



DATA WORKFLOW MANAGEMENT

Case study: Alumil S.A.

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I hereby declare that the work submitted is mine and that where I have made use of another's work, I have attributed the source(s) according to the Regulations set in the Student's Handbook.

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Abstract

This dissertation was written as part of the MSc in Management at the International Hellenic University.

The problem that exists and contributed in the writing of this dissertation is the lack of efficient management systems of data workflow in enterprises. Especially in large companies, where the amount of information needed in every application is large, the request for operational management has increased.

The scope of this dissertation is to extensively analyse the research and findings of workflow management, to highlight the impact of in in a company and to try to apply a change in data workflow of a company in the Greek industry, Alumil S.A.

The approach that is used is the theoretical analysis of the already existing literature, the analysis of the management systems on the company Alumil and the application of an improved solution for optimization. The solution is based on the systems of data management that are used in Alumil S.A and how the process of placing an order can be more time and money saving.

The contribution of this dissertation will be to propose the solution to the company, so as to be applied in real time and to succeed efficiency and effectiveness in the workflow management systems.

I would like to thank my supervisor Dr Korina Katsaliaki, who was helpful and present during the period of the dissertation writing. Also I would like to offer a special thanks to ALUMIL SA and all employees that provided the necessary information.

Keywords: Workflow, Workflow Management Systems (WfMS), Enterprise Recourse Planning systems (ERP), E-Commerce.

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1 INTRODUCTION

Over the years, organizations and enterprises have been dealing with a lot of competition at global level. In order to be successful, each enterprise has to find out ways to be more cost efficient and more flexible in developing new services and products. The fundamental elements of an organization are its information systems and its processes. These two have to change and be improved so as the business to maximize its output and gain competitive advantage.

Workflow technologies contribute, by providing software solutions, in the automation and optimization of specified business processes. Workflow and workflow management has been used as solutions for businesses in complex environments. The past years special interest have been given in Workflow Management system and Enterprise Resource Planning systems, both of them have improved the procedures.

The question is how the existing systems will be combined so as to progress all procedures needed in a company and whether more advanced software systems can manage a company's data workflow. These points are crucial for the viability of the company.

1.1 Objectives

This study aims to analyse the operational procedures of a manufacturing company. Specifically, all data and research will be applied in the company ALUMIL SA.

The study can be summarized in the point below:

- How can the business processes be reengineered so as to achieve optimization.

- Can become the data workflow more automated so as to generate workflow implementation?
- What may be alternative scenarios, either an improvement of the existing systems or generating a new one
- What are the quantitative benefits of the recommendations? Duration of the procedures will be measured, analysed and evaluated.

1.2 Outline of the report

This report will be organized into four main chapters and an appendix. In more detail:

Chapter 2 presents a literature review regarding the main concepts of data workflow management, what studies have taken place and what progress has been done since now.

Chapter 3 provides an overview of the company Alumil S.A. The structural organization of the company, the main management systems that are used until now and description of the procedures is applied.

Chapter 4 is the methodology chapter, in which methods and tools that used to analyse the case study Alumil SA is described.

Chapter 5 reports data analysis and proposal of some solutions that could contribute in the optimization of the existing management system.

2 LITERATURE REVIEW

This section offers an insight into the general concepts, such as data workflow, workflow management and Enterprise Resource Planning systems. Also, previous achievements will be referred and the effect of data management in businesses till now. In general, an overview of workflow management from process to workflow automation and the application of them will be done.

2.1 The Concept of Workflow.

Since the beginning of manufacturing, work activities, procedures and all kind of tasks were carried out totally by humans. Over time, processes and their increasing demand for efficiency have been automated by information systems and computers. In that part, humans were responsible for implementing them. This reaction has created the concept of workflow.

In fact, to be more accurate and according to [1] "Workflow is the concept closely related to reengineering and automating business and information processes in an organization".

Business processes define all the activities of an organization not only at an information processes level but also at a material level. It includes potential contracts for customers needs and services. On the other hand, information processes describe those tasks that are fulfilled by the interaction of humans and computer programs. These processes provide to the organization and manage all the information through databases and computer systems.

The categorization of information, business and material processes has been done by [1].

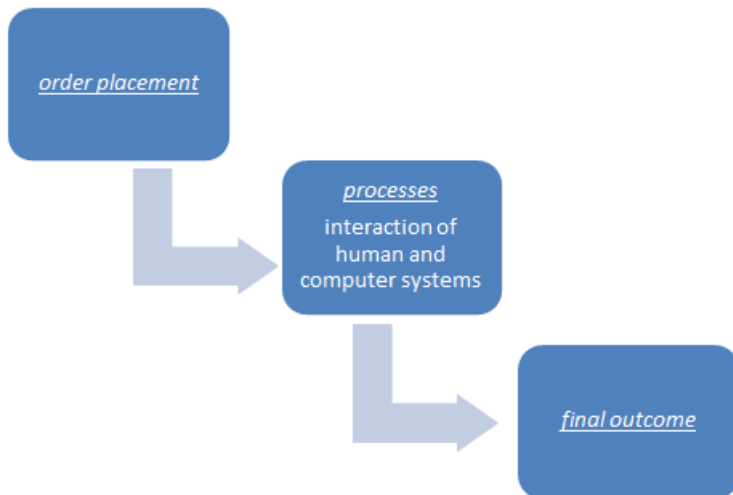
This categorization and the effort to organize and manage the workflow of processes in businesses drove from the customers. In order to gain competitive advantage an organization has to be more efficient and to have its customers satisfied. So, they developed their way of proceeding task. That has as a result to reduce costs, as more tasks were fulfilled by computers, to avoid long delays for processes and to increase the quality of their work. All this happened at an early stage. The evolution of workflow management has a lot more to offer.

Two are the core stages of managing the data workflow of an enterprise.

At first, all the possible workflows should be defined. Meaning, all parts of a process that can be improved and done by the information and computer system.

The second stage is to apply the business needs on these procedures and to reengineer it according to the information system. Of course all these can exist only assuming that the company can support new technological environment.

In [2] " Workflows are defined as activities involving the coordinated execution of multiple tasks performed by different processing entities ". These tasks referred above, can be either completed by computer systems or by a group of people working in the company, or even with a combination of them. For example, we can describe below a workflow in the system of the company Alumil, which will be used as the case study.



Graph 1. Workflow

This picture depicts the general concept of one task of the logistics department in the company. It is a kind of workflow that has a lot to process and a lot of things to change.

In the first step , the order placement, the customers orders are either placed on the system automatically , or sent via email. After that , in the second step there are a lot of procedures that should take place. To manage them there are a lot of people involved and a lot of different information systems. At the last step, after producing what is ordered , the outcome return to the customers. Although the above picture shows that the processes have a linear path, that is not true. Unfortunately, a lot of human and computer interaction is needed for the completion of a procedure. For every particularity in an order the responsible department should be informed and give their approval so as to continue. That is something that definitely has to be corrected.

2.2 Workflow characterization

A general characterization of workflows has been introduced by [3]. According to them, the workflow is divided into four main types depending on the work procedure. In more detail, the first type is a *business workflow*, which is focused on project management issues and has specific deliverables. The second one is a *scientific workflow*, whose execution is in a more scientific application, combining data and program execution steps. The third one is an *experimental workflow*, where the nodes are values derived during the experiment. The selection of the final variables are the result of the scientific workflow. Finally, the last type is the *manufacturing workflow*. The steps of it, are executed during the manufacture of the product. A particular sequence of steps are followed so as to reach the final result. At the manufacturing workflow the operators use information systems and technological means to control the execution of every procedure

A more specific categorization will be described next.

According to [4] workflows characterization can either be by the trade press which was first introduced by Mc Cready [5] , or considering automated processes with access to information systems.

