International Journal of Mechanical, Industrial and Aerospace Sciences
ISSN: 2517-9950
Vol:5, No:6, 2011

Orders Preparation and Control on the Productive Process Efficiency Preparation

F. Charrua-Santos, S. Dias, J. Matias, F. Brójo, S. Azevedo.

***Abstract*—**The main objective of this paper is to analyse the influence of preparation and control of orders on performance. The focused activities explored in this research are: procurement, production and distribution.

These changes in performance were obtained through improvement of the supply chain. It is proved using all the company activities that it is possible to increase de efficiency and do services in an adequate way, placing the products in the market efficiently. For that, it was explored the importance of the supply chain, with privilege to the practical environment and the quantification of the obtained results.

***Keywords*—**Competitiveness, Order Preparation and Control, Procurement Process and Operations Efficiency, Supply Chain Global Costs

I. Introduction

A competitive company has as main objective to maximize the aggregated value of its products, minimizing the supply chain global costs [1], [2], [3], [4]. This way, the performance of supply chains must be optimized through new management practices in order to reach their objectives.

In this context, it is given a special importance to the procurement process, which is seen as an important competitiveness factor [5]. Reference [6] made recently an interesting and relevant literature review about this topic. It is accepted that a structured analysis, at the purchase level, has a significant contribution to the selection process of key suppliers since it helps improving the company technical capacity and the development of more competitive products [7]. On the other hand, the purchase level, it is needed to analyse and decide about the number of suppliers. This study points to a reduction of the number, but simultaneously, for a reduced dependence from them through a higher involvement and responsiveness [8]. The selection process is a subject of higher importance and has been studied by the scientific community through the development of some decision support tools [9]. As complement to the suppliers selection process, it has been verified an increasing necessity of improvement of the "procurement" function as a way to optimize the strategic competitiveness by looking for the better selling price that satisfies both the seller and the purchaser [10].

The supporting company for this study is inserted in the plastic accessories market for two wheel vehicles, motorcycles and bicycles. The company has been remarked in the market by the quality, "Know-how", experience and flexibility, associated to the development of innovator products in an organised and functional environment that privileges the research.

After will be made a brief presentation of the company and an analysis to diagnose the factors capable of improvement, translated by an increase of the performance, and quantified through indicators.

The tool used to structure the problem is the Causal maps, also known as Ishikawa Diagram, Cause-Effect Diagram or Fishbone Diagram, since allows the structuration of the problem reasons, or improvement opportunity, with a good component visualization in a graphical synthetic form [11], [12], [13].

Three processes susceptible of analysis are identified: orders processing, purchase and production. These processes are presented on a flux diagram form. For each of the fluxes and problems identified in each one, are presented corrective measures.

The measures were implemented and the obtained results quantified in agreement with the performance indicators used by the company.

II. Case Study

A. Company profile

The focused company is an international company based on northern Portugal and permanently employing 160 workers. Totally focused on the two wheel business, the company works for both bicycle and motorbike industries being specialized in plastics.

The company has more than 20 years of activity developing products in partnership with some of the most important two wheel producers. This fact is an important enabler to achieve the needed know-how for the conception and development of new products, in accordance with the market tendencies.

The competitive priority of this company is the innovation, since it releases continuously in new products, new technologies and marketing campaigns. Being so, many new products, ideas, materials, and tools have been launched to the

F. Charrua-Santos is with the University of Beira Interior, Electromechanical Department Portugal (phone: +351-917391470; (e-mail: Bigares@ubi.pt).

S. Dias is with the Polisport, Logistic Department, Portugal (phone: +351-917391470; (e-mail: susana.dias@polisport.com).

J. Matias.is with the University of Beira Interior, Electromechanical department Portugal (phone: +351-275329947; (e-mail: Matias@ubi.pt).

F. Brójo.is with the University of Beira Interior, Aeronautics Department Portugal (phone: +351-275329749; (e-mail: brojo@ubi.pt).

