DEFINITION OF A SUPPLY CHAIN MANAGEMENT MODEL IN CONSTRUCTION – CASE STUDY

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ABSTRACT

The purpose of this paper is to describe the implementation of a construction Supply Chain Management (SCM) tool that is being developed in a PhD graduation project. The project is entitled "Definition of a Logistics Network Model in the Construction Industry: Case Study" and is being carried out in **dst – domingos da silva teixeira, s.a.**, with the main office in Braga - Portugal.

The project under development aims to elaborate a detailed analysis of the logistic system of a construction company, which includes the processes of re-engineering for the logistic activities by developing appropriate methodologies, procedures and tools aiming the compression of time, eliminating waste and improving the global performance of the logistics network. All the information is being integrated into an Information and Communication System (ICS).

In order to improve the information flow, a software based on a single database that permits accessibly outside the company through a web portal is being developed.

The main aspects of the current work will be discussed in this paper, along with some preliminary results.

KEY WORDS

Supply Chain Management, Information System, Logistics Case Study, Construction Company.

INTRODUCTION

The construction industry is a project-orientated business, so the information flux is essential to its success. The implementation of a well-defined information flow between the operations site and the main office is an important part of the process.

In a large construction project there can be found hundreds of entities working together, so the information that flows between those entities must be reliable and in real time. An information system that can aggregate the information related with the needs of materials, equipments and work force is an important step towards a better supply chain.

The main objectives of the PhD project are:

- To elaborate a detailed analysis of the logistic system of the company, identifying the main gaps and constraints, aiming to define a conceptual model of its logistic network;

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- To plan processes of re-engineering for the logistic activities, to develop appropriate methodologies and tools aiming basically the compression of time, eliminating waste and improving the global performance of the company;
- To develop the integration of all the relevant information into an Information and Communication System. This will permit the development and implementation of an advanced decision-making support system that can promote significantly the coordination of the global logistic network of the company, including external suppliers, transporters and construction outsourcing companies.

A more strategic objective of the PhD project, in a socio-economical view, is to contribute to the improvement of the efficiency and competitiveness of the construction industry.

In order to optimize this information flow, a web-portal is also being developed. This portal is an entrance to the intranet information that exists inside the company.

This web-portal is part of an ongoing project of a definition of a logistics network in the construction industry, applying the principles of lean construction, particularly in the online monitoring of the project.

SUPPLY CHAIN MANAGEMENT

The Supply Chain Management (SCM) in the construction can be seen as the network of installations/resources and activities that provides added value to the final customer, in the functions of project design, contact management, acquisition/provision of materials and services, production and delivery of raw material and management of the installations/resources (Love *et al*, 2004).

Nowadays, enterprises are facing an environment changing at an increasing rate which forces them to adapt to change by introducing new approaches to business management. In the logistics area, a significant degree of innovation has been observed because of the increasing complexity and dynamics of markets. However, the construction industry has been slower than other industries in adopting new management strategies and there is relatively little evidence of the application of good logistics practices in this area. Empirical experiences addressing SCM in construction are reported (Vrijhoef & Koskela, 2000) and, since the construction industry is the largest industrial sector in the world, accounting for approximately 10% of the global gross productive effort (O'Brien & Al-Biqami, 1998), it seems that there is a great potential for improving.

Products of the construction industry are built up on the sites where they will be used and require a wide diversity of components and functions. The supply chain is characterized by a great diversity and number of specialists and materials in different places in a given time period. Projects are carried out by many parties (often hundreds) and there is a high degree of customization and outsourcing, in contrast to traditional manufacturing sectors (Kornelius & Wamelink, 1998).

In overall, there seems to be an intrinsic inability in the industry to accelerate its rate of performance improvement. In this respect, the Strategic Forum (2005) points out a series of obstacles that inhibit this industry effectively addressing logistical problems. This series includes:

- difficulty to identify who benefits with the potential improvements;

- high fragmented nature of projects and the frequent appeal from bigger companies to sub-contracting smaller ones;
- construction job is seen as a on-off project of short duration;
- lack of transparency in costs, decisions are often based on the cash-flow of companies;
- information is not accurately transmitted as it should be;
- lack of trust and confidence of managers on the performance of the supply chain.

Problems include peaks in arrival of materials, congestion and storage on sites, vulnerable stock and inadequate storage facilities, poor maintenance, uncontrolled on-site transport, need for co-operation with public entities, focus on price and time relegating quality to balance budget. Lack of overall insight by each construction project partner leads to improvised procedures; each one responsible only for its own work. Sub-contracting leads to complex relationships where no one has an integrated overview of the system – requirements and responsibilities are not clearly defined.