In the first case , there are referred three kind of workflows:

- *Ad Hoc workflows*, where tasks and processes are controlled by humans. There is no automation and every activity is supported by a team of people who find out the workflow solution at the moment needed [6].
- *Administrative Workflow characterization workflows*: can be automated, as it is used for processes requiring simple information systems.
- *Production workflows*: is used for more complicated processes requiring multiple information systems. It can be automated, but human's intervention is critical in tasks execution.

In the second case, the characterization is in the scope of a human-oriented to system-oriented workflow [7]. In the human-oriented workflow, information systems are used so as to support human throughputs and their cooperation in tasks and processes. On the other hand, system-oriented workflows include information and computer systems for more intensive processes. In this case the tasks that are under control, are software and technical tasks.

In between of these two cases, transactional workflows exist. These workflows actually, combine human involvement in the execution of multiple tasks with the need for access in computer tasks.

2.3 Workflow management

In order all the above different kind of workflows to be functional, there should be a kind of management. The management of workflows starts with identifying and mapping the processes that will be needed. Next, the kind of workflow that will be the most appropriate, should be defined. According to the multiplication of the processes and whether human interaction is necessary a more system-oriented or human –oriented workflow is chosen. After that, an analysis of the process is crucial so as to improve and adjust it in a more efficient solution. Last but not least, the workflow is applied so as the processes to become automated. In this step, technological systems and software are required.

For the above steps, more deepening and analysis is applied. About the process modelling, there are two basic categories: the communication- based and the activity based methodology [8]. The first methodology, is focused on improving the customer's satisfaction. There is not a specific workflow loop that is applied. Between the customer and the performer interaction is needed, so as to prepare, to negotiate, to perform and finally to accept the action completed. Among this procedure, the performer may be the customer in some cases depending on the business process. In general more attention is paid on the commitment among humans. On the other

hand, the second methodology, focuses on forming the work while, customer's satisfaction is not captured. An activity based methodology is supported by a lot of different tasks and each of them has many subtasks. The combination of them consist the final product.

Both of the above methodologies in some situations, where the customer's satisfaction is related to the minimization of workflow tasks and human interaction, can be smoothly combined. So, the processes can be re- engineered in both activity and communication based workflow model. Alumil SA, the company that is going to be analysed next, is a case where the minimization of processes in the workflow will impact on customer's satisfaction and optimization of the total procedures.

GTE Telephone Operations was one of the company that applied reengineering efforts and a methodology for improving customer service and reduce the information system costs. Their effort is described in [9]. Also, an effort was undertaken at NYNEX Corporation to reengineer the processes [10]. Both corporations were telephone companies which captured the existing business processes and designed a corresponding workflow specification.

Related work on workflow mapping optimization has been conducted by [4], according to them, optimizing solutions and algorithms can be categorized into the following types:

- a) Graph-based method which is using graph theory [11] and [12].
- b) Methodologies based on lists programming, which usually have a critical path-based formula
- c) Grouping systems that adopt infeasible processors
- d) Duplication- based algorithms with more nodes at the procedure.
- e) Random search systems, in which is not defined the final process and the procedure is formed at the implementation.

In the first years of the effort of workflow management, workflow models were restricted in standardized systems. When the internet, network and information

systems where developed, there was a need to workflow mapping in diverse systems. That would support the smooth cooperation between the different institutions of a business, as information and resource sharing would become easier between the tasks.

In their research [11] there has been presented a Mapping and Scheduling Algorithm, which minimizes process workflow delay. After referring to the general algorithm and then they analyse the constituents' algorithms of it, such as:

- Critical Path-Based Module Mapping
- Greedy branch module mapping algorithm
- Exact End –to end delay calculation algorithm

2.4 WfMS and ERP systems

Over the years some Workflow Management (WfMS) and Enterprise Resource Planning (ERP) Systems has been developed. Both of the systems manage business processes but in a different way.

As it is already mentioned, for the WfMS, firstly the workflow type is specified and then the appropriate steps are followed for the implementation of it. While WfMS is applied, access in databases, applications and other systems is required and also interaction with performers.

At the implementation of an ERP system, attention is paid mainly on the optimization of the application in addition to the needs of the organization. The more detailed the system is, the better for constituting the business processes. The difference of a WfM system is that the ERP system is not completely quantified from the start because there are a lot of parameters altering through the procedure.

In order to understand and individualise the above systems, the terms flow logic and function logic are introduced by [13]. Function logic is applied in an explicit task while flow logic is more a combination of many functions needed to complete a series of actions for a complex project. In ERP systems, flow and function logic are both inserted in application and parameter tables, meaning that these systems are data-based and more focused on function logic to correspond to businesses' need. On the

other hand, in WfM Systems, the two logics are distinguished. Flow logic is found in a workflow model, while function logic is found in the data and the human resources the model needs. In this case flow logic prevails the function, because the WfMS are more process based.

The point for better output would be to integrate WfMS into ERP systems. That is something that has started to be applicable the last years. One of the problem that has appeared in this effort, is that these technologies are managed by different departments and people in an enterprise, so there is lack of co-ordination. On the one hand, ERP is mainly used in Information Systems Departments, while on the other hand, WfMS is applied in more Technical and Computer Science Department. Consequently, these two technologies have to be united to gain the best of the organization.

Historically analysing it, workflow management systems appeared in the 80's while since the 70's some information systems have been developed, characterized as the ancestors of workflow systems [14]. Some of them may be the METEOR, MOBILE, ADEPT, EXOTICA and in the field of commercial products IBM MQSeries Workflow, Staffware, TIBCO in Concert and COSA Workflow are included. On the other hand, ERP systems where firstly appeared during the 60's. At that time, the organizational information systems focused on controlling the already existing inventories. An extension to that were the material requirements planning which helped the companies to optimize the scheduling of the materials used and needed in every production level. The continued development in the technological field created the need for software systems which would facilitate processes from every department of a company, such as finance department, logistics and inventory management and so on. One approach was introduced by [15] . This approach can be considered as the base of ERP as it was an integrated system of organizational information. Software and systems available since then are some of the following: SAP, Oracle, and PeopleSoft. Having those as base, more ERP systems have been developed.

Comparing the evolution of the ERP and WfM systems, it is observed that the first had a more stable evolution than the second one. So, ERP systems were more reliable and offered a more well-known product in the market a contrast to WfM systems.

In more detail, the differences of these two systems are going to be analysed. What they offer in the business in the scope of domain, technology and implementation will be compared [13].

At first, the domain scope will be referred. At this point, the system is being characterized, according to its ability to integrate specific types of applications. The needs of an organization vary depending their field of interest. Different requirements will have a finance organization and different a marketing one.

As long as workflow systems are concerned, at this scope, these systems are more flexible. Customized processes can be managed. The workflow model is composed of different tasks and sub-workflows. At the time where the model is executed, the system recognises the model's needs and specifics and provides the necessary data at every step. This ability of WfMS is used to integrate different type of information, human recourses and requests in wide range of environments. Although WfMS has the ability to be independent, flexible and dynamic, as far as domain is concerned, it cannot yet be integrated in international markets with multi-language characteristics. On the other hand, ERP systems are more limited in the domain scope. These systems collect a lot of parameters in order to customize the applications according to the specific interest of each organisation. ERP provide a more best- practise solution to the organization. In this case, dynamic and changing ranges are not supported, in contrast to WfMS. Although, ERP is more suitable for multinational cases and environments and these systems generally provide more efficient results for specific industries.

Summarising, WfMS compared to ERP systems are more domain independent, dynamic and customized, while ERP manage processes with less customization, a more specific and static domain and supports international settings.