S. Azevedo is with the University of Beira Interior, Management and Economics Department (phone:+351- 256 410230(e-mail:s.azevedo@ubi.pt).

market in order to increase its business volume.

In industrial environment, successful strategies often hinge on the organization's ability to meet specific customer needs and to develop production systems that makes possible to shorten the time-to-market through quickly design, shorten cycle-time production and faster delivery of high-value products [14].

According to product manager these company strategic priorities are based in the following orientations: (i) conceive innovator products for two wheels vehicles, with the guarantee of performance, safety, and differentiation; and (ii) to improve the brand notoriety through continuously innovation, plastics quality and products differentiation.

Summing up, the company strategy has been based in the two value propositions: innovation and relationships. As regards innovation, it assumes that, the selection process is a subject of higher importance and has been studied by the scientific community through the development of some decision support tools [9]. As complement to the suppliers selection process, it has been verified an increasing selling innovator products (with higher margins) contribute to the selling productivity and leadership. In what concerns relationships, it assumes that trustworthy distributors will become loyal to the brand contributing to increasing the product range.

The company strategy scheme can be observed in Figure 1. The strategic objectives associated to the value proposal based in the relationships are presented dark grey and the strategic objectives associated to the value proposal based on innovation are presented light grey. Each strategic objective described in Figure 1 has one or more performance indicators, which makes possible to quantity in what extend the objectives are reached.

The existence of indicators helps to focus on the action in order to its improvement (Table 1)

III. Problems Analysis and Diagnosis

The resource constraints has been extensively researched in the operations management literature, mainly because the identification of constraints enables managers to plan more effective interventions [15]. Having by reference the company indicators presented in Table 1, it was verified that 11% of the deliveries scheduled were not -fulfilled. This non-fulfilment is reflected in the strategic objective of client satisfaction, identified by the number 8 in the Figure 1. The delivery schedule failure resulted in a 5% order cancelation, with the remained delivered after the delivery schedule. With this performance level, the customer satisfaction questionnaire showed, in 2009, a dissatisfaction level of 23%.

To help the modulation and analysis of the identified problem, it was developed a model of the company organization. This model was used as a basis to direct the actions to develop, helping to understand and interpret the actual performance. [16].

In this model, the company as a whole was divided in 8 macro-processes, interconnected, which interact between themselves. Every macro-process cross several departments. In Figure 2, are presented in a schematic way the interactions between the 8 macro-processes, the business partners and the working market.

After the analysis, it was made a study using the Ishikawa Diagram (see Figure 3), to help identify all the works developed in the different macro-processes of the company that might have influence in the identified problem. It was obtained this way the diagram presented in Figure 3, which allowed the identification of all the tasks that could have influence on the delivery schedule and between them, the ones that could reduce the delivery schedule without delay.

It was concluded that the improvement actions that could have the most rapid impact over the company performance should be centred on the purchase, production and order processing processes.

TABLE I
Units for Magnetic Properties

Objectives		Indicators
1	Increase the profitability in a sustainable way	Selling Net Profitability Selling Gross Margin
2	Increase the sales	Billing
3	Increase the sales productivity	Sales profitability Covering index
4	Sales increase (new)	Sales to new clients New products sales
5	Increase the products margin	Net sales profitability *Savings* Productivity
6	Increase the client range	Distributors performance
7	Client loyalty	Client number (new-lost)/ Billing
8	Satisfy clients	Client satisfaction degree
9	Promote the relation	Marketing plan fulfilment rate
10	Do not fail	Out of quality costs Reclamation rate Backsliding
11	Suppliers selection	Suppliers performance
12	Purchase well	Service level *Savings* "Green" type suppliers
13	Promote the brand	Brand image Weight of Polisport sales when compared with well known brands Marketing plan fulfilment rate
14	Innovation management	Industrial property number of records
15	1st plane new products	Projects plan fulfilment rate
16	Development of better products	Product rate of changes in the first 12 months of live
17	Develop key abilities	% of critical functions
18	Technology and information development	Annual development plan fulfilment rate
19	Internal culture development	Collaborators satisfaction Strategic index

