Material Resource Management in Construction

Administração de recursos materiais na construção civil

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ABSTRACT
The management of material resources in civil construction, an extremely important matter to be introduced in the sector's business culture. The purpose of this work is to guide the need for administration of material resources and services, demonstrating with simplicity that the administration of these resources is present in all stages of production in constructions as a whole. It is a fundamental tool for the development of work, increasing productivity and reducing costs, effectively collaborating and favoring the continuous improvement of the quality of the projects.

Keywords: Administration, Civil construction, Logistics, Materials, Purchasing, Planning.

1 INTRODUCTION

Due to the high cost for the construction of houses, buildings and the like in Brazil, it is very important to develop a process to improve the use of materials and reduce costs. It is notorious that the high competitiveness, the search for excellence, the focus on the client, the transformations in the market relations between the intervening companies, the new role of the State in the sector relations, among other aspects have defined new paradigms and imposed new competence references for the organizations and companies participating in the production process in the civil construction sector. With the introduction of the Administration of Material and Assets Resources the production stage was implemented, since this matter has a strong relationship with all sectors of the company promoting a better internal and external relationship, the production activity in civil construction is strongly dependent on the Administration of Material and Assets Resources, because this sector is responsible for the supply of raw materials, equipment and new technologies.

The subject to be developed will be in the area of civil construction and the problem to be addressed aims to answer the question: How does the management of material resources help in the development of work, in increasing production and in reducing costs in civil construction?

The objective is to verify whether it is possible to develop a simple and straightforward model to improve decision-making in the acquisition and use of materials in the construction industry.

The general objective is to explain the importance of material resources management in civil construction. The specific objectives are:

1. To present materials management methodologies and tools.
2. Elaborate simplified MRP process control in construction
3. Demonstrate the importance of materials purchasing management.
4. Establish a simplified model for cost reduction and productivity improvement in the construction industry.

This paper will be presented in three chapters, as follows:

1) The administration of materials and services

2) Purchasing and PCP management

3) Implementing material resources management in a steel and construction company.

For this article, various bibliographic research will be used for a better data analysis and understanding of the proposed theme. We will also use internet consultations in specific sites (universities, unions, associations, discussion groups and general entities related to Civil Construction and Business Administration), articles and periodicals published in technical notebooks and specific congresses, magazines from the Civil Construction, Economy and Business Administration sectors. A case study will be carried out in partnership with a construction company, where the sectors related to the objective of this work will be analyzed, including the proposition of implementation of procedures in the company.

2 THE ADMINISTRATION OF MATERIALS AND SERVICES

Materials management involves the management of numerous processes within the supply chain. Its origin is from the purchase of materials to the delivery of the final product to the consumer. Thus, through these processes, it is possible for a company to plan, control, schedule and execute the flow of materials and the storage of goods.

According to Viana (2000) materials management in an organized entity is responsible for decisions, planning, scheduling, purchasing, storage, and distribution.

It is much more than a branch of administrative science and technology; it deals with standards related to the management of what, under the generic name of materials, enter as constituent and constituent elements in the production line of a company.

According to Pozo (2001) this designation encompasses other accounting assets that, although not contributing directly to manufacturing, are part of the company's routine, for example, office materials, cleaning materials for conservation services, and safety materials for fire and accident prevention services.

For Martins et al (2006) It has under its responsibility the tasks of purchasing, storage, conservation, control, and physical distribution, taking care from the purchase to the delivery to the users of the materials ordered, making sure that there is no shortage of materials for production and that there is no accumulation of stocks.

The purpose of Materials Management is to ensure the continuous supply of the necessary items to meet the demands of the productive sectors or even to take care of all

problems that are related to supplies and everything else that may represent capital investment for an organization, supervising, watching over, and controlling so that the supplies are made on time and on schedule, thus competing to obtain more and better productivity.

Still for Viana (2000) the fundamental objective of Materials Management is to determine when and how much to acquire, to replenish stock, which determines that the supply strategy is always triggered by the user, as, as a consumer, he triggers the process.

2.1 INTERCONNECTION OF MATERIALS MANAGEMENT WITH OTHER ADMINISTRATIONS

Materials and Services Management has in its main focus not only to determine supply factors for a company's asset resources, but also to deliberate on deadlines and quantities that are essential to the existence of the entire production chain.