The second step will be to analyse each system according to their technological capabilities. Both, ERP and WfM systems, “support client server architecture” [13] and have evolved to Web environments of application. Both of these systems, as we already have mentioned manage business processes but of different kind each. The difference will be described taken under consideration an example of the company that is going to be analysed in the next chapters, Alumil S.A. where, one of the processes that deals with, is a trading process. For this process, continuous transaction between suppliers and customers is needed. For that reason, financial, inventory and order databases are used. The workflow in this case, explains the changes that are made in the databases. The technological requirement of such a process, is the continuous access in databases, the co-ordination of data and the functionality between all the components of the procedure.

Considering about the WfMS, these systems are more focused on processes. Depending on the type of workflow that is used, for example workflows that involve humans or those that involve systems and applications, WfMS can provide a level of control in human tasks, in software tasks, in the execution of applications and can support more automated systems. The environments that can be applied can both be mixed and independent.

On the other hand, ERP systems are more focused on the combination of data. The positive thing about that is, that it can provide a solution to the enterprises with different departments and applications (finance, sales, and human resources). Data is available in functional databases, which can be accessed and used for better management of applications. In this case the workflows used are more data oriented and homogeneous. The best solution though, for more efficiency in some cases is, as we said in the beginning, to integrate ERP and WfM systems into one solution. The last step for comparing these two systems, ERP and WfMS, is the implementation of the system. While ERP systems provide already written software that can be adjusted and applied in many organizations, WfMS can be adjusted at the time

needed. Workflow is defined and then , each department provides the information to the task in need. WfMS provides a more automated application management.

Gradually, ERP systems became more workflow –driven and workflow- enabled with the integration of workflow components [16]. An example is the purchase of COSA from Baan [17]. COSA is an engine that controls the execution of all business processes. Especially powerful Business Process and Document Management System needs an efficient control unit that administers all relevant processes , that is what COSA does.

2.5 Web services and E-Commerce

The new trend of Businesses is to provide to the cooperative companies the ability to control their processes. This situation is characterised as a Business to Business (B2B) association. B2B links require diverse systems from different companies to operate without any flaw, so their value chain can be managed more efficiently. Web Services has been firstly introduced by [18], where a completely different access to information systems. Oracle, Microsoft, IBM and Sun provide the companies with appropriate Web software that integrates information into their systems and among different programs. In this case, after a process is identified, a particular workflow model is being constructed. At the implementation of the model, tools are used so as to report the progress of the processes and to analyse the applications executed. Web services offered to the companies the ability of more customer interaction, better information integration and better use of software [19]. Despite all these, Web services cannot replace the use of WfMS and ERP in an enterprise. All systems are used in different ways of managing the workflow of the data.

In the next chapters the implementation of WfMS, ERP and Web Services will be analysed having as example the company Alumil S.A. and the procedures that take

place. Also, processes and data workflow will be evaluated using the systems as they are now and the difference for the company if a change could take place.

3. OVERVIEW OF THE COMPANY

This chapter contains a brief description of the company, Alumil S.A., in which the research will be applied. The organizational chart and the structure of the company is of high interest so as to analyze the processes and the data workflow needed in every level.

First and foremost it should be mentioned that Alumil is the largest privately-owned aluminium extrusion group in South-East Europe, as far as production, distribution network and range of aluminium profile systems are concerned. It is one of the top suppliers of branded aluminium systems for architectural use in Europe. All aluminium systems are designed and developed in the Research and Development Department and then tested and certified by internationally accredited certification institutes. The company owns 18 factories, 12 in Greece and 6 internationally, and is consisted of 1700 employees. It sales successfully in 45 countries internationally and has 24 subsidiaries companies in Europe, Middle East, Russia and the United State of America [20].

3.1 Organizational Structure

In order to analyze the processes of the company that need to have access in data and information systems and the workflow that already manage and can be improved, the organizational structure should be described [21].

Particularly, it is shown in the bellow table.

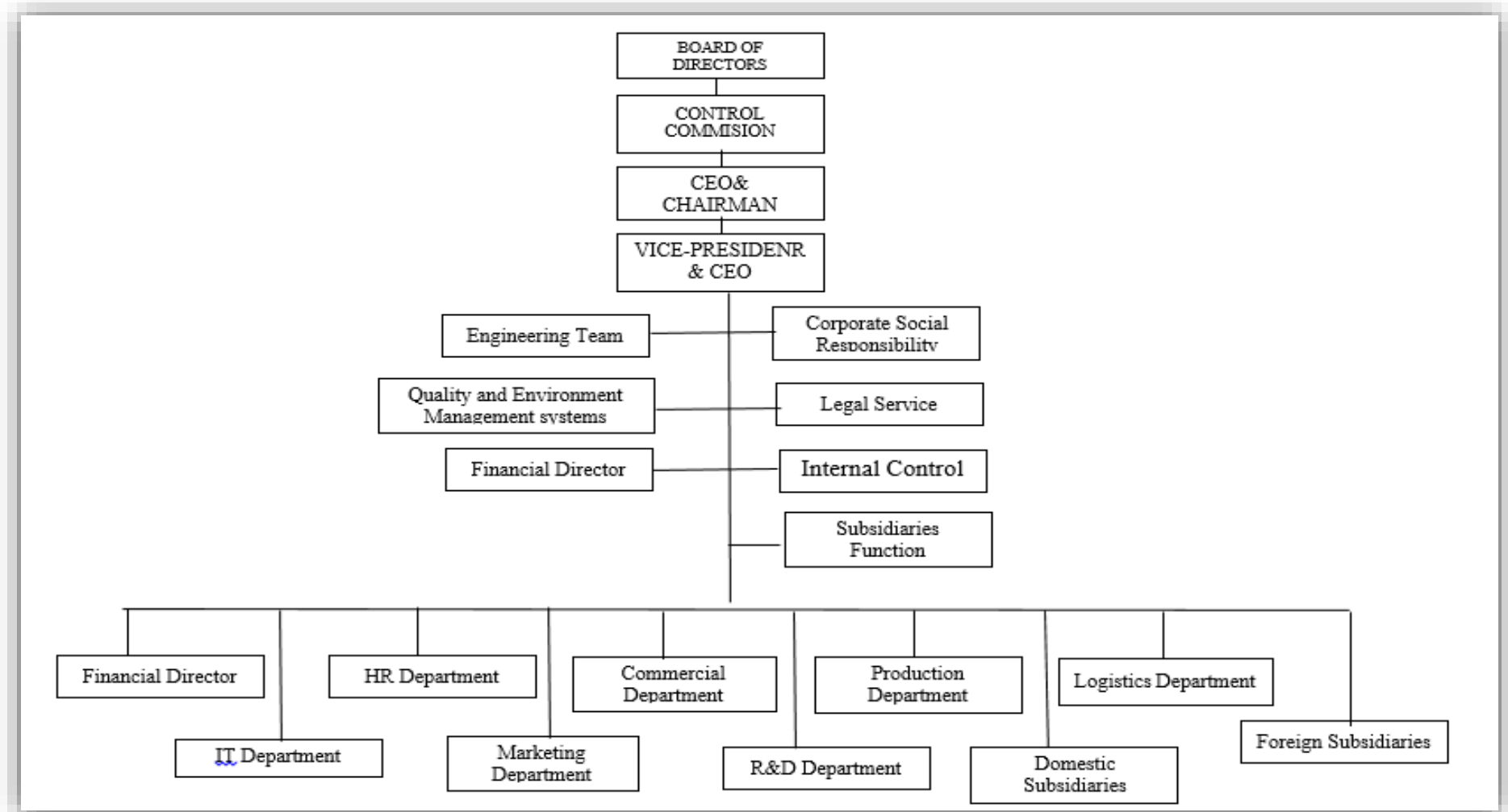
On the top of the hierarchy stands the Board of Director which is followed by the CEO, the President, and the Vice-President of the company and a commission of control. Beneath them there is a group of people who are responsible for

engineering issues, financial, legal, corporate, quality and environment. Also a department for subsidiaries control exists in that level of the structure.