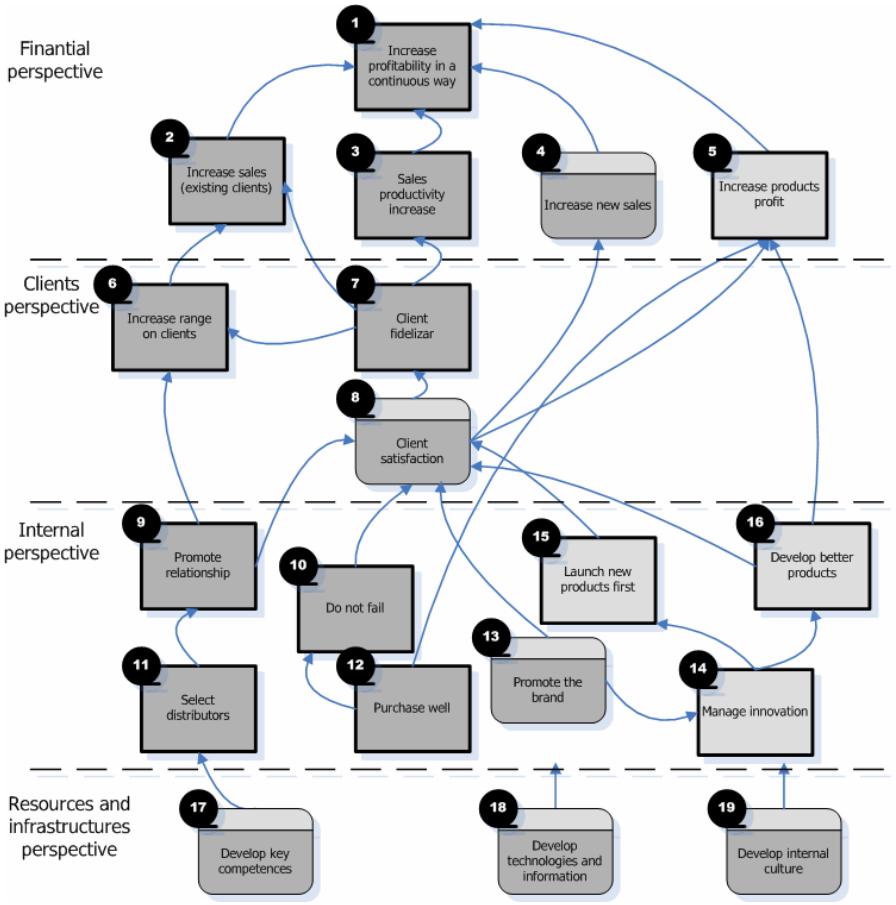

Fig. 1 Company strategic map

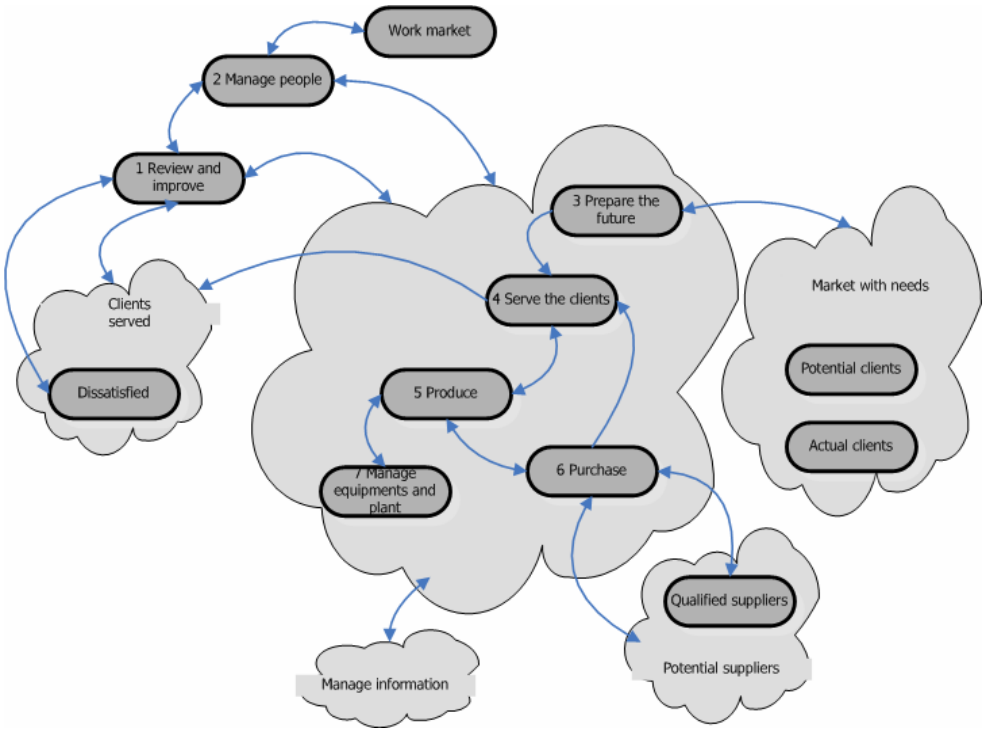

Fig. 2 Representative scheme of the management by processes adopted by the company

IV. . Corrective Measures and Results

The study of the three processes flow chart allowed obtaining the corrective measures to implement, which are presented in Tables 2, 3 and 4.

TABLE II
ORDER PROCESSING

Problem	Corrective measure	Status
Supplier dependence	Creation of the function Procurement With the objective of continuously look for the market better prices and diminution of the number of suppliers	Implemented
High supplier number		Implemented
Manage importations; manage suppliers at great distance where the mother language is different and the goods traffic times are high	Increase supplier evaluation	Implemented
	Do periodic meetings with the suppliers	Implemented
	Automatic dispatch from the informatics system to the suppliers of the purchase orders and pending orders	Implemented
	Promote good relations with the suppliers as well as partnerships in the new solutions search	Implemented

A. Order processing

Concerning the orders, it was verified that they were sometimes introduced in the system incorrectly or delayed. Accordingly, were implemented the adequate corrective measures. With the new function of order manager was revealed a better way to keep up with the orders. The function was structured to have a specific speaker by market, country and client.

A weekly meeting to keep up with orders was promoted, in order to filter possible errors in this phase of the supply chain.

In the preparation and expedition phase were implemented some of the advocated planning measures and was created an expedition map for each one of the expedition units. The transport suppliers were also involved to fulfil the pickup timetable.

For the warehouse management was created an action plan to identify the obsolete products. This way, the storage was reorganised and optimized and some of the inventory value recovered (some times the value was smaller than the acquisition one).Sales previsions and consumption of articles were introduced in the informatics system, allowing a higher answering capacity on new and urgent orders.It was also reinforced the reception control, with the inclusion of efficient measures for the inspection and formation of collaborators.