According to Cardoso (1998) it is related to all the related productive activities so that the supply goals can be reached in a practical way. To do so, it is necessary to develop a perfect materials management, including purchasing, storage, and distribution, each one of them aided by modern techniques and routines focused mainly on materials and services management.

According to Vieira (2006) the civil construction sector, today considered as an industrial sector, has Materials Management as a determining factor for business success in the globalized scenario where those who have the best business management techniques stand out. These techniques are related to efficient Purchasing Management, Integrated Logistics, and Production Planning, which reduce costs and deadlines for related activities and reduce waste of materials and idle labor time at the construction sites.

2.2 PRIMARY AND SUPPORTING ACTIVITIES OF MATERIALS MANAGEMENT

Vieira (2006) states that it is not a simple task to manage inputs and outputs of materials, and also to know what, when, and how much to buy, with efficiency and accuracy.

These activities can be seen through two major actions called primary and support activities.

Primary activities are fundamental to the fulfillment of the company's mission, as they comprise important steps for the entire development of Materials Management such

as; Order Processing, Transportation, Inventory Maintenance.

According to Dias (1993) secondary activities are used as support for the accomplishment of primary activities and are composed of the following steps: Storage, Material Handling, Planning, Procurement and Information System.

2.3 ORGANIZATIONAL STRUCTURE

A materials system must establish integration from sales forecasting, through master production schedule planning, to production and final delivery of the enterprise. It must be involved in the allocation and control of most of the enterprise's major resources: manufacturing, equipment, labor, and materials.

This material system is composed of an organizational structure that involves the inter-relationship of the various sectors of the company that occur in the following cases:

a) Planning; requirements planning, stock forecasting, and stock levels.

b) Purchasing; execution of operational routines, follow up on contracted purchases, supplier development.

c) Distribution and Transportation; involves activities related to the transportation of raw materials to the construction sites.

d) Storage; receiving, return, storage, preservation, packaging.

e) Also according to Dias (1993) control; physical, financial, periodic inventory.

2.4 IMPORTANCE OF MATERIALS MANAGEMENT FOR THE COMPANY

According to Viana (2000) any reductions in material costs exert a high advantage on profits. Similarly, any reductions in the costs of materials and the size of gross inventories, reduce the volume of investment in these inventories and allow the availability of basic capital of companies, the increase in the rate of return on capital investment.

Materials management is important to ensure that the company has a sustainable growth, as well as develop their activities and processes efficiently, to bring great results. In this way, it is possible to manage in a more effective way, controlling and making available the necessary inputs for the production processes to be fed, and thus guarantee the continuity of the company's entire cycle of activities during the production process.

3 PURCHASING AND PCP MANAGEMENT

Dias (1993) explains that different from before World War I, when the acquisition function had a bureaucratic role, today it has taken on a condition of survival within organizations, thus gaining greater visibility

According to Vieira (2006) nowadays the purchasing function is an integral part of the supply chain and companies started to call it supply management and not simply purchasing anymore.

The purchasing function assumes a truly strategic role in today's business in view of the volume of resources involved (from 50% to 80% of the gross revenue in industries), leaving behind the preconceived view of a bureaucratic and repetitive activity. From this it is easy to see that small gains in purchasing management can have great repercussions on profit.

Martins (2006) points out that the purchasing department gains visibility, since its tasks assume a condition for the survival of organizations.

3.1 THE IMPORTANCE OF PURCHASING IN ORGANIZATIONS

Webster (1972) states that making decisions when buying products and services, considering price, brand, and alternative supplier means ORGANIZATIONAL PURCHASING.

For Tamaki et al (2005) purchasing is an essential operation of the Materials or Supply Department, responsible for supplying materials or services at the right time and in the right quantities. He also affirms that any industrial activity needs raw materials, components, equipment, and services in order to operate. In the cycle of a manufacturing process, before starting the first operation, the materials and general supplies must be available, maintaining, with a certain degree of certainty, the continuity of its supply in order to meet the needs throughout the period. Therefore, the quantity of materials and their quality must be compatible with the production process.