During the research, typical problems were found such as:

- warehouse management problems that were causing high oscillations in stock levels;
- deficient coordination of the materials expedition;
- distribution problems, as a result of a great dispersion of construction jobs;
- unreliable communication channels between construction site and central coordinators, the logistics centre.

MAIN DEVELOPMENTS

A Web-based system, like a web portal is being designed to allow users to access the information from outside the company. The portal (Figure 1) is designed in order to introduce information, such as requests of materials and equipments, fuel consumptions, etc, related to the construction sites and to generate reports based on that information. Its primary function is to eliminate the papers that were being used to inform the central coordination centre of the company. With this on-line information, managers are able to request something and get much of the information they need, in real time.

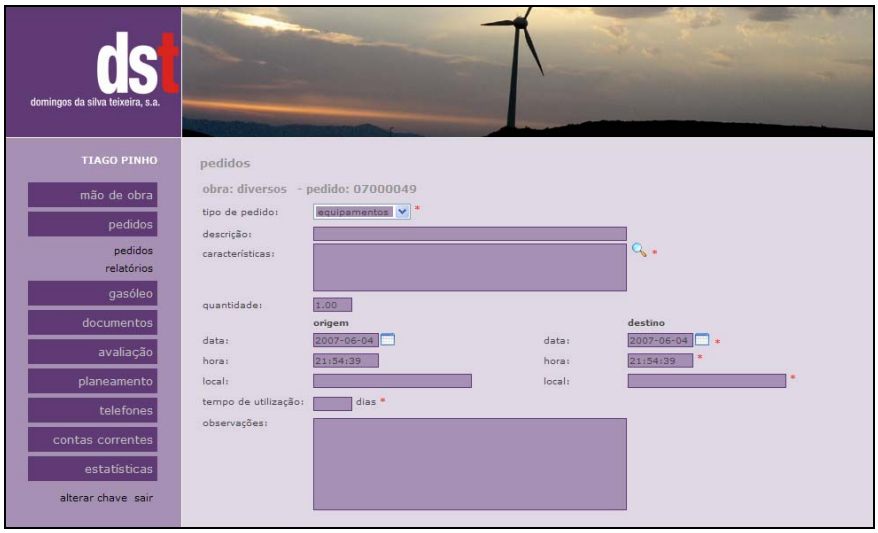

Figure 1: dst Web Portal

All the information used is stored in the main database of the company, which provides all users with the same information, without any errors or misinterpretation, since the information introduced and visualised in the portal is the same information used by the main program used in the company intranet.

The main characteristics of the portal are being developed in order to correspond to the needs of the intervenient of the company's supply chain so that the information could be available at any time and anywhere.

The principal features offered by the portal are (Figure 2):

- Ability to launch requests of materials: the portal connects to the main database and order processing system of the company, which immediately returns all relevant information about stocks and expedition details related to requests;
- Show the GPS position of the vehicles that transport the materials to the construction site;
- Ability to launch requests of equipments: the user selects the equipment, based on the characteristics needed;
- Ability to launch requests of transportation equipments: the user selects the vehicle, based on the characteristics needed;
- Ability to display the status of fuel consumption: the user can then manage the stock of the fuel stored on the tanks in the construction sites;
- Allows to perform project management, with the association of the resources (materials, equipment, work force) to the activities executed on-site;
- Ability to display the status of requests;
- Ability to generate reports;
- Ability to validate documents and generate official documents for transportation;
- Ability to evaluate suppliers (and clients to evaluate the company);

- Possibility to consult the stock available on-site;
- Possibility to consult information about external suppliers, e.g., information about their products (lead times, technical reports, technical drawings, etc.).