B. Purchase

One of the weakest links in the supply chain was the diversification of suppliers. Nevertheless, it wasn't high enough to promote disturbances.It was also difficult to define the demand from the clients to the suppliers in order to allow an efficient planning, able to answer the company needs.

To fill these gaps, the company had a high stock of goods with the consequent high rotation time of goods and products.

The chosen solution, created in the company purchase department the function "Procurement", having a responsible for the search of the better market solutions and for the negotiations with the suppliers, creating a nearest relation with them. In this restructuration was transferred the function repetitive purchase to the logistics department. Fig. 3 Ishikawa Diagram

TABLE III
PURCHASE

Problem	Corrective measure	Status
Order incorrect or delayed entry	Appoint responsibles for the orders, which keep up with their status – function Order Manager	Implemented
	Direct introduction of the order by the client in the informatics system	Being implemented
	Weekly check up of the orders situation, to filter possible delays or errors	Implemented
Transport arrangement	Produce by warehouse an order preparation and expedition plan in which the production is also involved	Implemented
Warehouse management	Define procedures for the obsolete products in order to recover the possible ones. Eliminate or sell the remaining ones.	Implemented
	Reinforce the quantitative Reception control by the purchase of the adequate equipment	Implemented
	Optimize the warehouse storage based on the product demand	Implemented
	Market study on the several possibilities of warehouse automation in terms of equipment (rfid) and software	Implemented

There were also created purchasing agreements for all the suppliers type, which are presented and negotiated to every new supplier. The importance of the supplier is also asserted in this negotiation, promoting the awareness and cooperative work instead of individual work.

