

# Implementation of Transactional Planning Systems for the Plastics Industry

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## Abstract

Transactional systems are an alternative process improvement for any industrial sector; however, due to the rapid growth of the plastics industry worldwide, this industry requires the automation of production with agile systems. This document presents a procedure to implement transactional tools of the Master Production Schedule (MPS) and Materials Requirements Planning (MRP) for the automation and control of the operations area processes in an organization. These processes are part of Enterprise Resource Planning (ERP) tools that use connections to mobile devices and are often compatible with different customer support systems, allowing the integration of all business units to interact with the manufacturing control and purchasing. The method used in the research have a quantitative cut in which 15 companies were studied in the plastics sector in Mexico and was divided in three phases, these focused on the revision of the business processes and the analysis of the substantive processes of the organization that allowed the subsequent establishment of proposals for improvement. In the final proposal of implementation of the tool transactional included: the functional analysis of the systems, the planning and their evaluation.

**Keywords:** Systems implementation, Transactional planning, Plastic industry

## 1. Introduction

Plastics or "polymers" are carbon-based products widely used in the world, world production in 2013 amounted to 300 million tons with a growth rate of 2.8% (Pérez, 2014). Although its excessive use has had negative environmental impacts (Alier & Jusmet, 2015, Orea & Villarino, 2015) it is important to point out that in addition to synthetic and semisynthetic plastics, there is the category of natural plastics that have a lower environmental impact (Mondal, Mondal and Bhaumik).

One of the outstanding features of the plastic industry is the advantage over the use of raw material 100% virgin or recycled that is obtained either externally or as a result of verification of quality assurance that provides products to different market segments. In this sense, it is essential that the manufacturing plants are equipped with modern technology to meet in time and form with the requirements and expectations of national and international customers and must conform to the high quality standards. Therefore, the systematization of the productive processes of this industry through planning and planning tools of requirements is relevant for the solution of needs in homes and companies.

Among the various units that make up a company, the operations and manufacturing units of plastic products are usually identified as the main area of opportunity of the plastic industry (Avila, Trejo, & Moreno, 2016, Sánchez & Jiménez, 2015; Romo & Reyes, 2014). This is due to the big number of factors involved in the Production Master Schedule (MPS) and Material Requirements Planning (MRP). MPS and MRP transactional planning tools are part of Enterprise Resource Planning (ERP) systems.

The practical advantages of implementing these tools lie in increasing the control of the company as they maintain a general vision with the obtaining of unique data, in the integration of key business processes, in their rapid adaptation to current and future requirements, in the processes standardization and in the connectivity with external systems that make the knowledge available in the market for the consultants.

Although planning problems intensify when this process is done manually, the implementation of transactional

planning tools, in addition to the complete and correct definition of finished product procedures, requires establishing and defining a strategy for the use of MPS tools and MRP that allow the control of the manufacturing processes, it is important to add in the procedure the purchasing unit due to the need to have raw material in a timely manner, as well as the integration of these modules with the systems that operate throughout the organization, such as customer service, payments and billing.

Therefore, the general objective of this project is to describe the process of implementing an information system or transactional planning tools that allow Master Production Planning (MPS) and the Material Requirements Planning (MRP) for the automation and control of the processes of the Operations area in the plastics industry. The tools must be compatible with ERP systems that maybe are operate in the companies.

Since the implementation process is an eminently practical activity, this document is structured through a brief theoretical revision of the transactional systems, to later present the methodology with which the systems implementation is addressed and the results obtained are presented. Finally, in the discussion section, besides the benefits, the limitations of the study are shown.

## **2. Literature Review**

An Enterprise Resource Planning (ERP) system “is an integrated software solution that spans the range of business processes that enables companies to gain a holistic view of the business enterprise” (Ehie & Madsen, 2005, pp. 546). Due to the use of an ERP system is considered as an important competitive advantage (Gamble, 1998), multiple companies worldwide have opted for its implementation. The most important benefits that an enterprise gets if they implement a whole ERP system are the reduction of inventory, the increase of productivity and the reduction of transport and logistics costs (Calisir & Calisir, 2004). In addition, ERP systems provide immediate intangible benefits such as internal improvement and customer service, or in the future as foresight and adaptability (Murphy & Simon, 2002).

### *2.1 Transactional Planning Tools*

The Production Master Schedule (MPS) and Material Requirements Planning (MRP) transactional planning tools are part of ERP systems, which are designed to automate most of an organization's core processes, from financial management to storage, procurement, human resources and logistics (Prouty, 2011; Sandoval & Mart ın, 2016). Its characteristics include the use of a centralized database, the integration of departments for the consolidation of processes and the operations of the company, the entry of data in a unique way (must be consistent and complete) and must have mechanisms of connectivity that allow and provide access to share information.

In order to maintain high levels of customer service, it is essential for a company to plan product manufacturing processes, an MPS system must maintain control of production and therefore can directly influence costs. Because it provides a link between material forecasting and raw material inputs, the MPS drives the MRP system, but constant adjustments in material requirements generate a broadly approached phenomenon called " schedule instability " or " MRP nervousness " (Herrera, Belmokhtar-Berraf, Thomas & Parada, 2016; Tang & Grubbstr ım, 2002; Xie, Zhao & Lee, 2003), so its correct implementation is a priority.

An MRP system is a formal tool for the manufacturing unit that relies on a BOM and identifies the specific materials or raw material needed to produce a particular item. In this way, the MPS accurately updates the inventory, records prices, available quantities, and determines the net material requirements. The dynamics of the MPS then allows you to update, modify or cancel existing product orders and maintain priorities in changing manufacturing environments (Umble, Haft & Umble, 2003).

When a company does not use transactional planning systems requires using applications with multiple interfaces, systems, platforms, heterogeneous technologies or general purpose systems such as spreadsheets (Frank, George, & Narasimhan, 2004). This requires transcription of data, transfer of documents on paper and generates duplication of information, lack of uniformity and difference of criteria and concepts.

### *2.2 Impact Factors on the Implementation of an ERP*

Successfully implementing an ERP system can generate costs of up to 3% of a company's total revenues (Austin, Cotteleer & Escalle, 2003). The empirical study of Ehie & Madsen showed a number of factors that impact on the successful implementation of an ERP. The factors mentioned are feasibility and the critical evaluation of ERP systems, project management principles, human resource development, business process reengineering, cost / budget issues IT infrastructure, consulting services, and top management support (2005, pp. 547). However solving these factors related to failure to implement ERP provides short, medium and long term benefits to companies.