After that, the different departments can be observed. In more detail, there is the Financial Director, who is responsible for issues that deal with accounts, credit control, administrative costs, supplies, budgeting and consolidation of balance sheets.

The next department is the IT. That department deals with the technical support of the business, international projects and of course the support and development of Oracle applications, ERP and WfM systems that will concern our case study. Also, the HR department cannot be missing. In a company of that size, it is one of the most crucial departments which treat the trainings, health and insurance services and the selection of employees. The commercial department consists of directors of sales of architectural and industrial use and also of directors of technical support and development. The Marketing and the R&D departments are responsible for trade marketing, for exhibitions that are organized all over the world and in which the company displays its products. For instance, during 2015 there have been exhibitions organized in India (Mumbai), Turkey (Smyrna), in USA and other countries. Also these departments consist of directors that are responsible for technical trainings, for system development and for promotion of new series of products or changes applied on the existing one. The next department is the production department. That department includes every procedure that has to do with the production, the control and the milling of the aluminium profiles. It is separated in different units each of which complete a step of the preparation of the finished goods. Specifically, the paint shop is included, the anodizing factory, the quality control factory and everything that is related to the production planning. After that, the next department of the organizational chart is the Logistics. That department is the one that interacts with every other and is the link between customers and the company. Logistics deals with customer support, orders, supplies, transportations and International logistics. Last, two units exist in the company that are responsible for the subsidiaries in Greece and abroad.

As the company has 24 subsidiaries that are increasing it is necessary to have a level of control.



Graph 2. Organizational structure

3.2 Inventory control system

Apart from the organisational structure, what should be mentioned is the kind of inventory system that is used. Such a large company, with that amount of orders needs to be able to serve satisfactorily their customers. In order to succeed so, safety stock is used. By this it is meant that an amount of accessories and profiles are held as stock in the accessory and the profile warehouse respectively. Orders that can be fully served by the warehouse are characterised as express. If this stock reached a point, the safety stock point, then the particular code should be produced again. At the point of the safety stock, all customers can be served without having back orders. The safety stock is determined of the request the code had in the last period of demand. In case the safety stock is not enough, because of higher request, then the date of delivery is extended. Some orders although, include products that are not that commercial and maybe are made by the exact instructions of the customer wholesaler, in that case, the orders are characterised as make- to- order. The lead time is bigger and no stock is kept.

These control systems are the main core of the inventory, of course, according to the demands of the wholesalers sometimes exceptions may exist. To determine what kind of inventory control will be used, data is needed. The data derive from the recourse and inventory planning systems and the orders workflow. Bellow, these systems will be referred in relation to the data workflow management that already exists.

3.3 Data Workflow

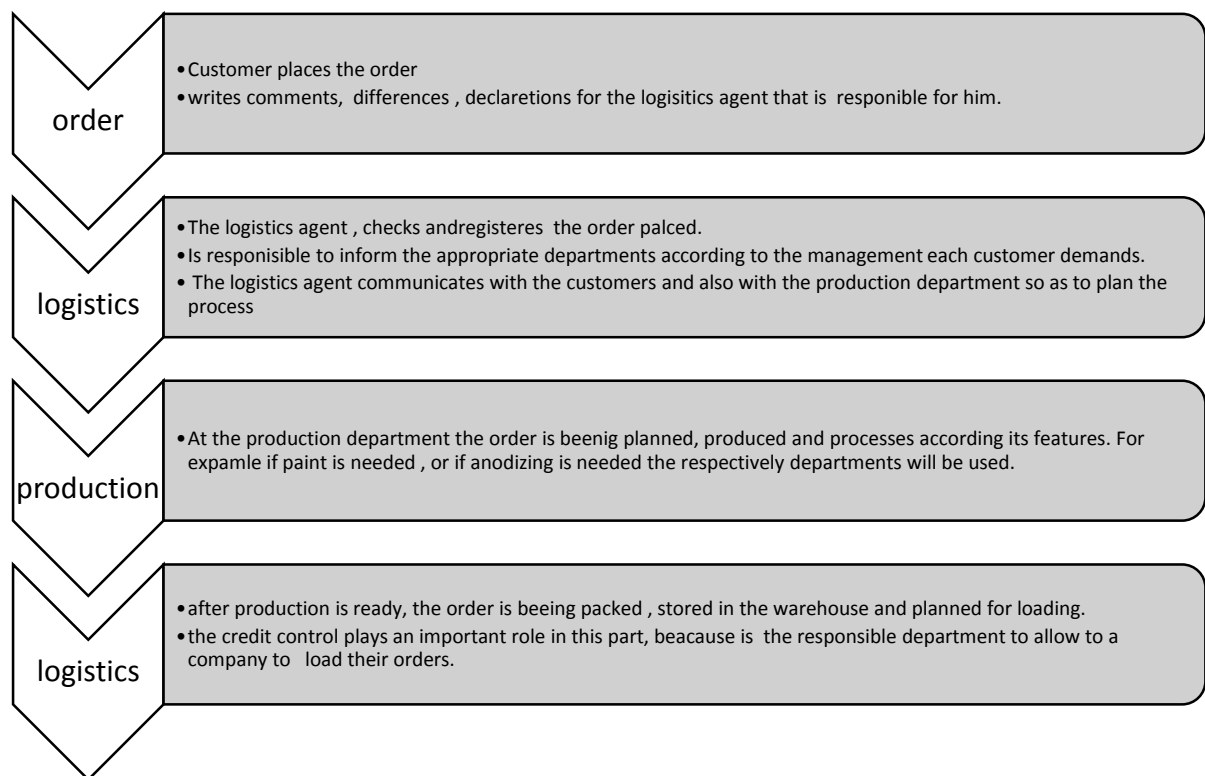
It is obvious from the above analysis that, due to the fact that the company has so many levels in the organizational chart, it is expected to have a large amount of data. That amount has to be organised and managed in a way that will improve the efficiency and effectiveness of the company.

As it is mentioned, the applications that have to be processed are so many and differ from the one department to the other. In order to limit the length of the data and workflow,

only two departments will concern the case study. The departments that need at most the management of their data workflow are the Logistics and the Production. These are the departments that will be used for the case study. Apart from the fact that these need the most the data workflow management, these departments already use systems like ERP , WfMS and e-commerce systems, so it will be easier to control the data workflow that exists until now and to apply a possible change.

In order to understand what kind of processes need to be managed and what type of data is used, the responsibilities of each department will be described.

