delivery process of materials to the construction is important to make the construction are smoothly construct without facing any problems occur. The area of this case study is in Kuantan and Segamat area which is the medium contractor (class C) are choosed. The data collection is to investigate the information of logistic management on site. All parties involves in the logistic construction and they are responsible to make the management is efficient. Project manager is the top level in managing the materials at site. Therefore, the good communication and cooperation among the parties involved can help the project manager to handle the logistic on site in getting the information of materials needed. The delivery materials to the site based on the schedule, suppliers and activities construction of the project to prevent the materials stock-out and problem in construction activities. Thus,all parties are responsible in managing the logistic flow in giving the information correctly and proper coordination is needed in delivery materials to the site.

## ABSTRAK

Logistik ditakrifkan sebagai pergerakan bahan dan peralatan ke tempat mana yang mereka akan digunakan. Dalam pembinaan, pengurusan logistik yang cekap memberikan kesan kepada projek pembinaan. Oleh kerana itu, dalam pengurusan logistik, jadual kegiatan dan pembekal adalah faktor yang penting. Penghantaran semua bahan dan peralatan di tapak bina hendaklah tiba pada masa dan ditempatkan pada lokasi yang tepat. Keberkesanan aliran logistik dan proses penghantaran bahan ke tapak pembinaan adalah penting untuk memastikan pembinaan berjalan lancar tanpa menghadapi masalah. Kajian kes ini adalah di daerah Kuantan dan daerah Segamat dan kontraktor kelas C yang dipilih. Pengumpulan data adalah untuk menyiasat maklumat pengurusan logistik di tapak bina. Semua pihak terlibat dalam pengurusan logistik dan mereka bertanggungjawab untuk mengendalikan pengurusan dengan lebih cekap. Pengurus projek adalah orang yang paling bertanggungjawab dalam mengatur bahan-bahan di tapak bina. Oleh kerana itu, komunikasi yang baik dan kerjasama antara pihak yang terlibat dapat membantu pengurus projek untuk mengendalikan logistik di tapak bina dengan mendapatkan maklumat bahan yang diperlukan. Bahan penghantaran ke tapak bina berdasarkan penjadualan, pembekal dan aktiviti pembinaan projek bagi mengelakkan pembaziran bahan dan masalah dalam kegiatan pembinaan. Jadi, semua pihak bertanggungjawab dalam menguruskan aliran logistik dengan memberikan maklumat yang betul dan koordinasi yang baik sangat diperlukan dalam bahan penghantaran ke tapak binaan.

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## LIST OF ABBREVIATIONS

JKR - Jabatan Kerja Raya

CIDB - Construction Industry Development Board

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# CHAPTER 1

## INTRODUCTION

### 1.1 Title of project

The logistic management of construction sites

### 1.2 Synopsis

Logistics is the part of the supply chain process that plans, implements, and controls the efficient flow of goods, services, and related information to fulfill customers' requirements [1]. This case study is to determine and evaluate the logistic management in a few construction sites. In this case study, it is to show how at the construction site, the logistic management is being manage to avoid the delay of project or stock out the materials. Traditionally, each contractor taking part in a project was responsible for his/her individual supply chain to provide materials and services required within his/her scope of works. Construction logistics can be used by contractors to plan and control the efficient and effective flow of materials from the suppliers to their incorporation into the finished structure [3]. In an ideal organisation, all goods delivered on site should be the right ones, should arrive at the right time and should be placed at the right location, in order to be transformed or assembled at the right place on the site [19].

### 1.3 Introduction

Logistic defined as the managing of the flow of materials and information from suppliers to customer and there are also materials handling and movement functions and through out organisation and its supply channel [2]. Logistics involves moving equipment, materials and supplies to where they will be used. Construction materials need to be supplied and stored on construction sites using timely plans that are dependent on the activities schedule, site space availability, and suppliers' constraints. According to the Rushton (2000) said the construction logistics involves the planning of efficient transfer of material and equipments from the suppliers to the construction site in a cost-effective way and timely manner [3].

In construction, the efficient management of construction material planning are needed to integrated approach towards logistical functions. The fundamental construction operations of facilities, inventory control and communication planning need to be coordinated properly [1]. In the field of construction, the activities such as orderings, transport and storage is dominating the logistic processes. In deciding on the project logistics such as building materials market, financing, managing contractors' approaches to supply and a deep understanding of the logistic impact on the project in term of cost, quality and time are required a wide knowledge [7].