This integration of Information Technology adds to the world trends of "Big Data" and the Social Customer Relationship Management (Di Benedetto & Kim, 2016; Heller, & Parasnis, 2011; Jung, Lehmkuhl, Küpper, Nierlich, Rosenberger, 2016; Orenge-Roglá & Chalmeta, 2016; Trainor, Andzulis, Rapp & Agnihotri, 2014) allowing the feedback of business information.

### 3. Method

This section presents the type of research carried out, the characteristics of the participants involved, and the stages in which the study oriented toward business process reengineering is divided.

#### 3.1 Participants

The research carried out is of a quantitative nature and has a descriptive scope, 15 companies representing the small and medium-sized plastics industry are identified, that generate products for the home and the industrial sector. The companies included in the study maintain a distribution of customers in the American continent, they are supported by supermarket chains and maintaining agreements for the export of their products.

#### 3.2 Procedures

For the definition of the process implementation of the transactional planning tools the research was divided into three stages:

Stage 1: Analysis of the characteristic organizational structure of the companies reason for the present investigation (David, 2003).

Stage 2: Review of business processes and analysis of organization substantive processes.

Stage 3: Proposal implementation of the transactional planning tools that includes the functional analysis of the systems, the planning of the implementation and its evaluation.

In stage 1 the information gathering is carried out in person through a directed interview and of the review of the mission, vision, objectives and organization chart of the companies. At this stage organizational structures are categorized and schematized.

The review of business processes and the analysis of the substantive organizational processes of stage 2 are oriented in the description provided by the members of the units of the organization and in the revision of the documents of the procedures of the Management Systems of Quality. After the analysis, the results are plotted with an "As Is" diagram scheme (Hernández-Nariño, Delgado-Landa, Marques-León, Nogueira-Rivera, Medina-León, & Negre-Sosa, 2016, Santos López & De La Cruz, 2014).

In stage 3, the proposal for improvement is diagrammed with a "To Be" scheme (Schmal & Olave 2014) in which the transactional planning tools are inserted with functional analysis and step planning. The evaluation of proposals can be carried out with a weighted matrix (Ramos & Rosaura, 2015) to efficiently make decisions.

### 4. Results

After analyzing the data and categorizing the information provided by the companies that have distribution in the Americas, the results were structured in three sections according to the Stages of the method on organizational structure, business processes and organization substantive processes, and the Proposal of process implementation. The general view of the organizations analyzed on the use of transactional tools is shown in Table 1.

Table 1. Use of systems or tools in the companies analyzed

Type of system	Number of Companies		Other archives or tools
	Yes	No	
Customer service	10	4	Spreadsheet
Payroll	11	4	Not specified
Sales	8	7	Spreadsheet
Control of payments to suppliers and Billing	14	1	System developed in the company
Production planning	3	12	Spreadsheet and system developed in the company
Stock	7	8	Spreadsheet
Product catalog	6	9	Spreadsheet and Web System

Source: Own elaboration

Table 1 shows that most companies do not use a system for production planning, stock control or a product catalog as this information is kept in separate files as spreadsheets that are not found connected to a database of orders or requests.

The use of independent documents for the production planning does not allow maintaining the control in the inventory since the updates of documents by the different business units are not realized in real time. This data mismatch does not allow accurate queries because the information is not unique during specific periods.

Among the consequences of the disarticulation of archives like the stock, is lack of the necessary materials to cover the orders of the clients in time so, the inadequate control has a negative impact in the area of sales resulting in economic losses and the inappropriate planning of the production. Another problem that arises from the independent management of archives is that the catalog of products is not kept adequately updated generating an excess of inventories since they are not sold in a timely manner; and sales are of paramount importance to maintain competitiveness.

In addition to the analysis in Table 1, it was also found that in the last years most companies have increased the volume of their sales and diversified both in their products and in the markets they serve, which has increased the production of its articles and the needs of control and automation of this area.

#### 4.1 Analysis of General Organizational Structure

The first step for the implementation of the tools that are proposed in the methodological process is the analysis of the data on the general organizational structure of the industrial sector in the area of plastics, this shows that the activities can be organized according to the following categorization: Management of Processes and Quality, Administration and Attention to Clients, Human Resources, Operations, Warehouse and Shipments.

In some cases it was identified that they use outsourcing as support in the processes of accounting, product promotion, maintenance, IT services and hiring of personnel. Although the literature considers as an impact factor related to failure to implement ERP, IT infrastructure in most companies this service is subcontracted. Table 2 shows a summary of the main activities of the organizational units identified.

Table 2. Overview of Organizational Units

Unit	Unit Sub	Main activities
General Direction		Revision of results, Definition of strategies, Planning, Design of new products
Administration and customer service		Coordinate sales and customer service functions on orders and billing
Human Resources		Establishes procedures and delivery of documents to the accounting area, defines in conjunction with the Management the commercial strategy, updates means of promotion and sale, updates price lists.
Processes and quality		Performs employee recruitment processes, maintains personnel control and training processes
Warehouse and shipments		Establishes and monitors audits and processes of product quality, maintains the procedures for introducing new products
Operations	Production	Control of inventories, assortment and shipment
	Molds	Produces product data sheet and schedules production. Control line and machines starts
	Purchases and materials	Establishes procedures for assembly and dismantling of molds, provides preventive and corrective maintenance to molds

Source: Own (From Romo & Reyes, 2014)

The inputs in the identification of the organizational structure were the organization chart of the companies, the job descriptions and the philosophical foundations of the firms; the philosophy is composed by the mission, vision, the objectives and the Institutional policies. According to the summary presented in Table 2, in addition to defining a

strategy for the company, the General Direction is the area in charge of the generation of new products. However, the dissociation of existing systems impedes a global view on the possibility of investing for innovation processes because it is isolated from the external context and global trends in raw materials and designs.

The area of Administration and customer service was identified as a weakness, since it is guided by a commercial strategy that is defined by the area of human resources and management, information on the needs of the clients would allow offering products or opening new markets. It is also important that the areas of operations and processes and quality are coordinated to define the production master plan with the aim of minimizing production times when it is necessary to perform machine and mold maintenance.