On the informatics system were also created warning routines sent directly to the suppliers and buyers, through e-mail, three days before the delivery deadline.

For the importations, the liability moved to the function – repetitive purchase, which is now responsible for the looking up of them.

C. Production

The problems identified in the production are the ones presented in the Table 4. In this table, are presented the corrective measures and the implementation status. On the production supply was raised the keeping up from the warehouse, eliminating the disturbances promoted by the goods storage, now placed in an area of easier access. On the other hand, was developed by the production department a production daily map, making the supply of the components on time and permanent areas for the delivery.The average term planning is now on the logistics department, for them to have a higher intervention on the components placement. The order confirmation is now also on the logistics department, which is responsible to check all the bottlenecks of the system.

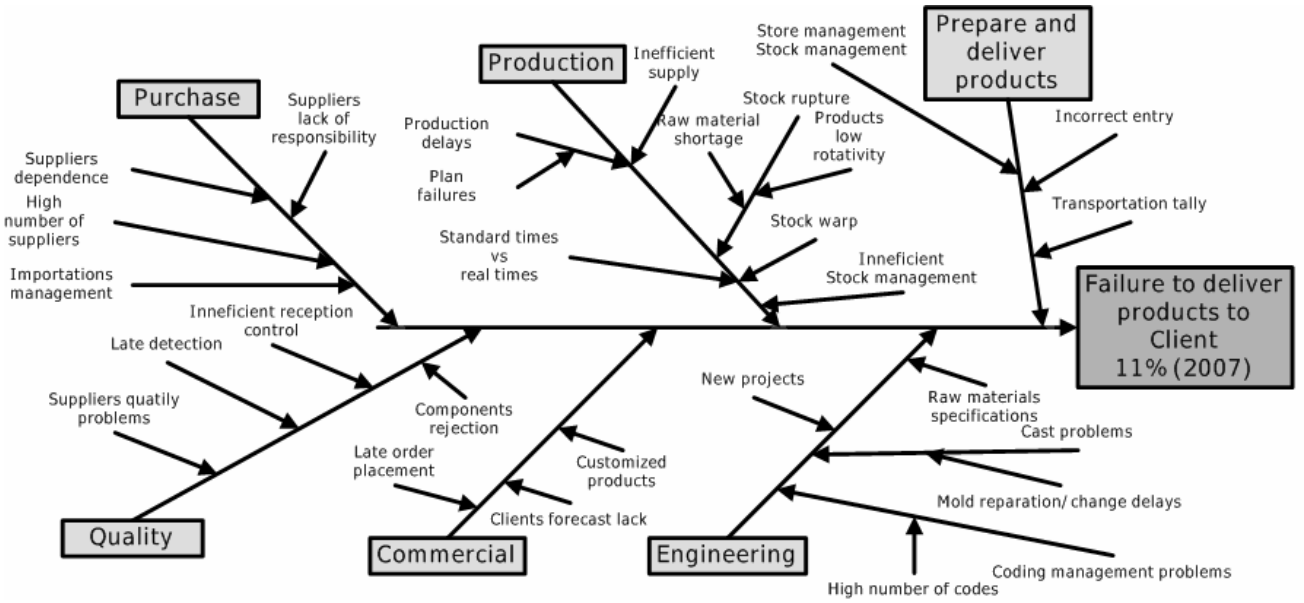

TABLE IV
PRODUCTION

Problem	Corrective measure	Status
Inefficient supply in the goods delivery to the production (there were recorded several disturbances on the delay disturbance)	Improvement of the warehouse practices using functions as picking and material dislocation	Implemented
	Efficient tidying up surplus material	Implemented
	Higher embrace from the warehouse staff in the production	Implemented
	Efficient supply of components	Implemented
	Components packaging in values multiple of the produced amount	Implemented
Planning with omissions – the existent plan doesn't show clearly the status of production	Creation of a daily production plan with real time actualization by the informatics system	Implemented
	Preview in the production plan minimal changes of workers in the working place	Implemented
Standard times versus real times – lack of an efficient timing and methods cabinet, as well as the impossibility to measure on real time the operation productivity of every working place	Purchase of software to solve the planning problem as well the lack of information about the evolution in real time of the standard times	Being implemented

To comply with the work, this department and the materials reception have now a different timetable, freeing the Friday afternoon. The products delivery is not disturbed with production or reception. The logistics team mobilize this way the human resources through the week for the higher flux places.

V. Conclusion

This study was made in two phases. The first one connected to the adopted analysis methodology and was verified that the sequential application of simple analysis methods contributed for the identification of problems with influence in the company performance. The second dimension was associated to the implementation of corrective measures, solving the identified problems. About this subject, it must be highlighted the good results obtained in what concerns the industrial performance, quantified through measures in use by the company (Figure 2). This way, the qualitative and qualitative results were:

