

# Improving supply chain management information systems in public administration using a new theory

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## Abstract

This article describes the objectives and features of the proposed supply chain management information system. A new approach based on customer complaints will be the start of the of this information system operating cycle. The system is developed for a real case applied to public administration in order to optimize logistics flows.

**Keywords :** Supply chain management, complaints, information system, suppliers, customers.

## 1. Introduction

Supply chain management is an ongoing challenge for businesses, although it represents a significant financial investment. The main goals of Supply Chain Management are: reducing inventory, increasing the speed of transactions with real-time data exchange and increasing revenue by satisfying customer demands more efficiently.

Manufacturing companies have known that keeping too much inventory is a costly problem. There are several proven methods to keep it at a low level: by signing long-term contracts which provides suppliers with valuable financial security and confirms a level of commitment, by involving suppliers in the early stages of New Product Planning, or by using supplier's skills to improve the feasibility of product concepts and reduce production costs.

For each supply chain operation, a specific application must be developed in order to manage the flow of internal and external data used in its optimization. Computer applications allow proper raw materials and products inventory management and enable access to data in real time.

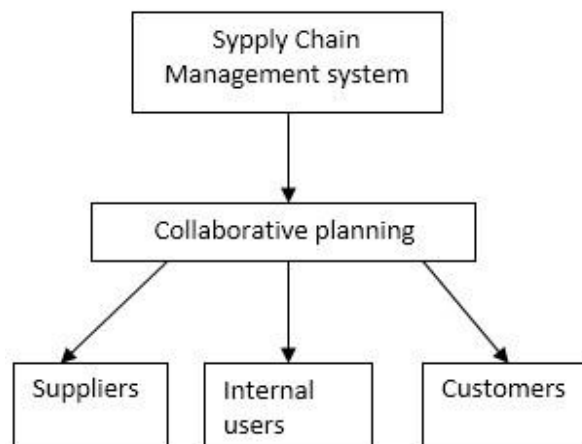


Fig. 1. : Real time communication system

The system establishes communication between the three actors in the supply chain: Suppliers, internal users and customers.

Customer satisfaction is the secret to SCM's process success , because it guarantees at least the maintaining of company's profits and increases its customers number.



Fig. 2. : Result of customer satisfaction

The implementation of supply chain management in public administration will help the government to better manage their data flow, improve the quality of delivered products, and reduce its budget procurement budget.

## 2. Problematic

Before or after putting a product in the market, few companies care about reviews and focus instead on their

internal processes, on the gain in cost, in execution time and in product quality but forget that quality is defined by customers reviews that express either their evaluation in respect of a particular product or service. Most of the time, this contact based approach is limited to a few surveys or claim boxes that are often neglected and undeveloped as they represent the key to continuous improvement of their products.

Most of companies deal with client complaints manually by following four key phases:

- Registration: This is to define the product or the service concerned and inform the subject of the complaint
- Analysis: This is the stage where the company must go to the root cause cause of the failure.
- Answer: Make a good response to the client
- Closing: close the claim and store it in the archive.

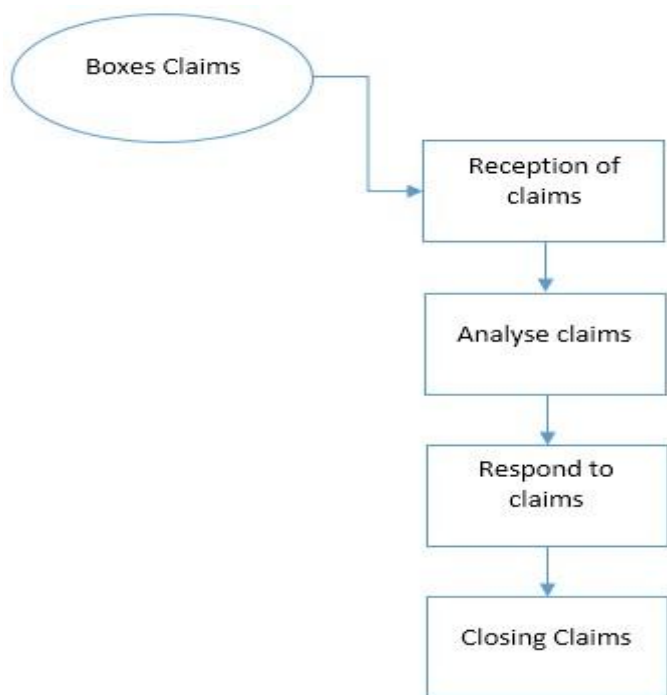


Fig. 3. : Usual claims procedure

It would be interesting to incorporate the procedure of customer complaints into the process of the supply chain in order to make the client a leading participant in an active way to improve the company's products and make financial optimization.