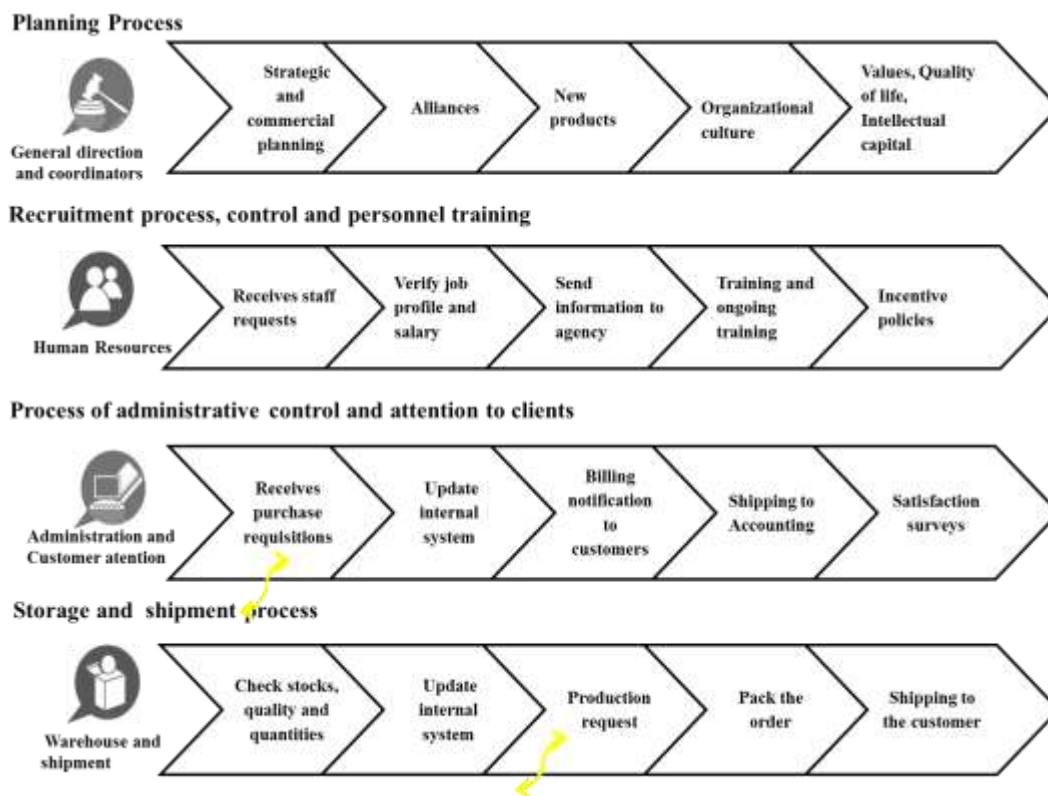
Among the strengths found in the companies are: the clear definition of strategic objectives and the appropriate organizational structure they possess, since in some cases there are coordinations that encompass different units and this allows them greater flexibility to modify and streamline processes.

4.2 Business Processes and Analysis of the Organization's Substantive Processes

The implementation of a transactional planning system requires the clear establishment of the business processes to achieve an accurate analysis of the organizational processes; this definition allows identifying areas for improvement, some of which can be resolved effectively without the need to implement systems. However, the analysis revealed that there is a high diversification of products, this explosion of product development arises at the request of specific customers and may be a result of the lack of identification of real needs of the market and inadequate controls of inventories.

4.2.1 Review of Business Processes

The purpose of processes review is to understand the objectives of the organization and determine what are needed to support those objectives. It is important to understand how can function an organization if the implementation of the transactional planning systems is carried out and verify that the requirements are fully understood, which allows projecting the future state of the organization in the medium and long term. This company Blueprint consists of a graphical view of its structure as shown in Figure 1.



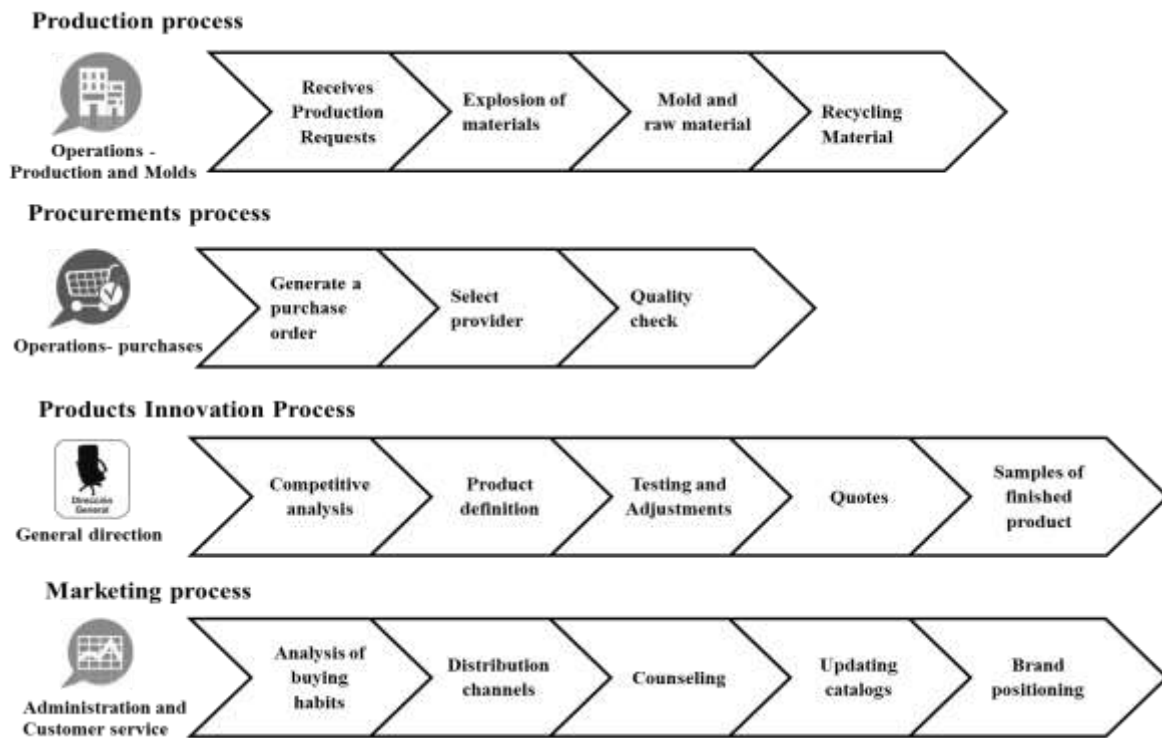


Figure 1. Schematization of business processes. Source: Own elaboration

The schematization that is show of Figure 1 is generated from the synthetic and representative analysis of most of the companies in which the study was performed. For each business unit the stages and the order necessary to complete a process are shown.