We can conclude then that the basic objectives of a Purchasing Section according to Webter (1972) would be:

a) "obtain continuous flow of supply in order to meet marketing (sales) and/or production programs;

b) coordinate this flow in such a way that a minimum of investment in stock is applied and that the company's operability is not affected;

c) purchasing materials and supplies for the company in compliance with the predetermined quantities and qualities and within the stipulated time frame;

d) always seek within a negotiation, obeying ethical standards, the best commercial conditions for the company;

e) establishing alternative sources of supply (supplier selection);

f) develop good and permanent relationships with suppliers;" (Webter, 1972, p.2)

And still according to Vieira (2006), to narrow the relationship with the company's sectors, improve the product options, technical assistance, standardizing materials, and analyze the values.

For Varalla (2003) one of the important parameters for the good functioning of the Purchasing Section and, consequently, for the achievement of all objectives is the forecasting of supply needs. It is never too much to insist on the information of these quantities, qualities and deadlines that are necessary for the factory to operate. It is this information that provides the efficient means for the buyer to do his job, and Purchasing and Production must have the necessary time to negotiate, manufacture and deliver the requested products.

The need to buy better and better is emphasized by all entrepreneurs today, along with the need to stock at adequate levels and to rationalize the production process. Buying well is one of the means that a company must use to reduce costs. There are certain commandments that define how to buy well, which include checking deadlines, prices, quality, and volume.

According to Coelho (2006) the selection of suppliers is also considered a key point in the purchasing process. The potentiality of the supplier must be checked, as well as its facilities and its products, and this is important. Its balance sheet must be carefully analyzed. With an updated and complete register of suppliers and with price quotations made every six months, many problems will be avoided.

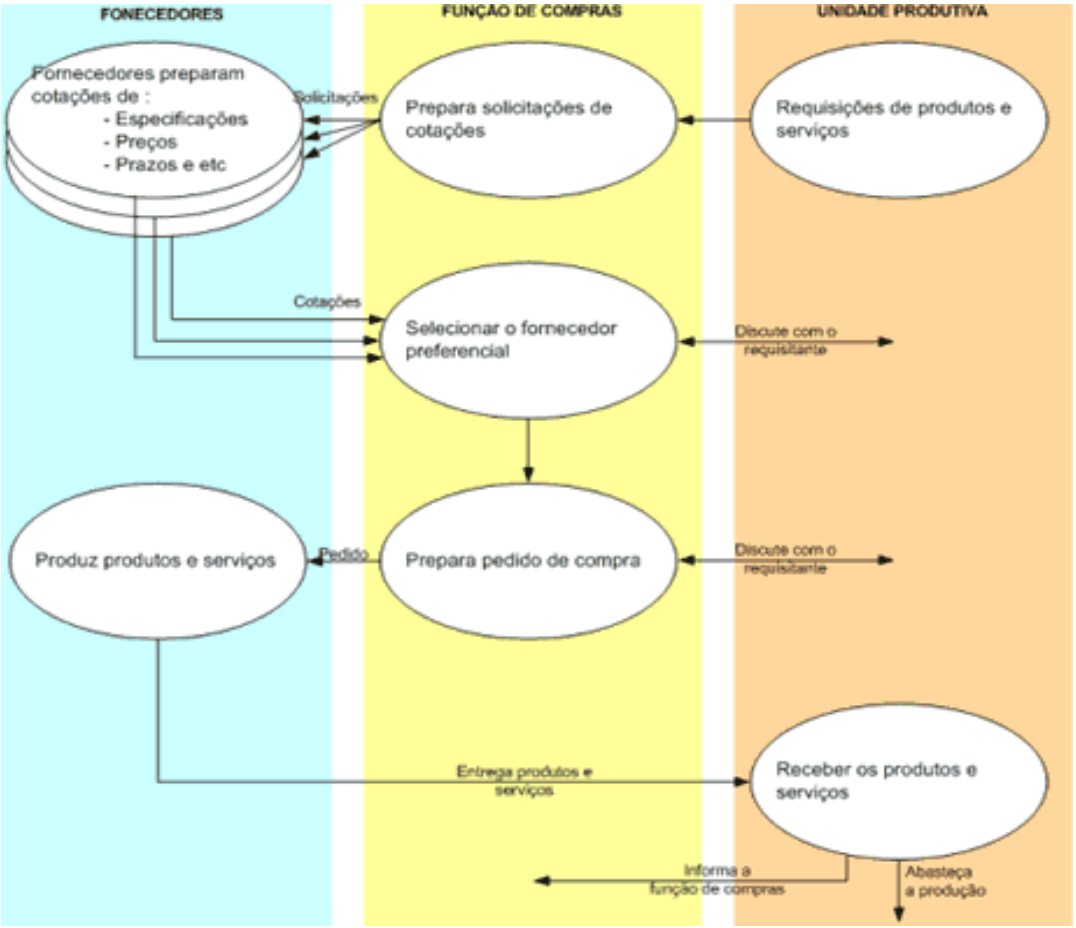
3.2 INTERNAL AND EXTERNAL RELATIONSHIP

For Viana (2000) by the very nature of the materials system, there is a strong relationship with various internal and external sectors of the company. We cannot isolate purchasing management because it depends on all types of information, such as working capital cost, financial availability, level of commercialization, raw material available in