i) The dissatisfaction level was reduced from 23% to 19% in 2010;

ii) The amount of products not delivered was reduced from 11% (average value of 2009) to 5% (average value of 2010);

iii) The average delivery time for the international market decreased from 3 weeks to 1.5 weeks. In what concerns the national market the reduction was from 1.5 weeks to 1 week;

iv) The suppliers' number was reduced 3%, increasing the negotiating power;

v) Some purchase prices were reduced through negotiation;

vi) Erroneous introduction of orders were not detected;

vii) Extra time for the expedition workers was reduced by 60%;

viii) The transportation costs were reduced by 16%;

ix) Reduction of obsolete material (some was recovered

through remanufacturing);

x) Identification and clear separation of components and final of life products.

REFERENCES

[1] Gunasekarana, A. and Ngaib, E.W.T., 2005. Build-to-order supply chain management: a literature review and framework for development. Journal of Operations Management, Vol. 23 (5), 423–451.

[2] Veen-Dirks, P.V., 2005. Management control and the production environment: a review. International Journal of Production Economics, Vol. 93–94, 263–272

[3] Wisner, J.D. and Tan, K.C., 2000. Supply chain management and its impact on purchasing. The Journal of Supply Chain Management, Vol. 36 (4), 33-42.

[4] Stock, G.N., Greis, N.P. and Kasarda, J.D., 2000. Enterprise logistics and supply chain structure: the role of fit. Journal of Operations Management, Vol. 18 (5), 531-547.

[5] Monczka, R.M., Petersen, K.J., Handfield, R.B. and Ragatz, G.L., 1998. Success factors in strategic supplier alliances: the buying company perspective. Decision Sciences, Vol. 29 (3), 553–577.

[6] Lawson, B., Cousins, P.D., Handfield, R.B. and Petersen, K.J., 2009. Strategic purchasing, supply management practices and buyer performance improvement: an empirical study of UK manufacturing organisations. International Journal of Production Research, Vol. 47 (10), 2649–2667.

[7] Hong, Y., Pearson, J.N. and Carr, A.S.A., 2009. Typology of coordination strategy in multi-organizational product development. International Journal of Operations & Production Management, Vol. 29 (10), 1000-1025.

[8] Squire, B., Cousins, P. D., Lawson, B. and Brown, S., 2009. The effect of supplier manufacturing capabilities on buyer responsiveness: The role of collaboration. International Journal of Operations & Production Management, Vol. 29 (8), 766-788.

[9] Lin, R-H., 2009. Potential use of FP-growth algorithm for identifying competitive suppliers in SCM. Journal of the Operational Research Society, Vol. 60 (8), 1135-1141.