The schematization of the business processes was done in two ways: 1) direct observation of the processes in the company and 2) interviews with those responsible for the units identified during the previous stage (Table 2). In both cases it is essential to verify the documentation that underpins each of the processes (such as the organizational chart or internal policies).

Once the processes are identified, the synthesis of activities is essential for the design, it is recommendable not to exceed six the number of steps in each process to obtain a quick overview, it is also important to present the steps in an orderly manner, whenever this is possible, so that they work in accordance with the workflow, in addition, the connections that may exist between the activities of the processes must be established. In Figure 2 the connections found are identified as double flow lines indicating the existence of data and information exchange, as presented between the production request of the warehouse area and its reception in the operations area.

However, it is essential to make a general description of each one, such as the one presented in Table 3, with the purpose of identifying its purpose and reason for existence.

Table 3. Description of business processes

Proceso	Activities
Planning	The Directorate-General and the Coordinations, by means of the results review, defines the commercial strategy, prices and alliances, as well as customer requirements, the production plan, the introduction of new products and the organizational culture for the quality of life and The values of the intellectual capital of the company. Review of results, Definition of strategies, Planning.
Recruitment, control and training of personnel	For the recruitment of personnel, the requesting department sends a request to Human Resources (HR) and this in turn channels it to the General Directorate (DG) for authorization. Once the hiring is authorized, the description, requirements, position profile and salary are sent to a recruitment agency, who presents the candidates to HR and interviews are conducted in the requesting area. There are ongoing training processes; As well as policies of incentives to the personnel according to their performance. Work climate surveys are sent to the coordinators.
Administrative control and customer service	When customer service is done by system, they clients check the products online and download order request formats. The order request and the information are consulted in warehouse and Shipment are captured in System, in case of not having sufficient existence, a document of pending order is generated. Billing and customer notifications are made and customer satisfaction surveys are performed.
Storage and shipping	The existence, quantity and quality requested in the order to prepare the finished product and the defined presentations are verified, the order for shipment is packaged, the characteristics of the product are documented and it feeds the information in system for the control of warehouse and the monitoring of the shipping to the customer. The orders to be supplied by the production unit are checked.
Production	The production area receives a request, a program and an order from the warehouse department. Operations check the availability of the mold and raw material required for production in a spreadsheet file and updates the raw materials inventory. Once the process is finished, the Quality unit verifies the product, if it meets the requirements, it is sent to the Warehouse area. If it does not meet the requested quality level, the product is recycled through a crushing process for its subsequent use, and added to the available raw material. The production processes are controlled in spreadsheet files for the time control and explosion of materials.
Procurements	Generates a purchase order (pet, pigments, labels or molds), selects the supplier and once received the raw material verifies the specifications of quality and quantity.
Product Innovation	By specific request, by competitive analysis or by reuse of old molds with new characteristics, the management defines a new product, orders the molds and accessories, tests and adjustments are made, the product is authorized (name, colors, packaging and presentations) , Materials are listed, samples are taken of the finished product, the information is captured in the system, the promotion strategy is defined, catalogs, WEB page and price lists are updated and a production program is carried out.
Marketing	There are companies with more than 350 variations of articles so they require analysis of buying habits. The strategy most commonly used by DGs is to keep wholesale distributors as the main distribution channel, visiting key distributors and advising on purchasing decisions. With the clients of self-services and those of North America and Central America contacts are maintained by telephone and email. The catalog of products is loaded on the companies' websites; most are shown in Spanish and English.

Source: Own elaboration

The review of the business processes is indispensable to identify the areas of opportunity of the company and to perform a successful reengineering before to the implementation of a transactional planning system; the descriptions shown in Table 3 must correspond faithfully to the schematization of the processes and be reviewed by the involved areas to discard errors. Table 3 represents an invaluable input in the systematization stage, so it was verified and corrected by each business unit to maintain a general agreement.

Since there are factors that negatively impact on the successful implementation of planning psystems such as human resource development or top management support, the validation of these descriptions generates links between the project and those responsible for the areas that guarantees a commitment aimed at concluding the project.

From the elaboration of Table 3 with the description of the business processes, the substantive processes of the organization are determined which makes feasible the incorporation of transactional planning tools.

4.2.2 Analysis of the Substantive Processes of the Organization

Una vez establecidas las Description of business processes se deben indentificar los procesos sustantivos de la organizaci3n, en este sentido

The general substantive processes where an improvement is proposed for companies include the following areas: Sales and customer service, Warehouse and shipments and Operations; these are shown in detail in the process diagram (AS IS) of Figure 2.