the market, supplier's and competitor's socioeconomic situation. In purchasing management the information has to flow naturally so that we can analyze market trends and reactions in order to make safe decisions and make the company competitive.

Forbes (1987) states that material management corresponds, as a whole, to the planning, organization, direction, coordination, and control of all acquisition, storage, and application control tasks of the materials used in the operational activities of a company, whether of an industrial, commercial, or service nature.

Figure 1 - Purchasing function links the company and its suppliers.



Source [SANTOS, Adriana P. L., et al. **Estruturação do processo de compras de materiais**. Brazil - Fortaleza, CE. 2001. 14p. 2º Simpósio Brasileiro de Gestão da Qualidade e Organização do Trabalho no Ambiente Construído].

3.3 PURCHASING ORGANIZATION

The three major common responsibilities of any company are usually: the financial area, the production area, and the sales area. Vieira (2006) says that at the beginning of a company's life, management is done by one man, the owner, who takes care of all three responsibilities. As the business grows, it becomes necessary to add more

professional assistance, and delegate authority and responsibility . As growth continues, the owner becomes responsible for adopting guidelines for action and becomes the head of the enterprise. Up to this point the three have been subordinate, but they are becoming separate executive responsibilities, coordinated in hierarchy, reporting to and being coordinated by a common general management body.

Regardless of the size of the company, the basic organizational principles are made up of fundamental rules that are considered as follows:

A. authority to buy;
B. purchase ledger;
C. price register;
D. stock and consumption register;
E. supplier registration;
F. files and specifications;
G. catalog files.

Completing the organization. We can include as typical activities of the Purchasing Section:

1. Search

a) market study;
b) study of materials;
c) cost analysis;
d) investigation of the sources of supply;
e) inspection of suppliers' factories;
f) development of supply sources;
g) development of alternative material sources.

2. Acquisition

a) requisition checking;
b) analysis of quotations;
c) decide to buy via contracts or in the open market;
d) interview vendors;
e) negotiate contracts;
f) place the purchase orders;

g) accompany the receipt of materials.

3. Administration

a) minimum stock maintenance;

b) material transfers;

c) avoid stock excesses and obsolescence;

d) standardize whatever is possible.

4. Various

a) estimate the cost;

b) dispose of unnecessary, obsolete or surplus materials;

c) take care of reciprocal commercial relations.

Besides the typical activities within the purchasing organization, other responsibilities can be shared with other sectors:

A. determining what to manufacture or buy;

B. standardization and simplification;

C. specifications and substitutions of materials;

D. comparative tests;

E. stock control;

F. selection of production equipment;

G. production schedules that are dependent on the availability of materials;

H. Selection of outsourced work teams.

It is logical that these points are not complete, as they vary from company to company, and must be adapted to the type of organization of each one.

The main function of purchasing research is to supply interested departments with information and analytical guidance. The field of purchasing research can be divided into distinct areas where these activities apply:

a) Study of materials.

b) And according to Forbes (1987) evaluation of the company's needs for periods ranging from one to ten years, short-term and long-term trends in supply and demand, price trends, technological improvements, prospects for possible

substitutes, development of standards and specifications.

3.4 ECONOMIC ANALYSIS

Effect of business cycles on materials purchased according to requirements, general price trends, influence of economic variations on suppliers and competitors.

a) Supplier analysis: Qualifications of active and potential suppliers, study of suppliers' facilities, evaluation of their performance, analysis of their financial condition.

b) Cost and price analysis: Reasons behind price variations, comparative study of similar parts, analysis of a supplier's costs and profit margins, investigations regarding alternative manufacturing methods and material specifications.

c) Analysis of packaging and transportation: Effect of supplier locations on costs, alternative shipping methods, reclassification of articles, introduction of packaging improvements, improved material handling methods.

d) For Dias (1993) administrative analysis: Control of forms, simplification of work, use of electronic data processing, preparation of reports.