### 3. Benchmark study

In order to choose a new approach that a company could adopt to manage its supply chain, a benchmark of the most important methods of representation and flow management studies is needed. Among these methods :

- TPM (Total Productive Maintenance): TPM is designed to maximize the overall equipment effectiveness. It involves all departments that plan, use and maintain equipment, involves all employees from top management to front line workers [8]. The concept of TPM was developed in Denso, A tier one automotive supplier in the Toyota group of suppliers, during 1960s and 70s in Japan. The central thrust of the program was the complete elimination of the “six major equipment losses”. The key concept behind effective improvements was autonomous maintenance. The concept of overall equipment effectiveness (OEE) and focused improvement were found to be quite encouraging for success of TPM [1]

Equipment that does not operate well or is always breaking down causes more work for everyone and customer dissatisfaction. Production equipment not being able to produce products with normal equipment performance is due to six major losses [2]:

1. Equipment Failure Loss
2. Setup and change over loss
3. Startup Loss
4. Speed Loss
5. Minor Stops/Idling Loss
6. Defects/Rework Loss

OEE is a result that can be expressed as the ratio of the actual output of the equipment divided by the maximum output of the equipment under best performance condition. The Overall Equipment Effectiveness was originated from the Total Productive Maintenance practices, developed by S.Nakajima at the Japan Institute of Plant Maintenance, the aims of TPM is to achieve the ideal performance and achieve the Zero loss which means no production scrap or defect, no breakdown, no accident, no waste in the process running or changeover[3]

$OEE = Availability \times Performance \text{ rate} \times Quality$   
Optimizing the performance of equipment or an ancillary service is always ultimately maximizing profits.

- SCOR Method: SCOR model is generic and a quasi-standard model to the description and analysis of supply chains. The SCOR model uses three well-known individual techniques: business process modeling, benchmarking performance and best practice analysis and turned into an integrated approach. It comprises a complete set of supply chain performance metrics, industry best practices, and enabling systems [4].

SCOR method is based on five pillars:

- Plan: Processes include gathering customer requirements, collecting information on available resources, and balancing requirements and resources to determine planned capabilities and resource gaps.
  - Source: Processes describe the ordering (or scheduling) and receipt of goods and services
  - Make: Processes describe the activities associated with the conversion of materials or creation of the content for services.
  - Deliver: Processes describe the activities associated with the creation, maintenance, and fulfillment of customer orders.
  - Return: Processes describe the activities associated with the reverse flow of goods back from the customer.[5]
- Lean (English word meaning "thin").

Lean has become a strategic method for gaining competitive advantage and even for survival, not just for manufacturers, but also for retailers and wholesalers. Adding value and removing waste are no longer options for companies. Non-lean practicing companies face competition from foreign made goods—competition which can have significant impacts on their business and industry. Even lean practitioners understand that the effort to be lean is ongoing [6]. Among the methods adopted by the LEAN there are the famous 5S.

The 5S method begins each program of improvement. It is the tool for helping the analysis of processes running on the workplace. The 5S is the methodology of creation and maintaining well organized, clean, high effective and high quality workplace. Its result is the effective organization of the workplace, reduction of work's environment, elimination of losses connected with failures and breaks, improvement of the quality and safety of work.