At the beginning it is important to refer again that Alumil is a company of extrusion in aluminium profiles and accessories. The production is at a wider range and at wholesale level. Indicatively, a set of operations that take place is a following:

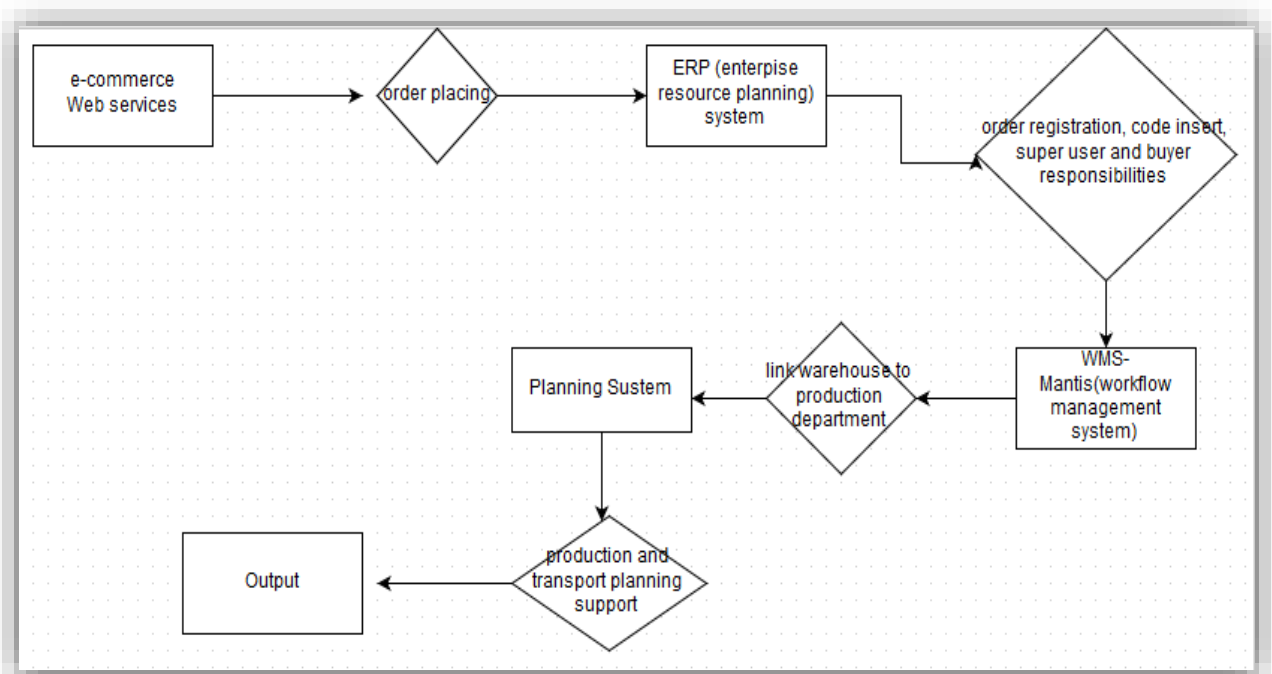


Graph 3. Set of Operations

All the processes and the data workflow are managed using Oracle systems. Particularly, ERP, WMS(Mantis), Planning and e-commerce.

In more detail, e-commerce is the software program which links the customers and the subsidiaries with the company and the logistics department. With that program, the company in interest, the customer, can place the order, can leave comments to the agents that manage their issues and can control the situation and the stage their orders are. After placing the order online, in e-commerce, in about 2 hours the order is available to be registered in the ERP system.

To understand more how the workflow goes through the systems a flowchart is presented and described below:



Graph 4. Systems Flowchart

The ERP system is the enterprise system in which every procedure can be administered. It is mostly used by the human resources of the logistics department and it is responsible for orders registration, credit control of the customers, invoices printing, changes in orders and inside transport of products. In more detail it has as an input all the data that is needed for the customer and its needs and as an outcome orders finished.

ERP system offers a workflow for the data management almost predesigned. It has been settled from the IT department so as to optimise, at a high level, the application and not that much the enterprise's need and benefit. The workflow is to exploit only the data inserted from e-commerce and to register to the other two systems Mantis and Planning all the information for the processing of every parameter. Through ERP one can get information about all the clients and the codes of accessories and profiles that the Alumil has. Also, new codes are inserted in that systems and their condition is recorded. Whether a code is active or inactive and whether the code is active but cannot be sold in customers but is reserved only for inner use. Other characteristics of ERP are that the call agents can have many different responsibilities. For example, they can interfere in an order as a power user, as a buyer, as a supplier as an administrator and others according to the requirements of the applications. The subsection of logistics that is responsible for issuance of invoices and for pricing each line of the order is also using the ERP system.

Because Alumil is such a large company the amount of data that need to be processed via ERP is demanding. For that reason, despite ERP is mainly focused on optimization of applications it can be customized and with the intervention of the IT department steps and the workflow can change at a point.

ERP though, would have been nothing if Mantis and Planning did not exist. The two systems supplement the ERP. While ERP seeks for customer's satisfaction and maximization, Mantis and Planning support the organisations need. Although these two systems are used for different purposes, both need access to databases and continuous refresh of their information.

Specifically, "Mantis" system is used to control every step of the workflow of an application. For example every step of an order placed. The director of the paint shop will organise the sequence of the operations so as to abide by the schedule. Every order has a promised delivery date which is given according to the orders requirements from the production department. That is in the case of the profiles, if there is an accessory order, because the products are not only produced but also purchased by suppliers, the delivery date is settled according to the availability and the expectation date.

Actually Mantis is the system which links the warehouse and every procedure at the production department with the logistics department and the directors. Every line of the order and every profile or accessory is clearly described and declared where it is and at which stage of production. Changes can be applied through that system, manually and also the barcodes and the places of the stock products are noted. Another characteristic of Mantis is that it has the ability to control the stock and to provide information about the loading.

“Planning” is the system that supports more the directors of production planning and transportation planning. In this system, every order and application is depicted. It can be defined in which situation it is, and if it is ready, the order is planned for loading. Firstly, the director of production planning, controls the availability of the orders, the customer’s request, for the delivery date, and reports about the amount of profiles and accessories that will be loaded separated by orders. Next, the director of transportation and loading planning, checks in the “Planning” system what will be loaded. He uses the data derived from the system, checks the condition of the clients and sets up the program of loading. By the phrase “condition of the client”, is meant their credit condition, if they are acceptable from the credit control to load, also is referred to their date of loading, if there is any. Some customers have specific dates that their orders are loaded. Another parameter that is taken under consideration is how urgent every the orders are, sometimes there are some orders, that although are placed later, the customer wants to have it earlier.

The entire procedure and all the systems that were described above, is obvious that need a very big amount of data and a lot of interaction between systems and the respectively responsible persons. Only the systems are not enough to complete the applications. That is the reason why data workflow have to be managed at the most efficient and effective way.

4. METHODOLOGY

The primary purpose of this section is to illustrate the research methodology that was applied in order to analyse the data workflow management system of the study. The analysis includes details regarding the phases that constitute the research design.

4.1 Methods and tools

The research of this study was separated in four main stages. Problem formulation is the first step of the research. The problem in which the research was based, is the data workflow management in Alumil SA. The next step, is the system definition and model development. This stage emphasizes on collecting the necessary data. After analyzing the data, in the third step of the research, alternative scenarios and improvement on the processes were investigated. Last, the conclusions and recommendation were covered.

In more detail, an observation of the companies systems and processes were conducted at an extended level. These observations, together with secondary data helped in the description of the tasks. Some flowcharts were created to depict certain simulations. As a simulation tool, simul8 was used without data input, but more as a graphical representation of a flow for these purposes. In the research part, an important role played the interviews for the alternative scenario. Interviews were held with people from the administrative staff of the logistics department of the company Alumil. The people that were asked are those how are using more the resource planning systems and the workflow management systems and for them, the data management is very important.

The questions that were asked are the following:

- Describe me the responsibilities of your position.
- In which step of the process do you believe data management is more necessary?
- Are there any improvements that of your opinion could be done in the existing systems?
- Do you recognize which step of the process is the most time consuming?
- Can you characterize the existing system as automated?
- Which will be the advantages of a more efficient data workflow management system according to your opinion?

- Is it easy to control each step of the procedure or would you propose a development?

The interviews were formed in a more conversational way, so as to embrace the work of the employees, to understand which part can be facilitated and to have an idea of things that could be changed according to their experience. A descriptive analysis of their results is presented in the following chapter with the use of graphs and tables and altogether led to the proposed output of eliminating a step from the ordering process. That would automate even more the whole procedure as, it would give more jurisdiction to the customers and less human interaction will be needed. The data workflow will be more efficiently and the all databases will be effectively informed.