3.5 PURCHASING SYSTEM OPERATIONS

An adequate purchasing system varies according to the company's structure and its adopted policy. The Purchasing area in traditional companies has been undergoing reformulations every year in its structure. In its system, changes are introduced with several basic characteristics in order to be able to buy better and to encourage new and efficient suppliers. From time to time this system is improved, but the basic elements remain the same. Among these features we can highlight the following:

a) Three Quotation Purchasing System: its purpose is to start from a minimum number of quotations to encourage new competitors. The pre-selection of qualified competitors avoids spending time with a large number of suppliers;

b) Objective pricing system: prior knowledge of the fair price, in addition to helping the buyer's decisions, provides a double check on the quotation system. And it gives the buyer a basis for argumentation in discussions of price increases and percentage distribution negotiations;

c) And also according to Forbes (1987) written documentation: the presence

of a lot of paper may seem unnecessary, but it is evident that the written documentation attached to the order, besides allowing, at the time of the second signature, the examination of each phase of negotiation, allows review and will always be available along with the purchase process to clarify any subsequent doubts.

3.6 PURCHASE REQUEST

Viana (2000) states that the Purchase Request is a document that gives the buyer authorization to execute a purchase. It is the document that must inform what is to be purchased, the quantity, delivery time, place of delivery and, in some special cases, the probable suppliers.

3.7 PAYMENT TERMS AND DISCOUNTS

For Contador (1998) one of the objectives of a purchase is to get the best payment conditions. Currently there is a trend toward standardization, which makes the buyer's action more difficult, demanding greater ability in trying to obtain longer and better terms. It is good to remember that this factor is actually of great value to the company; it is also good to take into consideration the financial cost currently in force and that all the benefits of the conditions obtained may be lost if deliveries are not made within the deadlines.

According to Viana (2000) the cash payment discounts are already fully integrated in any negotiation, by all suppliers of industrial products or not. What needs to be taken into consideration is the differential in percentage of the cash price and the price invoiced in a given number of days. There may be situations where there are substantial advantages for cash payment, and similarly there may be advantages for payment in installments

According to Dias (1993) quantity discounts are those in which price reductions are achieved due to an increase in the quantity purchased. These types of discounts are normally difficult to analyze, because in this case the entire stock sizing of the company is involved. If the buyer accepts a discount in function of an increase in the quantities purchased, he may run the very great risk of suddenly seeing the company's stocks too high. As a rule, one should always compare the total volume of discounts with all the company's storage costs to see if the deal is worthwhile.

3.8 THE NEGOTIATION

For Tamaki et al (2005) negotiation is not a dispute in which one party wins and

the other loses. Although elements of competition are obviously linked to the process, it is much more than that. When in a negotiation both parties win, we can then say that there was a good negotiation. Knowing how to negotiate is one of the most required skills of a buyer.

Basically any negotiation process follows six stages that need to be fulfilled with equal care for the final result to be positive. Difficulties not overcome in any of them can compromise the established objectives. They are as follows:

a) Preparation: where the objectives that should ideally be reached and those that reality will allow are established;

b) Opening: This stage serves to reduce tension, consolidate the objective, highlight a mutual goal, and create a climate of acceptance. Then, it must be made very clear that one is there to solve a problem, satisfy a need, allowing the other to be predisposed to answer the questions one will ask;

c) Exploration: Here one needs to verify that the need detected during the preparation stage is true, and this can only be achieved by asking objective, but never threatening, questions. This process establishes a psychological reciprocity in which people tend to treat others in the same way that they are treated by them;

d) Presentation: at this stage, the relationship between the initial objectives and expectations and the needs of the other party must be made. The more we provide conditions for the other party to make the connection between proposition, feeling, and need, the more fruitful this stage will be;

e) Clarification: we need to consider objections raised as opportunities to provide more information. This always shows interest, because if it doesn't exist, the other person won't even object. The clarification process consists of listening carefully to the objections; accepting not the objection itself, but the feeling or logic behind it, and showing the other that we understand it;

f) Also for Contador (1998) final action: is the search for an agreement or decision. It is worth remembering that people buy a product or an idea with help and not with a push, but this does not mean that they make the decision alone. The negotiator who does this usually fails.