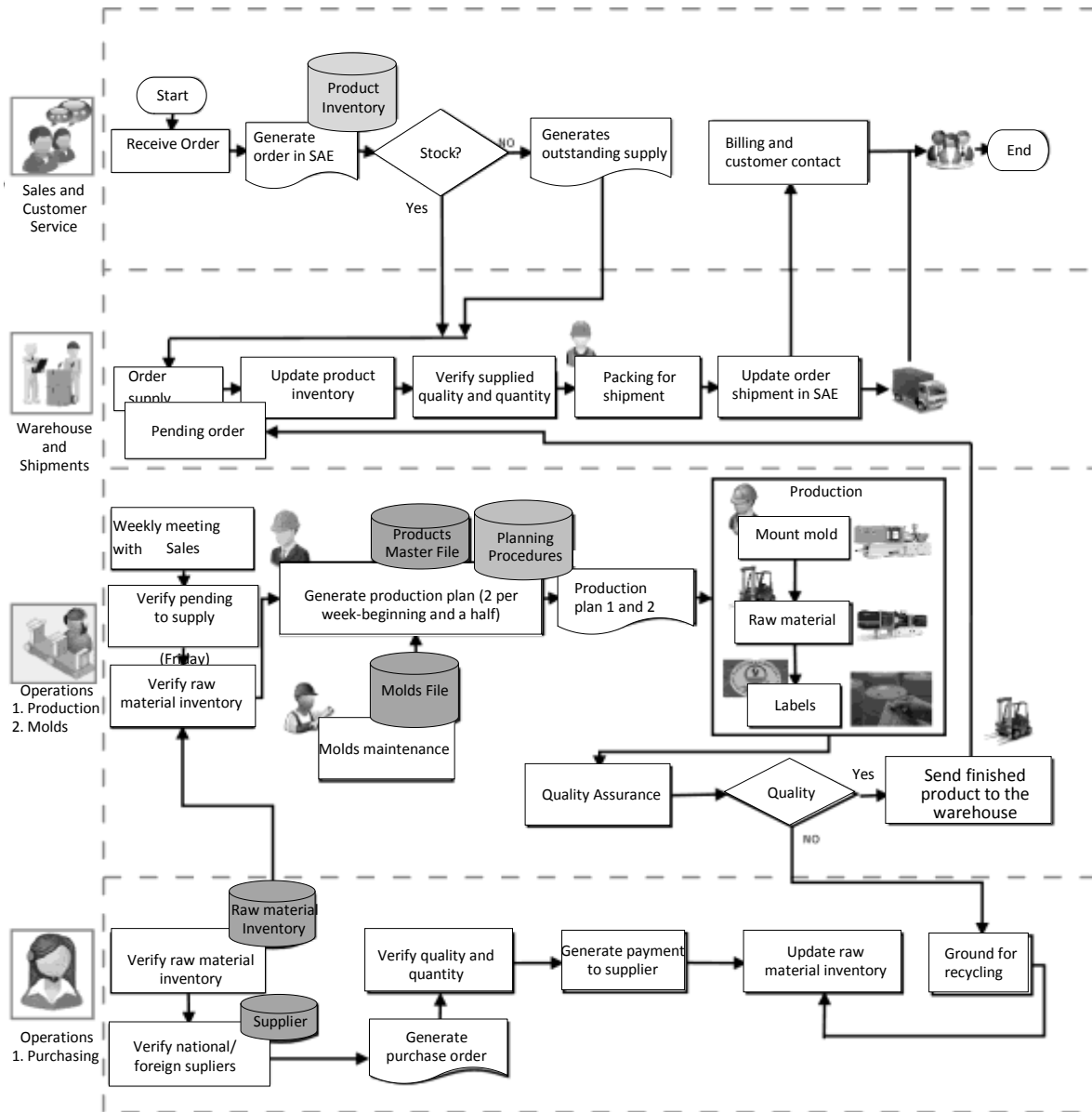


Figure 2. Diagram of the substantive processes of the organization "As Is". Source: Own

In diagram of Figure 2 there are six important tables closely linked between the units of the companies: product inventory, products master file, planning procedures, molds file, raw material inventory and suppliers, these tables must maintain updated records of the data that circulate throughout the organization so they must be controlled through a database.

One of the first checks to be made when receiving an order from the area of sales and customer service is the existence of products in the stock, this way the warehouse area and shipments can fill and pack an order expeditiously. The inventory update should be done immediately (as shown in the diagram), although this activity



seems fundamental, during the verification of procedures companies were found that update the inventory once the order of shipment has been issued, and this generating data discordance in the inventory since warehouse could try to send an order without having products in exist.

Among the important findings identified during the analysis and diagramming stage was the double planning of production, which should be reschedule twice a week due to the lack of linkage between the orders and the products master file, which could be a significant change for companies during the reengineering of processes. The complexity in its realization lies in the interaction of multiple archives, such as the availability of molds or the inventory of the raw material.

Description of the processes shown in Figure 2 is presented in Table 4, which details the activities performed by each business unit as well as the areas of opportunity found.

Table 4. Description of the substantive processes derived from Figure 2.

Unit	Process description	Opportunity areas
Sales and customer service	Once an order is received, the personnel in this area register it in a System considering the existence of the same in the Product Inventory. If the product is available the request is sent to the Warehouse and Shipments area to be stocked. If the product is not available, a "Product to Surrender" notification is generated and must be checked weekly with the Operations area. The billing and contact with the client is done as a closing of this process.	<ul style="list-style-type: none"> <li>• Establish statistics on the most demanded products found in the "Outputs" to generate valid information that contributes to better annual production planning.</li> <li>• Generate customer statistics with higher incidence of pending orders.</li> </ul>
Warehouse and shipments	The order is verified; the Product Inventory is supplied and updated. The staff is in charge of verifying the quality and quantity supplied packing and updating the order sending in System to contribute to the billing process carried out by the Sales and Customer Service area. When there is not enough product and is "Product to be supplied" is expected the end of its production by the Operations area for the subsequent packaging and shipping to the customer.	<ul style="list-style-type: none"> <li>• Establish times of delivery of the "Products to be delivered" that allow greater monitoring and attention to customers by the Sales Unit.</li> </ul>
Operations 1. Production 2. Molds	The frequency of meetings with sales has been established on a weekly basis with the objective of verifying the pending issues. An engineer performs the Master Production Planning twice a week considering raw material inventory, production master file, planning procedures and mold file. In the production process the mold is assembled, the raw material is transferred to the production line area and quantity of necessary labels. At the end of the process the quality of the product is verified, if there is rejected product is crushed and recycled. Otherwise, it is considered in optimal conditions to be inventoried as finished product and it is transferred to the Area of Warehouse and Shipments to fill the Pending Order.	<ul style="list-style-type: none"> <li>• Automate the process of transfer of raw material by installing pipes in the roof to eliminate the use of forklifts.</li> <li>• Use of one system for Master Production Planning (MPS) and Material Requirements Planning (MRP).</li> </ul>
Operations 3. Purchasing	The inventory of necessary raw material is verified by the area of Operations in Production. Here are verified the national and foreign suppliers whom are generated Purchase Orders. Likewise, the amount and quality upon receipt is verified, and payment to the supplier is subsequently generated. In case you have received recycling material you must also update the Raw Material Inventory.	<ul style="list-style-type: none"> <li>• Use of the Material Requirements Planning (MRP) system to perform raw material acquisitions and statistical sales data.</li> </ul>

Source: Own elaboration

The main problems identified during the description of the substantive processes was that the current control of materials and molds is implemented through and molds master file that is updated in spreadsheets and the double planning of production.