The philosophy of the 5S has its roots in Japan. Name 5S is the acronym of five Japanese words of the following meanings:

- Seiri (sorting, organization of the workplace, elimination of unnecessary materials). Refers to the practice of sorting through all the tools, materials, etc., in the work area and keeping only essential items. Everything else is stored or discarded. This leads to fewer hazards and less clutter to interfere with productive work.
  - Seiton (set in order, place for everything). Focuses on the need for the workplace in order. Tools, equipment, and materials must be systematically arranged for the easiest and the most efficient access. There must be a place for everything, and everything must be in its place.
  - Seiso (shine, cleaning, removing of wastes, dust etc.). Indicates the need to keep the workplace clean as well as neat. Cleaning in Japanese companies is a daily activity. At the end of each shift, the work area is cleaned up and everything is restored to its place.
  - Seiketsu (standardize, constant place for things, constant rules of organization, storage and keeping cleanness). Allows for control and consistency. Basic housekeeping standards apply everywhere in the facility. Everyone knows exactly what his or her responsibilities are. House keeping duties are part of regular work routines.
  - Shitsuke (sustain, automatic realization of above-mentioned rules). Refers to maintaining standards and keeping the facility in safe and efficient order day after day, year after year.[7]
- SIX SIGMA: Six Sigma was created at Motorola in the 1980s. It is by many people seen as a statistically based and process oriented way to reach improvements by reducing variation and measuring the financial output of each driven project (Klefsjö et al., 2006). Six Sigma was not only inspired by quality work in Japan, but also influenced by ideas from Joseph Juran; for instance, the project-by-project approach and the use of capability indices (Juran, 1951; Juran and Godfrey 1999).[8]

DMAIC is the method used in Six Sigma to better manage the supply chain. It is the acronym for the different phases in the following figure.

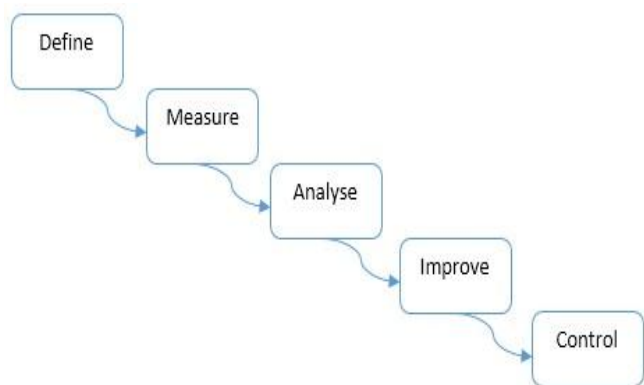


Fig. 4. : The five phases that make up DMAIC method

- Define the customer requirements, improvement activity and project’s needs.
- Measure the requirements.
- Analyze the process to determine root causes of defects.
- Improve process performance by eliminating defects.
- Control the improved process and future process performance.[9]
  
- Combination of Lean and Six Sigma is a powerful, proven method of improving business efficiency and effectiveness. In a nutshell, here are the key principles of Lean Six Sigma Business Transformation to bear in mind:
  - Focus on the Customer.
  - Identify and understand how the work gets done (the value stream).
  - Manage, improve and smooth the process flow.
  - Remove Non-Value-Added steps and waste.
  - Manage by fact and reduce variation.
  - Involve and equip the people in the process.
  - Undertake improvement activity in a systematic way.[10]

To perform a comparative study of different methods, a choice of indicators is needed:

- Human Resources: Level of organization and communication between individuals.
- Physical Resources: See if the machines, supplies, raw materials meet the requirement of high quality to minimize losses.
- Visual inspection: No one can replace visual inspection of verifying the presence of resources, consideration of problems on the ground ...
- Management of waste: By minimizing all types of waste costs are minimized and the quality of services and products are optimized.

- Customer complaints: Put the customer first focus ensures a good stability of the firm. In addition to claims help the company define its plans for maintenance and production.

Following the brief description of these different methods of supply chain management, we can sort on the Consolidated TABLE I hereunder, different approaches studied by the above indicators to measure the performance and the strengths of each.

The compliance degrees with performance indicators are:

WR: Well Respected

MR: Moderately Respected

NR: Not Respected

Table1. Comparative study of SCM methodologies

Criteria/ Method	TPM	Lean 6 Sigma	SCOR	Lean & 6 sigma
Management of waste	MR	WR	MR	NR
Physical Resources	WR	NR	NR	NR
Customer complaints	NR	NR	WR	WR
Human Resources	WR	MR	NR	NR
Visual inspection	MR	WR	NR	NR

Even if we chose the combination of both lean and 6 sigma methods it doesn’t satisfy the criteria needed for a good supply chain management.