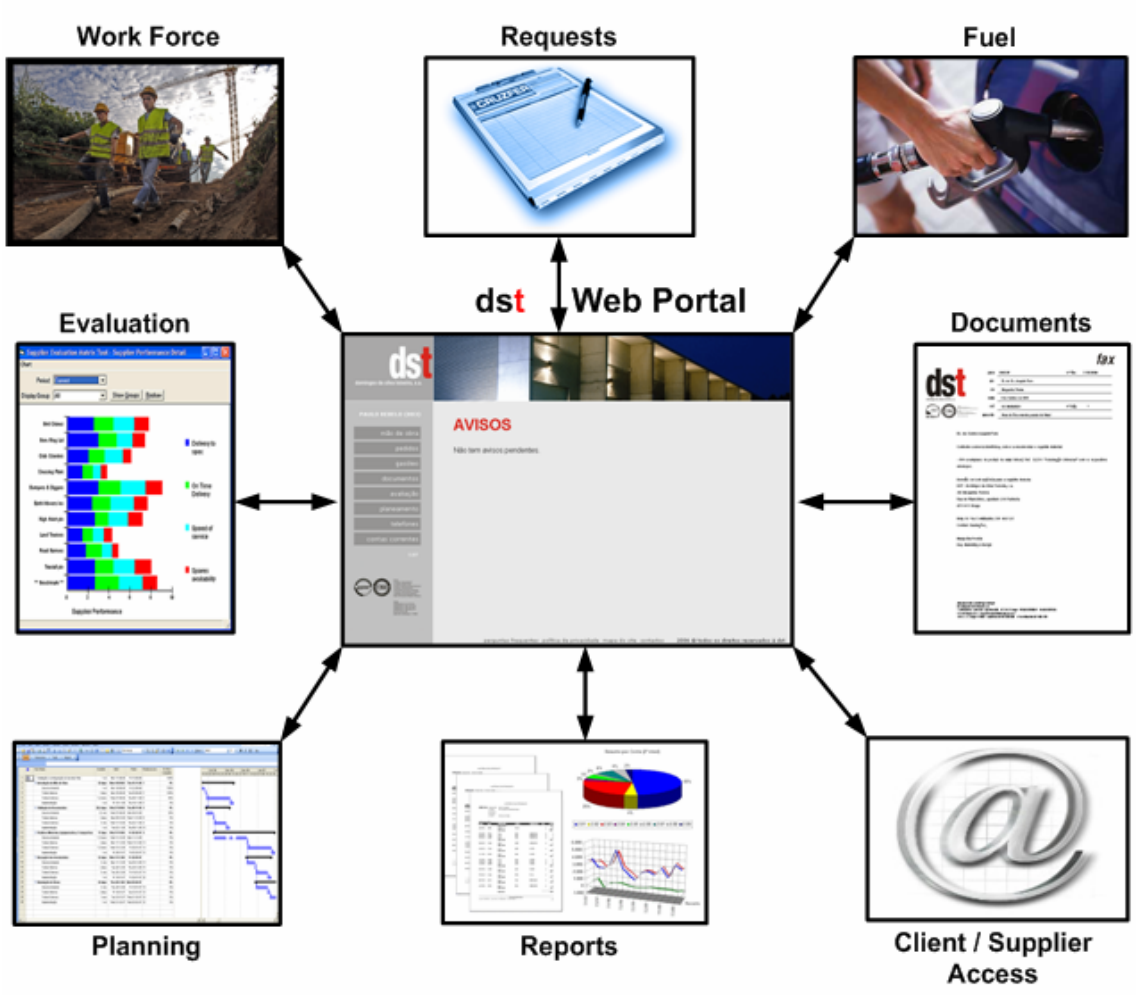

Figure 2: *dst* Web Portal (Pinho et al, 2007)

CONCLUSIONS

The main developments during the project are:

- re-engineering processes, creation of procedures and work instructions, conducting technical reunions, in order to obtain ISO certification of the logistics centre;
- development of a web portal, which serves as an information interface between the construction sites and the logistics centre, optimizing the communication and reducing the errors.

Now, the company has already implemented and integrated a fleet management system using GPS technology and a time clock/access control of the employees. As a result, the

information gathered is being used to allocate, more efficiently, costs to construction sites and to monitor their activities.

The integrated ICS software is being developed in order to meet the company needs, and specially, the logistics centre. The external access is made through a web portal, where the engineers can access real-time data regarding their construction projects, essentially, the requests, the workforce control, the fuel control and the economical position of the construction project.

In overall, the information flows and the efficiency of communication across departments and construction sites have been greatly improved, which allows that most of the warehouse and distribution problems are now less frequent. The construction sites can see which supplier is supplying the materials that they have requested and the expected time of arrival.

The next planned developments under the project include site activities planning and costing, information integration with the suppliers and customers, using electronic data interchange (EDI) and the implementation of a PDA access to the web portal.

ACKNOWLEDGEMENTS

This work would not be accomplished without the help of the *dst* Information Systems Department, namely Rui Caridade, Paulo Rebelo, Eva Lima and Sónia Freitas. A special note to the *dst* administration, in the person of José Teixeira, that provided all the tools needed for the development of this project.

This project is also financed by the FCT – Fundação para a Ciência e Tecnologia.

Last, an acknowledgement to the staff of the Systems and Production Department of the Minho University, in Braga.

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