The generation of Table 4 allowed detailing the processes through general descriptions that result in the definition of a set of improvement areas for each business unit. This definition contributes to the decision making in those areas that require an immediate attention.

### 4.3 Implementation Process of Transactional Planning Tools

In addition to the analysis presented in the previous section, the decision on the reengineering of the processes subject to modification must be taken considering three aspects. First, what are the objectives of the company and what do you want to get with the planning tools. Second, what are the areas of opportunity that you want to attend immediately and third, what kind of tools can be implemented based on a cost / benefit analysis.

Proposal of implementation of the transactional tools includes the functional analysis of the systems, the planning of the implementation and evaluation. As a starting point, a general solution is proposed, divided into two phases. In the process diagram (TO BE) of Figure 3 is presented Phase 1.

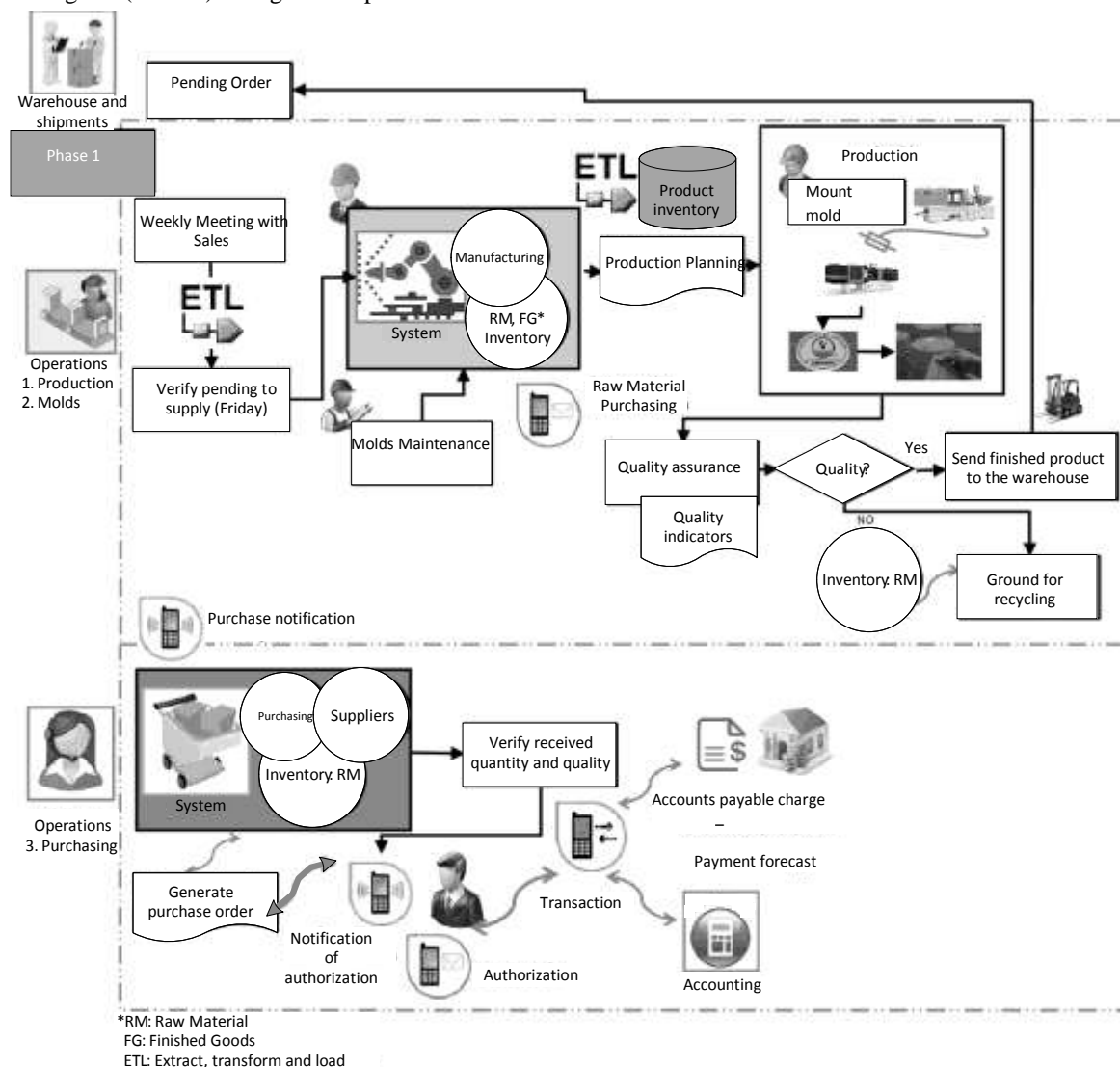


Figure 3. "To Be" Diagram of implementation Phase 1. Source: Own elaboration

The re-engineering presented in Figure 3 is detailed in two sections corresponding to the production process and the procurements process:

1) *Production process.* The production unit meets weekly with the sales area to verify the slopes to be supplied,

because the difference between the systems requires a process of extraction, transformation and loading (ETL) of the orders that allow updating an ERP system.

Production planning is done in the manufacturing module where raw material and finished product inventories are updated, alarm (message or ticket) is sent to the Purchasing area for verification or purchase of raw material. The reverse process of ETL is performed for the finished product inventory to which the Sales and Warehouse areas have access. Once the manufacturing process is completed, the Quality unit verifies the product, if it meets the requirements, it is sent to the Warehouse area for packaging and shipping to the customer. Products that do not meet the required characteristics are recycled by a crushing process for later use; the material is added to the raw material available.

2) *Procurements process.* The Purchasing area receives notification to verify the existence and stock of raw material in the system, a purchase order is generated (pet, pigments, labels or molds) according to the best option of the supplier. An alarm or purchase authorization request is sent to continue the process by receiving confirmation and setting payment forecasts in system. When the material is received, the quantity and quality are verified in system for assignment to supplier accounts, banks and accounting.

It is important to note that among the objectives defined by the companies were the following:

- a) Maintain wholesale distributors as the main distribution channel,
- b) Maintain commitments of delivery periods to customers and,
- c) Generation of special orders

In order to maintain alignment with the objectives of the companies, the implementation of changes in the Operations unit should positively impact the Sales and customer service unit, so in the process diagram (TO BE) of Figure 4 Presents implementation Phase 2.