#### 4. PROPOSED APPROACH

Following the comparative study described previously, we define a new approach based on respect of performance indicators already studied. The new proposed approach is a cycle called CSAP (CLAIM, STUDY, ACT, PROPOSE) It is based on the following steps:

- Claim: Defines the first step of the cycle of CSAP approach. The main objectives of this phase are: The collection of customer complaints, the definition of product demand, the definition of the problem, harvesting client proposals, receiving a problem description and a declaration of a new need.

- **Study:** After receiving the customer complaints, the company needs to study the data sent by the clients to analyze it and deeply study the problem. This step, which is represented by the word "Study" is the heaviest of those described in the CSAP cycle. This step is based on processing the data collected to have an idea about the quality of the product presented on the market. It should be based on statistical studies and dashboards to facilitate decision making and supply chain optimization. Indeed, the best way to analyze all customer complaints is to establish statistics to understand the claims evolution.

- **Act:** In this step, the company must take into account the different statistics and results to propose changes to its supply chain. If, for example, we found that 80% of customers believe that the quality of the product of a specific brand is low, then the company must work out a solution with the supplier.

- **Propose:** It is the final stage of CSAP cycle which allows the company to offer the product on the market after modification. The objective of this step is to push the client to test the new product, increase loyal customers numbers, reward customers who submitted their feedbacks, and convince them to help the company improve the quality of its products by show the importance of their inputs.

Choosing a cycle for Supply chain management process will better simulate all stakeholders of the company, especially if we integrate this cycle on the development process of information systems within companies. This is why we chose to represent the CSAP cycle as follows Figure 5:

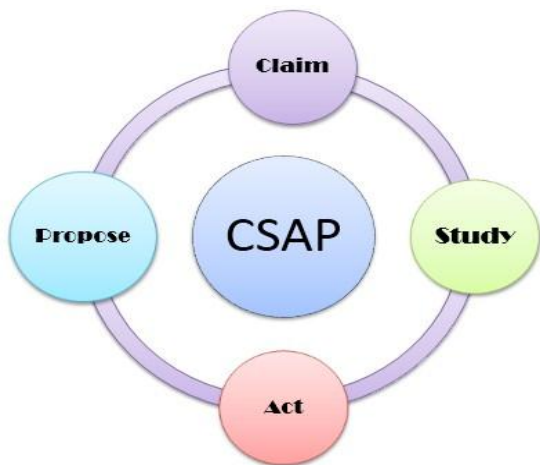


Fig. 5. Representation of CSAP cycle

For each step of the SCM cycle, we need to use some tools or proceedings that can help the supply chain manager to successfully implement all the CSAP phases. For this reason, let's sort the four steps with the corresponding proceedings in the Fig.6.

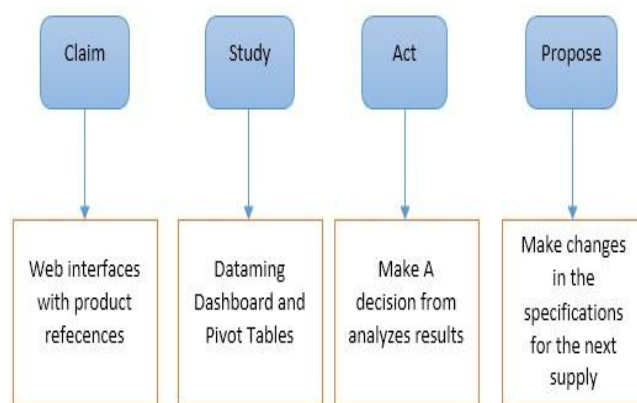


Fig. 6. Proceedings for each step of the CSAP cycle

In the first step of the CSAP cycle, the user of the information system (public administration employees) can fill out web forms and showing up the concerned product or service and the problem to fix.

The second step is about analysing the data collected from the information system users. The result of this phase is dashboards and pivot tables made about all the products and deliveries used in the company.

The third step help making decisions from 'Study' phase and all analyzes results.

The final step is an implementation of the recommendations in the supply chain. This is the step that proposes products and services again in their new form.

## 5. Implementation

Several software packages are available on the market to track the evolution of the supply chain, but the adaptation of the software to governments in Morocco and their evolution and improvement require a large investment (of consultants, delegation to the parent company, maintenance contracts ...) this update and these exorbitant costs can be avoided by developing an in-house solution that includes all the flows and processes necessary for the proper management of the supply chain within the Moroccan public institution, using highly developed technologies and management systems database that can treat very complex queries. It is possible to develop a highly specialized computer application that suits the needs of the public administration, without investing in expensive and complex softwares like SAP solutions.