The stages of analysis that were used helped in forming the dissertation's target. The target was firstly to determine in which step of the process described an alteration can take place and what would be the positive results for the company.

5. PRACTICAL APPLICATION

5.1 Analysis of existing situation

In order to clarify the data workflow and how it can be improved, an example and a particular procedure will be analyzed. Although data workflow is critical in every level of the organisational structure, as every department requests management of the income and outcome of data, only the process of an order will be described. The process of an order. This process apart from the fact that requires to have access in data systems, is the one that also uses features from all the units of the company.

Orders can be placed for many reasons in the company, either for internal use, which includes all the orders that transfer stock from one warehouse to the other, or orders that provide our subsidiaries with finished goods. Also, orders can be placed from the owned factories for raw material. Another type of orders concern the suppliers-customers. These category consists of customers to who we sell materials and accessories they process them and return to the company another code accessory. In general every transaction and application is recorded through the systems. The type of order that will be analysed next, is the most common one and occupies the largest volume of orders. That type is the one a wholesaler places to Alumil.

5.1.1 Placing an Order

As it is mentioned in previous section, the order is mainly placed by the customer via the e-commerce system. There are some cases, where the orders will be placed manually by the call agent. That has to do more with the particularities of each customer. Both of these situations will reviewed. The customers, meaning the manufacturing companies and the dealers, according to the country they are or the products they buy, are served by a particular call agent. Except from the call agent who treats all the issues that have to deal with their orders, there are also supporters from the commercial unit for every client. The above are mentioned because they play an important role in the workflow and the data accessing.

5.1.2 Migration to ERP system

After the order is placed, it send via the system in Alumil and can be found in ERP system. In the ERP system, all orders are in a pending condition until the responsible call agent registers it. The orders are characterized by the name of the company, the type of order (profile or accessory) and a distinctive number. The call agent that is responsible for the order checks the lines, contacts with the company-client if needed and then registers the order. This procedure until the registration can last from 3 hours the least, until days. That is because there are a lot of parameters that should be taken under consideration and a lot of data that may be missing from the ERP system. For example:

- There are some aluminium profiles that are available only in specific treatment and color. Some are available in standard lengths and others are given only after approval is given from the sales department. In this case, the call agent has to collect all required data so as to proceed in registration. On the one hand they have to contact with the customer and inform them about the changes and the restrictions and on the other hand they have to contact with product managers and sellers so as to get authorisation to proceed.

- Another situation, which will delay the registration of the order are the prices. Every client may has arranged with the sales department special prices according to the product they order. In this case, again, the call agent contacts to the sales department and to the credit control department to enter the correct prices.

- Last, what could happen, is the lack of existence of a code. For instance, there are some accessories that while their standard color is black or unpainted, they can be painted in different colors after customer's requirement. In this case the Alumil code does not exist, so the responsible call agent has to apply to the product manager the issue so as a code with the particular characteristics to be active.

In all the above cases it is obvious that the data included in the databases of the company and in the systems are not enough to proceed instantly in the registration of the order. Data are required from external factors and that delays the first step of the

procedure. Indicatively, from one day to four or even a week can last the delay of registration, depending the difficulty of the situation?

5.1.3 Production Planning

After the registration, the order is transitioned in the systems that are responsible for the planning of the production and the loading. At first, the director of production planning, checks the order and categorizes it. Some orders are declared to be urgent from the customer, so their treatment differentiates according to the delivery date that is asked. Some, belong to the express category, that means that the profiles or accessories are ready in stock and can be selected and organized for loading. There are cases where shortages may exist, either from the profile or from the powder of paint. The above situations are managed by the director of production, data is collected from the systems and from the production line and the director acts accordingly. In this position, that the director occupies, a lot of data is needed. The workflow in this stage is slightly easier to manage because the director accesses data from the system, the call agent and the production department in the factory. The amount of data is constricted but more demanding and of higher importance. This is a more responsible position. The director of the production planning manages all the orders regardless the type of order, the company of the country. The outcome of the process the director controls, is the date of availability of the order. The date is recorded on the Planning system and is accessible form all the departments in interest. Having that date as basis, the production in the factory is planned, the customer can organize their constructions, the call agent can inform whoever is concerned and last and more important, the director of loading planning will use that date to organize the loading program and the trucks. In combination to the production planning, the paint shop planning and the anodizing planning is also organized. Every treatment that the profiles or accessories need, are combined to order from different companies and if the schedule can afford it, they can be together painted or treated.

This is applicable after cooperation with the director of the paint shop and the director of the accessories warehouse.

The duration of this step is the largest of the process of ordering. That is because the production is included from the stage of the raw material to the step where finished goods are at the wrapping stage. From the type of the order it can either last from 1 week for profiles and 2 days for accessories to months. If for example there is lack of an accessory and the accessory is not produced from Alumil but from an external supplier then the duration is depended on what date of availability the supplier provides. Either way the data workflow in this step is also crucial to be managed so as to optimize the procedure and to reduce potential delays that appear because of lack of data or incomplete databases.

5.1.4 Loading Planning

The last important step of the process of a new order that is inserted in the system, is the planning of the loading. Here, the director of the loading planning collects all data provided from the previous departments. The schedule of the loading is a combination of availability of the orders, customer's request, urgency of the orders, availability of transportation mean and the credit situation of the customers and specifically the interested orders. The workflow of data in the loading procedure goes as bellow. Firstly, all orders that are available and ready to load are the one that are taken under consideration to be loaded. These orders are then checked from the credit control. They are characterized as open or closed. Open orders means they are okay to be loaded, while closed means they are not. If the orders are open, then they proceed to loading. Another parameter that is important is how urgent is the order and hoe many orders the customer has. If the amount of orders for a customer is large enough, maybe a truck will be arranged only for that company. If the available orders are not large enough, then orders from different companies but in near destinations are combined. Every day there some standard transportation routes according to the demand of products. These demands have derived from reports and from the request

of previous years. For instance it is standardized that ever Monday, Thursday and Sunday a truck will be loaded and sent to Athens.

In this position the director of the loading planning also must have access in databases of the systems used. Actually the work the director does, requires data from the whole procedure of the order from the registration, to the agreements with the sales department and until they are wrapped as finished goods.

A department that also takes part in the procedure is the invoices department. That one uses more data that has to do with the prices and the number of the profiles and accessories included in the order. The data workflow in this department consists a chapter on its own. The responsible human resources in this department have to be able to use data regarding the credit and the transportation. Information about what each country of extraction needs, what documents should be fulfilled, what requirements the truck should keep and others. From the order the data that are needed are the amount of materials that will be send, their price and if they are open. This department although it is a different section, it also plays an important role because without editing the final invoice the truck is not able to leave, meaning that the order will not be delivered. Parameters that will delay this final procedure is the missing prices, which need to be completed, so data accessing is crucial in this part. Also, mistakes that did not troubled the production line, such as the code name or other characteristics regarding the customer's name may delay the workflow of the process describing.