Bell and Stukhart (1986) stressed that materials management function include materials requirement planning and material take off, vendor evaluation and selection, purchasing, expenditure, shipping, material receiving, warehousing and inventory, and material distribution [6]. In an ideal organisation, all goods delivered on site should be the right ones, should arrive at the right time and should be placed at the right location, in order to be transformed or assembled at the right place on the site. Construction logistics deals with many technical, organisational and environmental issues affecting the cost of a project, time and quality of execution [38].

Thus, in logistic management the scheduling is the tools to coordinate the activities in the construction sites. Without a proper scheduling of logistic management, activities in site cannot be carried out smoothly.

#### **1.4 Problem statement**

In managing the logistic to become a good management at construction site, a few factor must be consider such as selected suppliers, the management delivery time and the transportation of materials to the sites. The logistic activities with a greater impact gives a quality at construction sites such as communication and information, infrastructure management, subcontracting, control of processes and storage. In building construction or infrastructure several activities interact, the result of logistic system is difficulted to monitor. Thus, the project manager role is important to focus in the logistic activities that have the greatest impact in the quality of construction [5].

The objective of this study is to determine and evaluate effectiveness of logistic flow in construction sites. The delivery materials to the construction sites is based on project manager experience, scheduling or planning [6]. Materials supply is an important element of operation of construction companies and thus a factor affect the quality of construction projects. Traditionally, the responsible for providing the materials and services required within their scope of works are contractors part [7].

The quantity of material should be available at the site at a given time in order to guarantee a desired level of protection against interruptions due to the shortage of materials. Thus scheduling of the deliveries to the site must be provided in construction project to avoid any factors that can effect the work [9]. Shifting responsibility for supplies to many subcontractors may result in the building site congestions, excessive expenses and delays [7].

## **1.5 Objectives**

1. To determine and evaluate the effectiveness logistic flow at construction sites.
2. To evaluate the process of delivery materials on construction sites.

## **1.6 Scope of work**

The scope of study that involve:

- a) Determine the logistic activities at construction sites based on the management.
- b) Evaluate the process delivery of materials on construction sites.