Of course, negotiation can be made much easier if there is trust in the negotiators'

relationship. Building trust is very important in the process, and there are some acts that should be avoided.

The general characteristics of a good negotiator are:

g) See negotiation as an ongoing process in which no item is immutable, even after the final agreement and signing of the contract.

h) Be open-minded.

i) Be alert to your personal and business needs, in the same way that you don't neglect your opponent's needs.

j) Be flexible and able to quickly define mutual goals and interests.

k) Do not try to convince the opponent that his point of view is wrong and should be changed.

l) Develop creative alternatives that meet your opponent's needs.

m) Be cooperative because cooperation enables a favorable climate for solving problems in harmony.

n) Be competitive because this can help stimulate both parties to be more efficient in pursuing desired mutual benefits.

o) Understand that manipulation of people is incompatible with the goals of harmony resulting from cooperation and competition.

p) For Filha (2004) aAchieving one's own goals while making significant contributions to achieving the organization's goals.

3.9 E.D.I. (ELECTRONIC DATA INTERCHANGE)

One of the forms of purchase that is currently growing the most is EDI, technology for transmitting data electronically. Through the use of a computer, coupled to a moldem and a telephone line and with specific software for communication and translation of electronic documents, the client's computer is directly connected to the supplier's computer, regardless of the hardware and software in use.

Besides the traditional EDI, widely used by large companies, EDI via the Internet is gaining strength as a lower cost option, allowing access to more companies.

For Viana (2000) the use of EDI allows direct transmission of orders and data, great reduction of time, administrative and paper costs. EDI has been the preferred option for doing business for both small and large organizations.

3.10 ACQUISITION STRATEGIES

Filho (2004) states that the definition of a correct purchasing strategy can give the company a great competitive advantage. If on the one hand it decides to produce more internally, it gains dependence, but loses flexibility. On the other hand, if it decides to buy more from third parties to the detriment of in-house manufacturing, it can become dependent. In this case, it must also decide the degree of relationship it wants with its partners. Basically, we can have two operational strategies that will define the procurement strategies for material goods, verticalization and horizontalization. Both have advantages and disadvantages, and in general, what is an advantage in one becomes a disadvantage in the other, and vice versa.

3.10.1 Verticalization

Verticalization is the strategy that envisions that the company will produce internally everything it can, or at least will try to produce.

The main advantages of verticalization are independence from third parties - the company has greater freedom in changing its policies, deadlines and quality standards, besides being able to prioritize one product over another that is less important at the time, keeping with it the profits that would be passed on to suppliers and maintaining control over its own technology.

According to Martins et al (2006) the verticalization strategy also has disadvantages. It requires greater investment in facilities and equipment.

TABLE 1 - Advantages and Disadvantages of Verticalization

Advantages	Disadvantages
Independence from third parties	Higher investment
Higher profits	Less flexibility (loss of focus)
Greater autonomy	Increased company structure
Domain over own technology	

(Source: MARTINS, 2006)

3.10.2 Horizontalization

Horizontalization consists of the strategy of buying from third parties as many as possible of the items that make up the final product or the services it requires. So great is the modern company's preference for it that, nowadays, one of the sectors with the greatest expansion has been outsourcing and partnerships.

Among the main advantages of horizontalization are cost reduction - no need for new investments in industrial facilities; greater flexibility to change production volumes due to market variations - the company buys from the supplier the quantity it thinks necessary, it can even buy nothing in a given month; it can count on the suppliers' know-how in developing new products (simultaneous engineering).

As Martins (2006) explains, the horizontalization strategy also has disadvantages of not earning the profit from the service or manufacturing that is being passed on.

TABLE 2 - Advantages and Disadvantages of Horizontalization

Advantages	**Disadvantages**
Cost reduction	Less technological control
Greater flexibility and efficiency	You no longer earn the supplier's profit
Incorporation of new technologies	Increased exposure
Focus on the company's core business	

(Source: MARTINS, 2006)

3.11 PURCHASING AND SUPPLIER DEVELOPMENT

Before selecting a supplier the purchasing center specifies the desired attributes and indicates their relative importance. Then the candidates are evaluated on these attributes and the best qualified ones are identified.

Kotle (1998) states that we can use the Rating Scale Table as a generalized evaluative method.