The objective of this approach is to organize the flow of data, avoid waste, allow officials to declare their complaints freely and optimize the condition of the goods delivered by the suppliers. The application must manage the supply of products, supplies, inventory, and claims, propose new officials and also allows generating tables and dashboards.

To facilitate usability and access to information, the application can be divided in several modules:

- **Product Management:** Where an employee may record information about a product used in a



department. The user also has the option to delete or modify an existing product.

- **Supply Management:** This section contains the entry of shipments for each product by filling in the type of supply, the code of the delivery as well as many other details such as the date of delivery. Other operations can be done to remove or edit data delivery. A search will be made available to the user for a list of deliveries by type of supply (Order, market, Donation ...).
- **Inventory management:** This section brings together the addition of a new product assignment to a given entity. The user has the possibility to modify or remove an assignment. There will be also a part where you can see the list of remaining by product and history assignments entity stock.
- **Claims Management:** This part is the most important since it will allow the optimization of our supply chain by implementing an interface for all the public administration employees that will enable to record any type of claim regarding a product (consumable or durable). A user can also propose a new product and enter the description. Lists of claims and proposals will also be posted in this section.
- **Statistics:** This section is dedicated to everything that comes from the business intelligence and data mining, which gives an overall idea on several indicators such as the number of claims by type of problem, the number of complaints by product type (durable or consumable) or the number of claims by type of problem and division name ...

The computer application is given an accessible web interface via an internal computer network to a public authority created with Microsoft technologies. During the study, the proposed block diagram is divided into three main parts: the front office, middle office and back office.

- **The Front-Office:** Contains the various processes, workflows and scenarios logic of the application, the business intelligence (BI) and electronic document management (EDM) part, all accessible through the portal of public administration and linked to its Active Directory.

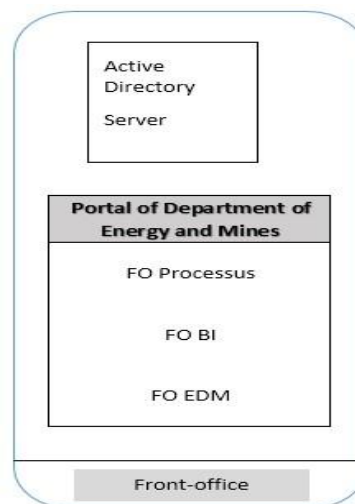


Fig. 7. Front-office representation

- **The Middle-Office:** Contains the server database and the application server of EDM, management system process and BI system.

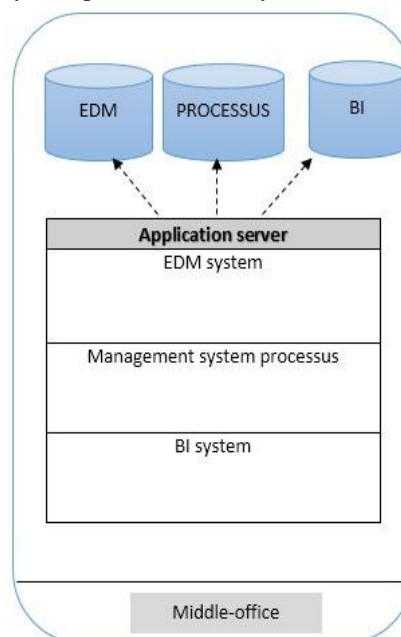


Fig. 8. Middle-office representation

- **The back-office** is made up of different components that represent the reference business of the administration and configuration of the implemented solution for professional references and BI fields.



Fig. 9. Back-office representation

The proposed computer application represents a tool for logistics management in public administration. The implementation of this new approach (CSAP) brings a gain in financial resources and quality of service since the considering claims of officials is the key to improvement and to enhancing availability of products and services for employees.

## 6. PERSPECTIVES

Among the prospects of this great project is to generalize the management of the supply chain for all areas and trades, and not to limit the study just to treat supplies and products. It would also be interesting to generalize it to the human resources management division, in order to manage the flow and treatment of several applications required by the officials

and to optimize annual holiday periods by studying the key performance indicators.

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