## 1.7 Methodology

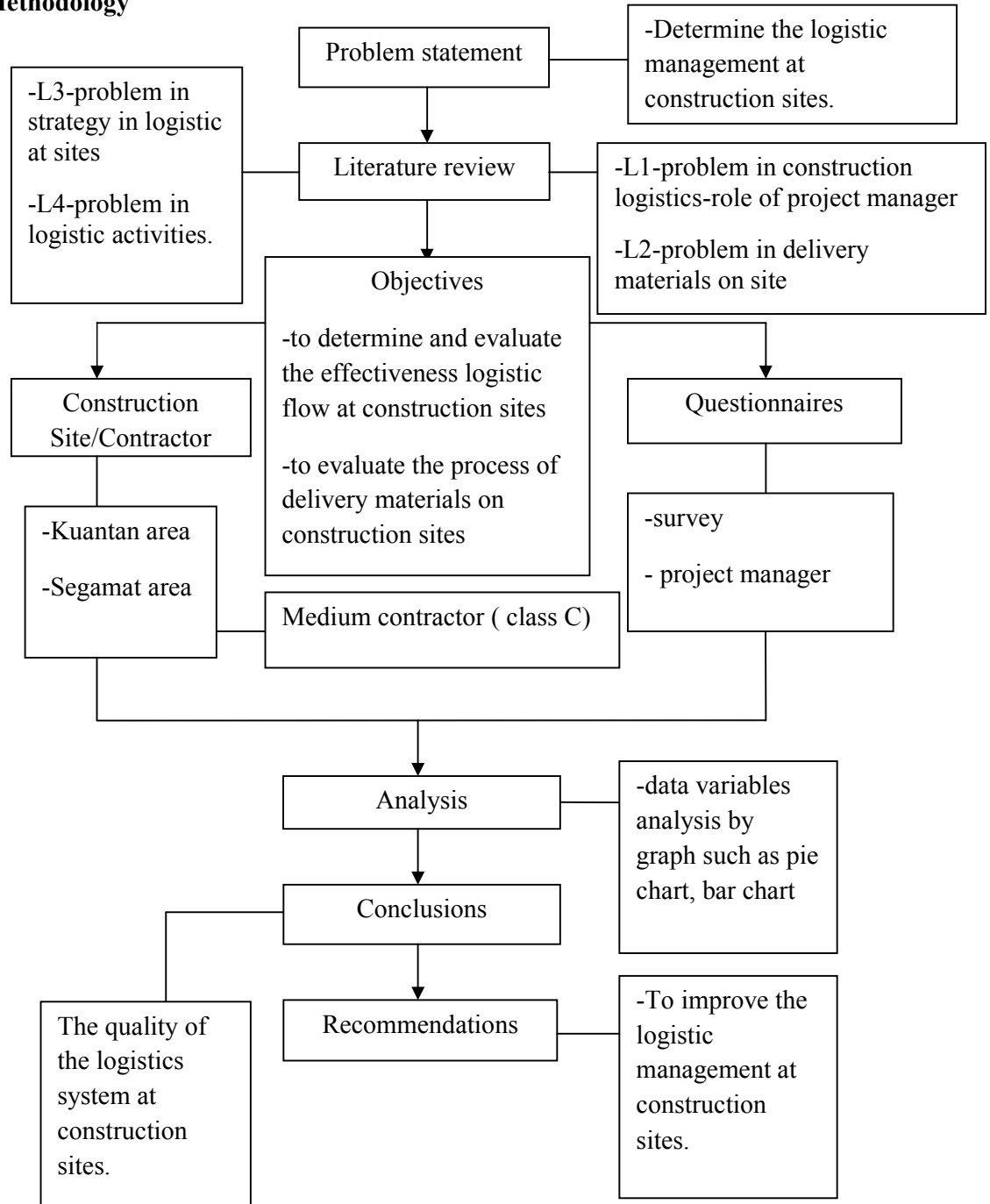


Figure 1.1 : Flow chart methodology



## CHAPTER 2

### LITERATURE REVIEW

#### 2.1 Logistics

Logistic is about managing the flow of materials and information from source to customer and also materials handling and movement functions and through out organization and its supply channel. In logistics reverse, the product can be able to reverse normal logistic by organization from suppliers to customers so that the inventory deemed unsuitable can be located to customers and returned to supplier on time and cost effective manner [2]. Logistic also a key concept that be understood as a system of resource such as material, workforce, information and funds which are flow from the supplier to the customer. It is also can be expressed as a philosophy of managing the processes of goods and information flows based on an integrated and schematic approach to these processes that called logistic processes [7].

Planning, organising and control of flows of goods from their purchase through processing to the customers is called logistics [7]. Logistics also is the part of the supply chain process that plans, implements and control the efficient flow of goods, services and related information to fulfill the customers' requirements. Logistic management can be classified into three perspectives which are competitive strategy, firm focused tactics and operational efficiencies [1]. Good logistics will have the minimum materials on site awaiting assembly. It is also good for cash flow, make the site clean and tidy and also reduces the risk of falls, slips and trips [8].

Logistics is a process of strategically managing the procurement, movement and storage of materials, parts and finished inventory (and the related information flows) through the organisation and its marketing channels in such a way that current and future profitability are maximised through the cost-effective fulfilment of orders [11]. In construction terms, logistics can be understood as a multidisciplinary process that seeks to guarantee at right time, cost and quality such as material supply, storage, processing and handling, manpower supply, schedule control, site infrastructure and equipment location, site physical flow management, management of information related to all physical and services flow [21].

## **2.2 Contractor**

A construction company as an organisation and as a participant in a construction project [7]. Traditional construction management studies of housing refurbishment and home buyers, have focused on the relationship between the customer and the contractor [1]. Contractor is a professional responsible for all construction activities. There are general contractor and subcontractor or specialty contractors. General manager responsible in coordinate with the owner on all matters since the general contractor is the only one of the contractors holding a contract with the owner. The contractor also develop a realistic construction schedule and also ensure the work is well coordinated and performed in a safe manner. The number of subcontractors working simultaneously on site also increases when the big projects are handling because more materials deliveries at sites [11].