TABLE 3 - Supplier Evaluation Scale

Scale of assessment					
	Weight of	-1	-2	-3	-4
Attributes	**Importance weak average good excellent**				
Price	0,3				X
Supplier reputation	0,2			X	
Product reliability	0,3				X
Service reliability	0,1		X		
Supplier flexibility	0,1			X	
Total score:	0.30*(4) + 0.20*(3) + 0.30*(4) + 0.10*(2) + 0.10*(3) = 3.50				

(Source: Kotler, 1998).

3.12 PARTNER" SOURCING RELATIONSHIPS

According to Pozo (2001) partner relationships in supply chains are seen as compromises between, vertical integration on one side, (the one who owns the resources supplied to you), and pure market relationships on the other side (the one who has only a transactional relationship with those who supply to you).

Viana (2000) states that they are defined as relatively long-lasting cooperative arrangements between companies, involving flows and linkages that use the resources and/or governance structures of autonomous organizations, for the joint achievement of individual goals associated with the corporate mission of each sponsoring company.

However, suppliers and consumers are expected to cooperate, sharing resources and skills, to achieve joint benefits beyond what they would expect to obtain acting alone.

According to Tamaki et al (2005) the adoption of a procedure, which establishes in a clear and documented way the means to conduct the purchasing process, can be an instrument to discipline and minimize the conflicts among the several agents of the process, delimiting the weak points through which deviations can happen. The adoption of a documented procedure is not the only solution to achieve a successful procurement process. The competence of the human resources and the personal principles of those involved have great influences in determining the desired level of effectiveness and efficiency.

4 IMPLEMENTING MATERIAL RESOURCES MANAGEMENT IN A STEEL AND CONSTRUCTION COMPANY

The object of the study is a service company in the Civil Construction segment, with average annual turnover of over R$ 1,000,000.00 (one million reais), around 50 (fifty) employees, engaged in the construction of buildings and metal assemblies, with its customer portfolio focused on serving the public sector.

4.1 MATERIAL AND METHODOLOGY USED

The analysis work was carried out at the company's headquarters and at one of its construction sites, both in the city of Barretos, accompanied by the responsible administrative engineer, with the support of the construction manager, and the participation of all the other company employees involved in each functional stage that is the object of study in this research.

To gather the necessary information, the following research methodologies were

used: personal interviews with those involved in the process to gather information about the execution and peculiarity of each job, participation in the routine of the company's daily activities through previously scheduled visits, internal analysis of documents, forms and methods used with the proviso that none of the documents or forms were attached to this work for reasons of corporate confidentiality.

Initially, all the company's departments were surveyed and analyzed for a better understanding of the processes and routines developed in the company's day-to-day activities.

4.2 RESULTS OBTAINED

After gathering all the necessary information, the results obtained will be presented in three (3) different departments.

4.2.1 Planning department

The planning department is considered to be the company's fundamental department in the realization of all the other stages of the production and purchasing process, because it is in this department that the physical-financial planning of all the work and services to be performed by the company is decided.

Main departments involved in the planning process: construction, purchasing, and financial.

Currently the planning department works as follows:

1st Stage: because we are dealing with service providers for public agencies, the specifications of the budget proposals are previously defined in terms of quantity of services (material and labor), minimum values and deadlines. All this information is established respecting standards defined by ABNT (Brazilian Association of Technical Standards) and governed by the Bidding Law no. 9666/93.

2nd Stage: After the entire process of analysis, appeals, and judgments (a phase that takes about 2 months), the company wins the bid, and then the planning of the work begins, since the service order for the start of the work is issued by the client with a deadline of 5 (five) days to start the work.

Site planning consists of the following tasks:

a) Studies of the projects for the elaboration of the necessary corrections and adjustments;

b) Preparation of analytical purchasing budgets;

c) Definition of the necessary hiring in each stage;

d) Definition of maximum terms and quantities of services to be executed in each period (physical chronogram);

e) Definition of the monthly measurement values;

3rd Stage: After a careful analysis of the needs, a package is then assembled, composed of a material cost spreadsheet for each stage of the work, a schedule of activities to be performed, labor cost spreadsheets, equipment cost spreadsheet, total cost budget forecast, adequate and corrected projects, defined initial contracting, and a purchasing schedule. This package is delivered to the purchasing and construction sectors.

4.2.2 Purchasing department

The purchasing department is what defines the main profit strategy of the company, responsible for negotiating 100% of the materials needed in the execution of a building. This department is driven according to the material needs of the construction sector. It is managed by the Civil Engineer, who develops the quotation, negotiation, and finalization activities of the purchases.