[10] Kristianto, Y. and Helo, P., 2009. Strategic thinking in supply and innovation in dual sourcing procurement. International Journal of Applied Management Science, Vol. 1 (4), 401-419.

[11] Scavarda, A. J., Bouzdine-Chameeva, T., Goldstein, S. M., Hays, J. M. and Hill, A.V., (2006), Methodology for Constructing Collective Casual Maps, Decisions Sciences, 37(2):263-283.

[12] Stevenson, M., Hendry, L.C. and Kingsman, B.G., 2005. A review of production planning and control: the applicability of key concepts to the make-to-order industry. International Journal of Production Research, Vol. 43 (5), 869–898.

[13] Ketokivi, M. and Heikkila, J., 2003. A strategic management system for manufacturing/linking action to performance. Production Planning & Control, Vol. 14 (6), 487–496.

[14] Tracey, M., Vonderembse, M.A. and Lim, J-S., 1999. Manufacturing technology and strategy formulation: keys to enhancing competitiveness and improving performance. Journal of Operations Management, Vol. 17 (4), 411-428.

[15] Siemsen, E., Roth, A. V. and Balasubramanian, S., 2008. How motivation, opportunity, and ability drive knowledge sharing: the constraining-factor model. Journal of Operations Management, Vol. 26 (3), 557-570.

[16] Taylor, A. and Taylor, M., 2009. Operations management research: contemporary themes, trends and potential future directions. International Journal of Operations & Production Management, Vol. 29 (12), 1316-1340.

F Charrua Santos is a tenured Assistant Professor in the Department of Electromechanical Engineering of the University of Beira Interior and a member of the Industrial Management and Engineering Research Centre and of the Technological Forecasting and Theory Research Group. He graduated in Industrial Production and Management Engineering (1995) at Beira Interior University (Portugal), was Manager of the department of Production Planning of a big textile company, become Assistant the Department of Electromechanical Engineering of the University of Beira Interior, received an MSc in Mechanical Engineering at Beira Interior University in 2001 (Portugal) and received his PhD in Production Engineering (2009) at Beira Interior University (Portugal). During the period was coordinator of more than a dozen applied research projects in the processes optimization and operations scheduling always in industrial environment.

Susana T. Dias graduated in Industrial Production and Management Engineering in 1998 at Beira Interior University (Portugal). Become production director of POLISPORT in 1998 and actually is director of logistics with responsibilities at management and monitoring of orders and products deliveries, stock management, production planning, evaluation of teams performance, elaboration of monitoring indicators for all the teams, supervision of the projects of the department. Received an MSC in Industrial Management and Engineering by Beira Interior University in 2008 (Portugal).

João C.O. Matias is a tenured Assistant Professor in the Department of Electromechanical Engineering of the University of Beira Interior and a member of the Industrial Management and Engineering Research Centre and of the Technological Forecasting and Theory Research Group. He graduated in Mechanical Engineering (1994) at Coimbra University (Portugal), specialized in Quality Management (1997) at Beira Interior University (Portugal), and received his PhD in Production Engineering (2003) at Beira Interior University (Portugal). His current research interests include Industrial Engineering and Management and Technological Forecasting.

Francisco. P. Brójo is a tenured Assistant Professor in the Department of Aerospace Sciences of the University of Beira Interior and a collaborator of the Industrial Management and Engineering Research Centre and of the Technological Forecasting and Theory Research Group. He graduated in Mechanical Engineering (1991) at Coimbra University (Portugal), specialized in Energy (1996) at Beira Interior University (Portugal), and received his PhD in Mechanical Engineering (2004) at Cranfield University (UK). His current research interests include Industrial Engineering and Management.

S. Azevedo is a tenured Assistant Professor in the Management and Economics Department. of the University of Beira Interior and a member of the NECE – Research Unit in Business Sciences. He graduated in Management science at University of Beira Interior (Portugal), and received his PhD in Management at Beira Interior University (Portugal). His current research interests include Logistics, ICT logistics, Logistics and Competitiveness, Supply Chain Management, Retailing and Merchandising.