According to the Pooler (1997) said that contractors also responsible in carrying costs to maintain the material inventory at construction sites between supply an consumption times. Construction firms have many simultaneously on going construction projects, from which the relevant performance information is needed. There are also tens of material groups and subcontractors, whose performance should be monitored together with construction firms' practices. Construction industry is a project-oriented industry. [11].

For subcontracting management, the selection are very precise and the contracting so as to safeguard the company interest, the performance evaluation, control of the building workers acceptance at the working site and principle of partnerships [5]. The contractor has responsible to discover the problem and finding solutions for the problem occur on site [15]. The contractors should clearly understand their responsibility to provide materials on time and be well-prepared for the financial responsibility in order to avoid time-overrun [18].

### **2.3 Scheduling/Planning period**

In construction sites, the project manager must utilise the delivery scheduling procedure for timing the materials replenishments is needed to examine and develop the good and efficient logistic management at sites [7]. For each planning period, the actual availability level ensured by the delivery process should not be less than required availability level. The materials must arrived at the construction sites in advanced of the starting date of the corresponding construction activities [9]. The tighter the project schedule, the more the material deliveries which need to be handled at the same time [11].

The logistics concept requires accurate scheduling of materials to programmed delivery dates keyed to actual site layout and storage arrangements [10]. The bigger the contract price and the shorter the time for completion, the more efficiently the construction time has been utilised in the project. The project schedule related measure gives important information about construction environment to the managers [11]. In the construction process, the amount of material that should be available on sites at a given time to guarantee the desired level of protection against changes in delivery dates and the rate of progress [9].

Van Truong Luu and Soo-Yong Kim (2009) discovered that schedules are essential to the successful execution of projects. Without a schedule, it is difficult to coordinate the diverse activities found in a construction project [18].

## 2.4 Project manager

Project managers should take into account the delivery materials or information of the flows and compressing timetables when planning strategies for the future in construction projects [11]. The construction site manager must observed the problems that occur in managing the logistics on site which is giving the impact in construction quality such as communication and information, infrastructure management, subcontracting, control of process and storage. Project manager allowed to identify five critical factors in logistic management on sites such as personnel, material flow, schedule, contractor organization and information flow [1].

These are allowing the project manager to understand the activities that must be managed more carefully [5]. Besides that, in teamwork the project manager must have good communication because it is the key to team building or partnering . It is also considered as a commitment between two organization having a common purpose and business objectives throughout the duration of a given project [1]. Project manager is the top management level in the construction site. Besides that, project manager is assisted by site engineer, site supervisor and so on [15]. Project managers in construction are responsible for the overall success of delivering the owner's physical development within the constraints of cost, schedule, quality and safety requirements [16].

## 2.5 Materials

The standard materials, like timber, mortar and plasterboard, have the biggest logistics costs of material flows as percentage of the purchasing price, because the logistics chain of standard materials consist of many movements and warehousing [11]. Bulk materials comprise materials such as concrete, wood or insulation materials are accumulating in high amounts when building are demolished or deconstructed. Materials required to create the building or structure. One of advantage of the planning is that the materials can arrived on time and can direct to the construction sites. Besides that, it can reduces the opportunities for the materials to be damaged, stolen or obstruct operations and require moving once, twice and more to the sites. There are a

few factor that are contribute in materials and equipment delivery problem, design delay, long supply chain, road delays and other [8].

Materials is an important element of operation of construction company and it is factor can affecting the quality of construction projects on site. The logistic system at construction sites, need a proper management for the important of delivery and planning, structure and organisation material consumption in term of project efficiency. Timber, mortar and plasterboard are typical standard materials while kitchen cabinets is a concrete elements and windows are customized materials. [7]. In site logistics, the site layout planning of material storage areas is the construction temporary facilities [3].

The standard materials such as timber, mortar and plasterboard, have the biggest logistics costs of material flows as percentage of the purchasing price because the logistics chain of standard materials consist of many movements and warehousing [11]. Vrijhoef and Koskela (2000) said that the materials are often ordered either very late and invariably leaving the supplier with uncertain demand and high material buffers to guarantee service level or too early leading to buffering at the site [23]

Materials management is an important element in project planning and control. Bulk materials refer to materials in their natural or semi-processed state such as earthwork to be excavated and wet concrete mix 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. 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 [39].