The work methodology developed by the department works as follows: after receiving the work folder from the planning department, the activities of purchasing the materials needed to start the work begin; during the execution of the work, internal requisitions are used to request materials from the construction sector, and negotiations are held to purchase materials of greater technical complexity.

The purchasing department also performs activities related to the transportation of materials and the contracting of some outsourced services, cost control of construction sites, inventory taking, control of the company's fleet and inventory.

The purchasing criteria adopted by the company are based on the lowest price, since the technical standards of the materials are pre-established in the initial proposal, not allowing the use of substitutes.

The classification of suppliers also did not respect the premises observed in chapter (five) of this work, being used only as a negotiation criterion the lowest price and the longest payment term, a fact that does not guarantee the quality of the materials.

The use of computer systems was restricted only to the use of Excel software to

control the consumption of material on site and the registration of prices paid per material.

The use of stock techniques, deliveries and supplier evaluation are not used by the company.

After the negotiation of the purchases, the effectiveness is done through a Purchase Order issued by the company containing the supplier's complete registration, technical data of the purchase and negotiated payment data, authorizing the purchase and issuing of invoices. The purchase orders are forwarded to the financial sector for payment scheduling and cash flow forecast.

It can be seen that there is no integration with the accounting sector for the tax issues that involve the sector.

The company's purchasing department has a well-defined interface with the construction department, which allows for better budgetary control of the projects.

4.3 RECOMMENDATIONS AND CONSIDERATIONS

Based on the results obtained from the surveys carried out in the company and based on the literature review in this article, the following modifications are recommended to the company's directors:

4.3.1 Recommendation for improving the performance of the planning sector

More agile definition by the edital purchase: to increase the deadline for the analysis of the technical file, clarification of doubts, and more careful analysis of the technical projects.

Use of more precise computer tools in the definition of the construction planning: after researching software suppliers, we suggest the purchase of software that allows, through analytical budgeting, the elaboration of more precise physical-financial schedules.

We also suggest the use of MS-Project software, which allows for greater control in the development of activities during the execution of the work.

In the budgeting activities it is noted that there are no deadlines for quotations, so it is up to the purchasing sector to keep the budgeters updated on prices. The use of the suggested software allows a better integration of the purchasing and budgeting sectors, since at the moment of purchase the values are already updated in the system, allowing the reduction of errors in the preparation of budgets.

In the hiring process we noticed a difficulty in the company in recruiting and

selecting labor, for this problem the use of specialized employment agencies suited the company's profile, because the use of labor in this type of activity is configured basically on a temporary basis or with a fixed term.

Hiring outsourced companies and/or professionals will make it easier to control the labor on the construction site and will make it possible to better execute the services in certain stages of the construction.

4.3.1 Recommendations for improvement of the purchasing sector

Definition of the purchasing and negotiation policy.

With the implementation of the system, the purchasing module allows better integration with the other departments of the company, including the financial and construction departments.

Work with the zero stock system according to MRP and JIT techniques.

Increase the number of quotations in the negotiations for the search for constant savings and allow the updating of the system for the budgeting department.

Define supply and delivery parameters, according to Table 3 - Supplier Evaluation Scale.

Increase the use of the Internet and e-mail in negotiations, reducing telephone costs and digitizing the documents required for the company's registration to be sent electronically.

Hiring of a purchasing assistant for the development of secondary activities in the purchasing sector, allowing the person in charge of purchasing to make better deals.

5 CONCLUDING REMARKS

In view of the above, materials management is very important to improve the results of a company. It is possible to affirm that correctly managing material resources helps a lot in the development of the work, in the increase of production and in the reduction of costs. Thus, by developing a simple model of material resources management, supported by a good computerized system, it will be possible to improve the decision making process, with regard to the acquisition and use of materials.

Therefore, by using materials management methodologies and tools, and by elaborating a simplified MRP process control, it is possible to perform a more effective materials purchase management, and by establishing a simplified management model, it allows for a significant reduction of the costs involved in the processes, and, as a

consequence, productivity improvement is obtained.

In short, the Management of Material Resources is a tool of great importance in construction companies, since it ensures greater agility in decision-making regarding purchasing, inventory control, distribution, standardization, deadlines, and costs, with a focus on quality and supply of materials.

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