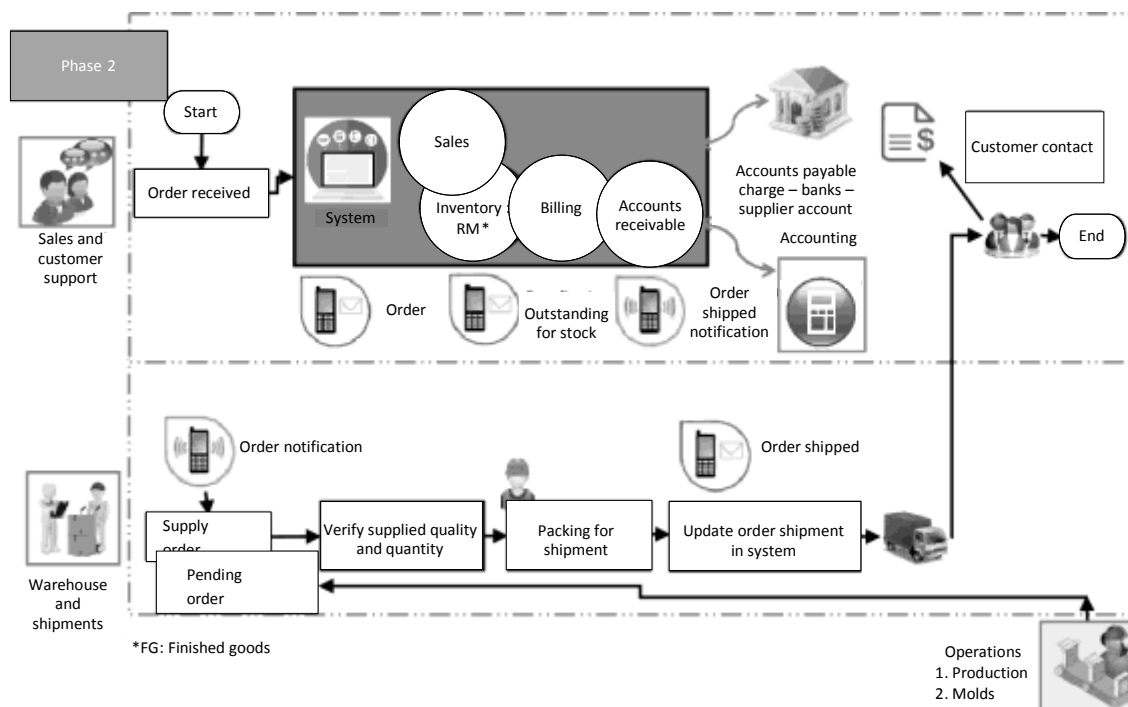


Figure 4. "To Be" Diagram of Implementation Phase 2. Source: Own elaboration

In phase 2 identifies the feasibility of scaling the ERP with the implementation of a CRM module of the same supplier that manages a single database and integrates all the business units:

1) *Process of administrative control and attention to clients.* With a CRM system the Sales area can capture a customer order from any device on the system. The notification of an order can be dealt with in Warehouse and Shipments, in case of not having sufficient existence, a pending request is generated. Billing and customer notification processes can be automated to affect accounts receivable and accounting. This area should conduct customer satisfaction surveys.

2) *Storage and shipping process.* It verifies the existence, quantity and quality requested in the order to prepare the finished product in the defined presentations, pack the order for shipment, document the characteristics of the product and update the shipment in the system for warehouse control and traceability. The production notifications are verified on the pending orders to be attended.

The final implementation of the ERP or transactional planning tools will allow management to be informed about the overall processes of the company. The integrated process is described in Figure 5.

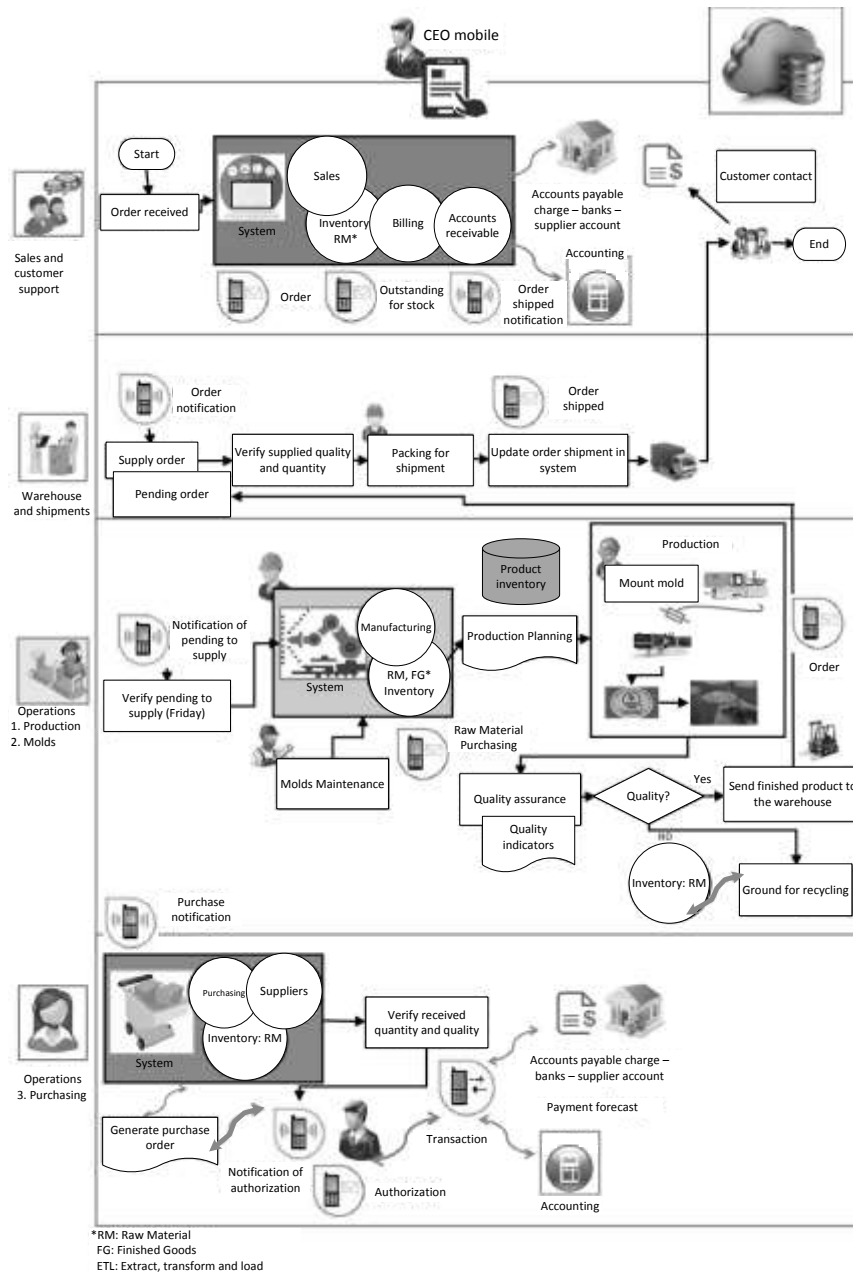


Figure 5. Integrated 1 and 2 phases of implementation process. Source: Own elaboration