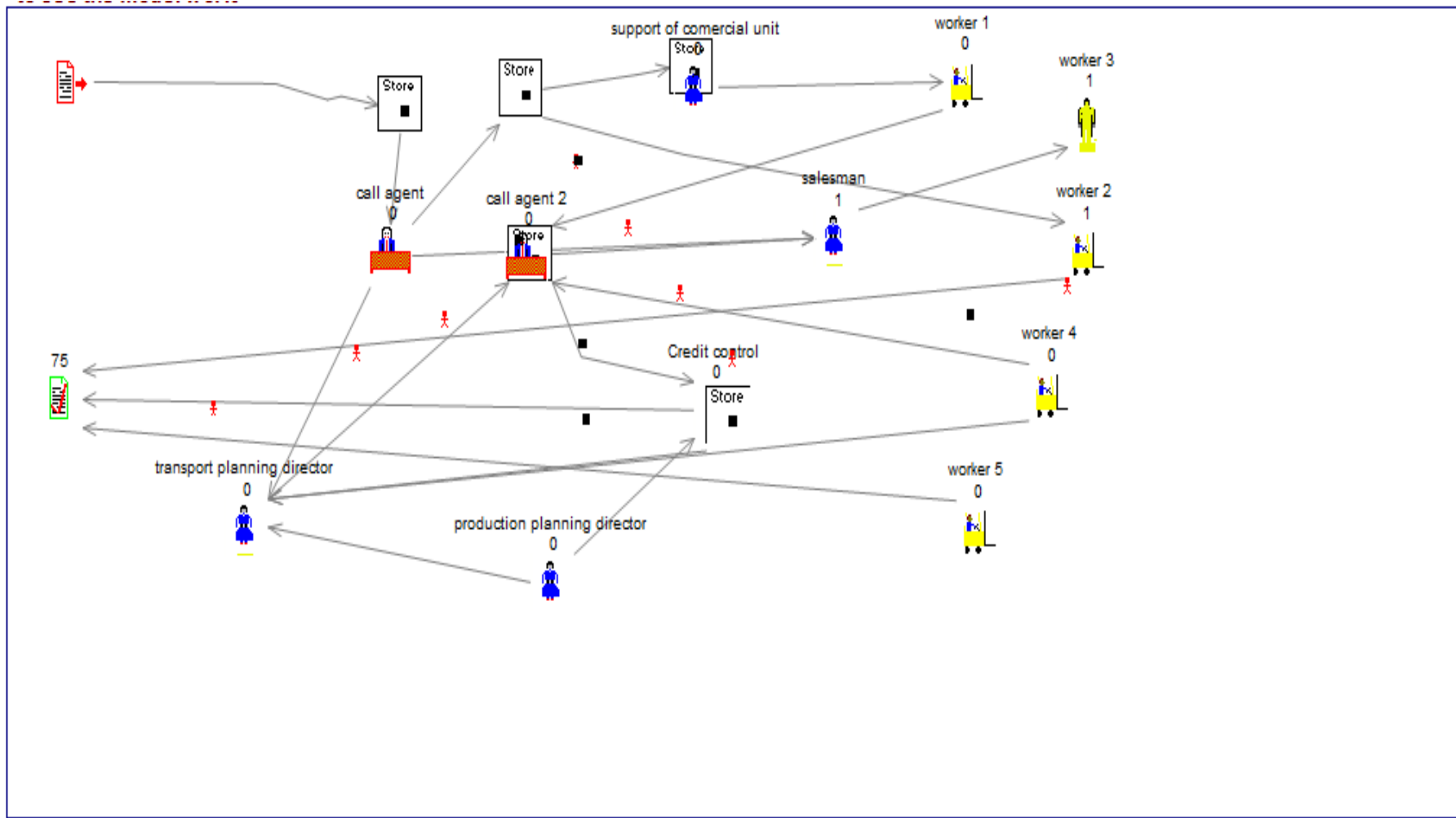
In general the whole procedure may last from two days to months. In the picture bellow is depicted the workflow of the data through the order processing. The key is to find out a way that will minimize delays, will organize the data workflow and will optimize the processing of applications. Even one step less of the procedure may change the entire workflow.

Using the program Simul8 bellow is depicted indicatively how the workflow of the procedure is:

As store is symbolized the ERP system, where the orders are in a pending condition and are waiting either approval from other departments or from the call agent to

declare something with the customer. Two call agents are depicted, a stage of support of commercial unit, a salesman meaning the support of the sales department. Also, a station of credit control, of the transport-loading planning director and the production planning director. Last, as workers are illustrated the people in the warehouse and the production.

Generally, as it is shown in the picture, the workflow of the inserted data until the final outcome is more like a fully connected or a star topology, as it is characterized in the computer network. By that, it is meant, that from every station, and an amount of data have to be accessed, from every department, so as to complete the procedure.



Graph 5. Simul8 Existing Situation

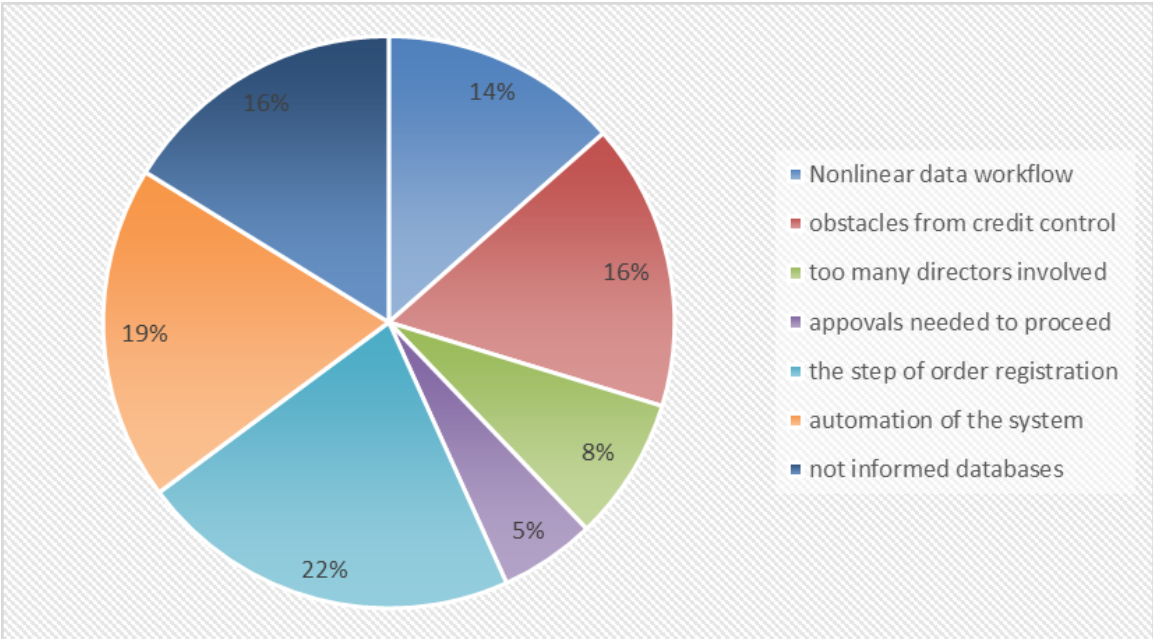
5.2 Proposal for system optimization

After having analyzed the situation that exists until now in the company, it can be considered that the major problem of the data workflow is the nonlinear system. Also, some steps of the whole procedure can be eliminated and that would save a lot of time and effort between the departments.

In order to determine which step can be eliminated, and to overview the situation that exists in the company, a series of interviews were organized with the people of the logistics department that are more involved with the data workflow at the procedure of a new order.

5.2.1 Interviews' Results

Interviews were taken from the call center agents, the directors of the production and loading planning and from employees that are involved with the warehouse organization. All of them were asked the disadvantages of the existing system from their point of view. The answers can be depicted in the bellow graph.



The 22% of the people asked, supported that the step where the call agent has to register the order, that the customer has placed, is the one that delays most the procedure. That happens because the data workflow in this step cannot be managed in an efficient way, as collaboration with other departments and the customer is needed. The next most popular answer on the question what is the most difficult thing that you have to face in your daily work, as far as procedures are concerned, was the automation of the system with 19%. Yes, the systems used (ERP, Mantis, Planning, E-commerce) are fully automated and if not, the IT department makes improvements every day, although, in some cases automation is not enough to proceed and manual actions are necessary to proceed.