## **2.6 Transportation sector**

Distribution and transportation of materials is an intense problem faced by major industrial and construction companies in many countries [12].

## **2.7 Construction project**

Management of the transformational work that creates value for the end user or client or owner by joining together the elements of building or structure in a particular sequence. This is a layering process whether it is in the creation of the buildings or in civil type projects such as roads, bridges, railways and others [8]. The major criteria of construction process are defined as scope definition, financial planning, requirement procedure and operating procedure. These criteria must be considered before the contractor and owner execute to a binding agreement contract [1]. The scope of responsibility of such an organisation are wider and include flows of management of resources other than materials such as equipment, staff and workforce, finance and information. The production also part of the responsibility in organisation [7].

The flows both internal and external of construction process which are the inputs to the conversion activities and can be classified into two groups that are construction resources like materials, equipment and labour and construction information [13]. Construction projects usually involve many actors such as an architect, designers, a main contractor, subcontractors and dozen of material suppliers [17].

In a construction project where time truly equals money, the management of time is critical, thus predicting the likelihood of time-overrun may play a key role towards project success [18]. Construction projects are unique, as they may have a distinctive set of objectives, require the application of new technology or technical approaches to achieve the required result [25]. Chan (2003) pointed out that construction is a very competitive and high-risk business [34]. In the field of construction, procurement planning and execution such as ordering, reception, transport and storage are dominate the logistic processes [38].

## **2.8 People handling the logistic**

In materials handling, there have one team that responsible for office accomodation, welfare, occupational health, security and other facilities to support those whose working on the construction sites. The activities that they took care are traffic management, reduced traffic movement and contributed safety. The designers and constructors must pay more attention in logistics system because it is the earliest stages for design [8]. People whose are working in construction sites are the greatest asset in construction logistics tasks [1].

## **2.9 Supplier**

The quality standard, payment terms, transportation costs and delivery schedule vary from one supplier to another, the sourcing of apposite materials at a reasonable price becomes major challenge of contracting firms. An unreasonably high offer from suppliers could in turn result in failure in securing the project. Therefore, each participant would make every attempt to attain an agreement and establish trust and good long-term relationship [30].

Suppliers can also attempt to differentiate themselves by getting closer to their customers and for example, by emphasising a relationship approach well before the contract bid [32]. The task of supplier selection has always been considered a key one within purchasing and supply management. According to Weber (1991) said that the quality is the most important factor followed by delivery performance and cost [35]. Suppliers contribute to the overall performance of a supply chain. Poor supplier performance affects the performance of the whole chain [36].

## **2.10 Construction process**

Integration of the procurement and construction process at a detailed planning and controlling of the level in the comparison between the delivery materials schedule and corresponding construction schedule. Its for evaluate the safety time with which the materials should be delivered on the time in schedule [9]. In construction the value are created when the work are assembled correctly. Therefore, in may happen if the

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resource flows are smoothly on sites such as the operations, information and materials [8]. Tenah (2003) pointed out as general, contracting are often replaced by project management system which is the project manager acting on behalf of the employer in deciding on designers, contractors and supplier selection [7].

## **2.11 Material delivery process**

According to Samuli Pakhala (1998) stressed the process is developed based on process through the relationship cooperation between construction firms and material suppliers. There are two measurements are applied as a part of the cooperative developing process which are measuring the effectiveness of information and material flows. Being a partner in construction firm is important, when developing material delivery processes in the construction industry. [17].

In the case of delivery systems with a general contractor or other party that disposes of necessary logistic resources, it is reasonable to use them to create and manage the whole project supply system [7]. For all the materials arrived at construction site, the delivery process requires the action of two main participants which are the industrialist who provides construction goods either directly to site or through a distribution network and the contractor who is responsible for the assembly of these goods with the other parts of the building [19].

Customized materials are design-to-order materials and standard materials as well as small purchases are make-to-order or make-to-stock materials. The factor that the delivery materials facing in construction site are design changes, timing, shortages, handling and storing, damages, waste and packaging are typical problems in every construction site. Material flows are the main problems of standard materials, because bulky and heavy standard materials are difficult to handle and store at the site [17].