Once the documentation of the process model generated is available, the implementation Phase begins with the evaluation of systems by means of an array of weights, table 5 shows an example for the analysis

Table 5. Example of the application of a Matrix of weights for evaluation of commercial transactional tools

Characteristic to evaluate	Weight	Transactional tool x1		Transactional tool x2		Transactional tool x3	
		Qual.	Score	Qual.	Score	Qual.	Score
Functionality	8.3	3.5	29.0 5.0	3.5	29.05	4	33.2
Implementation time	1.7	4	6.8	3	5.1	3	5.1
Commitment	5.0	4	20	4	20	4	20
Experience	1.7	4	6.8	5	8.2	4	6.8
Support	8.3	4	33.2	5	41.5	3	24.9
Integration	6.7	5	33.5	4	26.8	4	26.8
Trend of the Company.	3.3	5	16.5	3	9.9	4	13.2
Total Points	30		145.85		140.85		130
Total Coverage (maximum score to get: 175)			84%		81%		75%

Source: Own elaboration

The construction of the matrix is done by establishing a series of characteristics to evaluate that are important for the company or the industrial sector, in the example of Table 5 there are 6 characteristics but also the cost of the transactional planning tool could be included. The weight is established according to the importance of the characteristic to evaluate. The sum of the weights is divided by the total of the characteristics and represents the maximum qualification that a tool could obtain in that area. The total Coverage is determined from the sum of the weights by the maximum ratings; in the example the maximum score is 175. The points result from the rating obtained by the weight originally assigned and the total percentage of coverage of each tool that is the Sum of the points between the maximum score.

The supplier must deliver the general characteristics of the tool before the analysis and once selected, the supplier must deliver a base system or prototype according to the analysis of the company processes, and the end users are responsible for verifying the prototypes and make the necessary adjustments to configuration.

In this phase of the project both horizontal and vertical system tests are defined, which are defined as integration test cases that determine the target business environment and provide a basis of confidence about the system's ability to manage the company. Each and every one of the tests is validated by the users or holders who are responsible for the business processes. When the necessary approvals are obtained, the following activity can be continued within the implementation methodology, it consists to train the end users and test the system with the data of the productive areas. The tests include the procedures and programs of conversion and the volume and load of the system.

## 5. Discussion

Because of the importance of transactional systems, there is sufficient information on the procedures for establishing the structure of the implementation team, selecting a transactional system, managing it efficiently, or measuring organizational impact (Chiesa, 2004; Jalil, Zaouia & El Bouanani, 2016; Kossmann, & Kossmann, 2016; Ripamonti, Ripamonti, Galuppo & Galuppo, 2016; Vera, 2006). However, this study focuses on the revision of organizational structures and the analysis of the substantive processes of the companies functioning as a guide to enable process reengineering.

According to the theoretical review, when no transactional planning tools are used in a company, heterogeneous technologies are used to solve problems in each area, as shown by the analysis of results, since in this study it was found that in the plastic industry most firms employ systems with multiple interfaces to control processes such as payment to suppliers, customer care or inventory management, generating problems such as duplication of information, lack of uniformity and difference of criteria and concepts.

In this sense, the disintegrated vision of the companies is due to the fact that their entire operational process is

segmented into independent controls for each business unit, losing the advantage of the holistic view of the business enterprise provided by the transactional systems. Therefore, one of the practical advantages of this proposal is the use of mobile devices to send notifications about the updating of information between processes that allows keeping management informed and provides a quick view of the transitions for all areas.

Although the review of business processes and analysis of organization substantive processes is complex, it is also an indispensable resource for the implementation of a transactional planning system. The dynamics generated during the review and correction stages of business processes with areas managers brings the additional advantage of staff involvement in the reengineering process, which contributes to mitigating negative impact factors on employee resilience and maximizes the success of the implementation and later use of the tools.

Because the proposal for the system implementation process focuses on reviewing and analyzing the organizational structure of companies, a large number of factors like human development, adjustments in organizational charts, investment, infrastructure, or errors in the systems that may be present during the stages of implementation and adjustments are not addressed.

Nevertheless, the study identified that there are companies that lack the necessary IT infrastructure to provide a sufficiently robust support for the proper operation of transactional systems. These companies, usually micros, solve their problems by using independent files, which has gradually deteriorated the attention to their customers due to delays in deliveries, so that, despite existing a large market for the marketing of their products, the companies are being less productive and become less competitive.

Although the reengineering process must be carried out in a particular way in each company based on its characteristics, philosophy, structure and processes, this study represents an important contribution from the practical point of view since it presents a generalization of manufacturing processes in the plastic industry. This assertion is based on the identification of related problems identified in the companies belonging to the same sector. Therefore, the results of this research can be used as a comparative practice guide to perform reengineering exercises in the plastic industry or in other sectors with manufacturing characteristics of transformation of primary and secondary materials similar to plastic as the manufacturing industries of glass or metal products.

The process of implementing a transactional system in plastic industry can be synthesized in three fundamental sections focused on a company or a sector through the generalization of components: a) Analysis of the organizational structure of the company, b) Review of the business processes and analysis of the substantive processes, and c) a proposal for implementation once the areas of opportunity of the different units that make up the companies have been identified.

The implementation of transactional planning systems improves the business processes by integrating the information. This process allows companies to consider the external context for the definition of business strategies and innovation processes it is expected that the process described in these paper functions as a guide that will overcome the resistance to process automation in the plastics production industry.

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