At the high of 16% of the employees asked, they referred to the lack of data workflow in issues that are related to credit control and to not informed databases. The credit control according to them is an issue that can block every department and can stop the orders from production. That delays the workflow. Also, if databases are not informed, the call agent or anyone who will need access to some data will definitely suspend its work to search about the data. That has as a result for the company to loose valuable time and money. Last, from 5% to 14% of the workers asked, they stated that topics such as, many directors and supporters are involved in every clients and approvals needed to be taken. That has a result of misunderstandings, a lot of human interaction with different opinions and of course the company's instructions which may cause postpones of the procedures.

5.2.2 Proposals for

The above results indicate us in which area is essential to concentrate and to apply a change. The first change that can be proposed and applied is at the beginning of the process of an order, in the registration step. What could be functional would be to remove completely the registration process. As a result, when the customer places the order it will be automatically registered. That saves a lot of time from the call center

agent and from other concerning departments. By removing the registration control from the logistics department, means that the E-commerce system will be that automated that will not need any data form external factors. The databases will be efficiently informed. Potential approvals that may be needed, prices that may be missing, vagueness that need declaration, all will be managed at the E-commerce level.

Also there will be no manual placing of orders, only orders inserted from the customers in the system will be accepted. In this way, the e-commerce system will be enriched, it will contain all the information for every profile and accessory that the company sells. Every code will be depicted and will be described so as to be easy for the user.

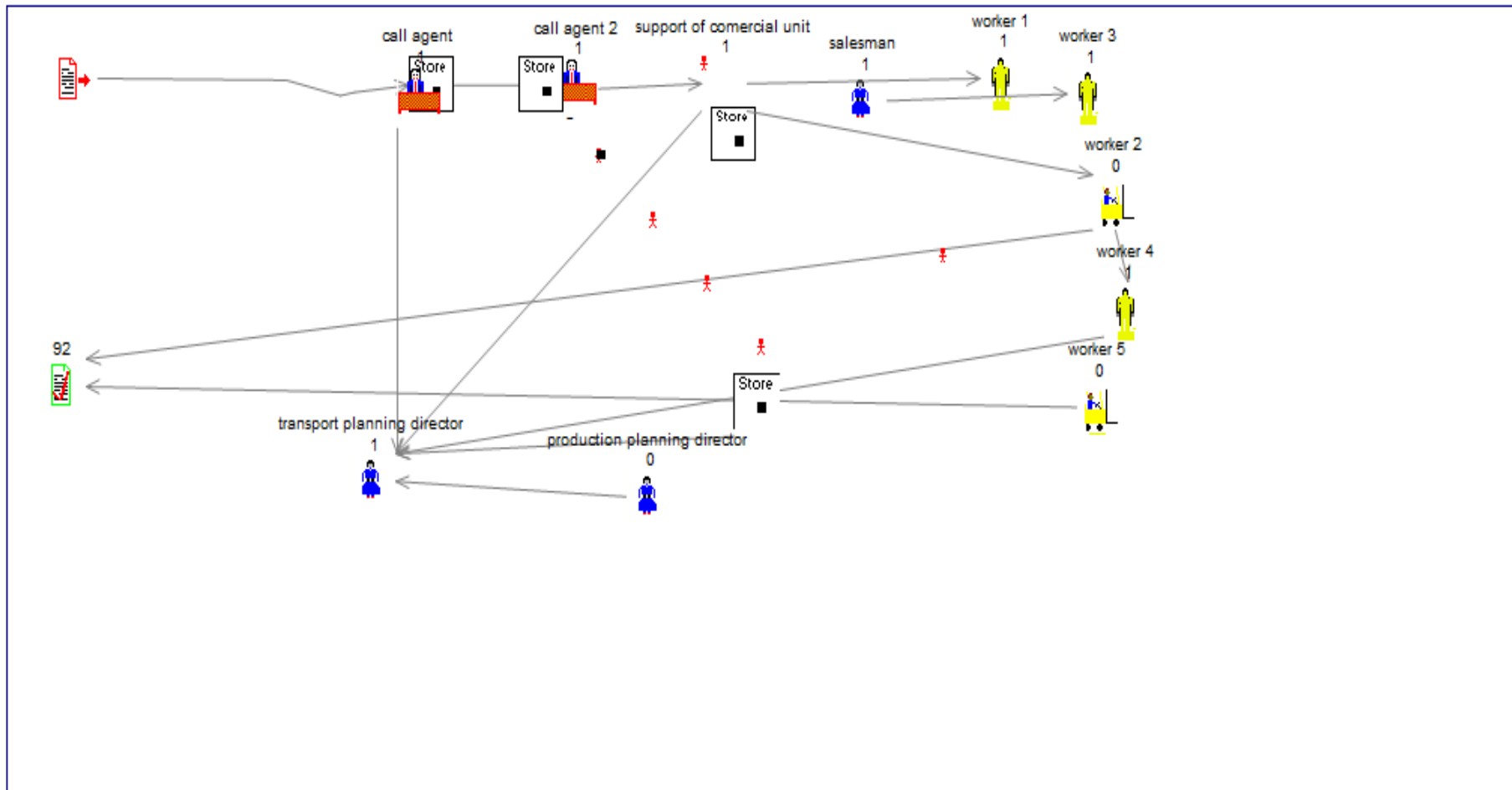
In addition to this step, another change that could facilitate the process of order registration, would be to create a field of feedback on the online site of every client. That would enable them to leave messages, to write down their requests, to negotiate special prices and to have a direct communication not only to the call agent but also to their commercial supporter or sales person. The feedback will be assigned to the current order and will be sent also to the production line. That would enable all the involved employees to follow potential instructions or exceptions.

5.2.3 Benefits for the Company

In fact what the proposal is, is for the procedure and the data workflow to become linear. Linearity will contribute in reducing the procedure time and to improve applications and communication. The management of the data workflow will be at a more efficient and effective way. The advantages for the company will be many. At first, customers will be more satisfied as they will gain control of their orders. Their intervention will be active and they will feel that they are part of the procedure. That will be, in long term period, translated in more orders and loyalty towards the company. Another advantage will be the better management and organization of the data through the departments. Less communication will be needed, as most of the data needed will be online and will be provided from the system.

That kind of improve of data workflow management would yield a lot of benefits to the company. Saving time on procedures, means that employees would be able to concentrate on customers' satisfaction. The relationship between the company and the wholesalers- suppliers would strengthen and that would make the company to be more reliable. In long term conditions, that would offer more clients, which is translated in more market shares for the company.

In the next picture the workflow of the order application after removing the step of registration from the call agent is depicted. The simulation was completed using Simul8. The symbols are the same as referred above. The difference is obvious as far as the workflow is concerned.



Graph 6. Simul8 Proposed Changes

6. Conclusion

Through this thesis, an attempt was made to analyze and evaluate the quality of data workflow management in the company Alumil SA, as well as to investigate changes that could contribute to the improvement of the system's performance.

The methodology used to approach the above-mentioned issue was simulation modeling. The necessary data for the model were collected through personal field observations and interviews with the company's staff. Interviews with the administrative staff of the company revealed their responsibilities and as a result the time for data accessing needed.

The system's performance was evaluated based on the interaction of the staff with databases and systems, on the time spend for data mining and on the final result. The results of this revealed that procedure were delayed and that caused discontentment of customers. In this context, several alternative strategies were proposed so as to improve the processes, and to achieve efficiency and effectiveness in implementation.

Conclusively, any process change or redesign should always be examined in close association with how staffs' demands regarding the data access are affected by implementation of these changes.

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APPENDIX

