



A Case Study for Management and Industrial Engineering Integration Approach

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ABSTRACT

The aim of this study is reported in face of the phenomenon of reindustrialization in Europe, supported by developing a case study as a Company can react to the process adopting a new engineering and management system, as the factory was almost deactivated during several years, so the final idea is to demonstrate that is a new reindustrialization movement, but not performing on the same way as in the past, taking in consideration the new industrial management models.

The European Foundation for Quality model (EFQM) and then apply the improvement and management actions in each one of its aspects in order to promote and evaluate the permanent and continuous improvement, for this proposal we use the change and organizational development method, as a research and action approach.

In this organizational transformation and in the case in particular through changes in the shareholder body, the change of generation and especially by the inclusion of the professional management team, in consequence of the key performance indicators improvement, including the EFQM score as a all.

The implementation of a operational management model will lead the board to a leadership style conducive to value creation and results in terms of quality, human and financial capital based on effective organizational performance.

Phased implementation, with the creation and development of pilot areas, is particularly beneficial to the organization's culture.

Keywords: Organizational Change; Organizational culture; Leadership; LEAN management; Engineering Application Model.

I. INTRODUCTION

In our introduction we will base the analyses of the macro message of the Portuguese minister of foreign affairs (Santos Silva in eco.sapo.pt, 2020):

1.1. PANDEMIC SHOWED NEED FOR REINDUSTRIALIZATION OF EUROPE

The economic crisis provoked by the response to the Covid-19 pandemic forced "to learn some lessons that could be an opportunity for Portugal and Europe", said the Minister of State and Foreign Affairs, Augusto Santos Silva, at a hearing of the Economy commission, Innovation, Public Works and Housing of the Parliament.

One of the lessons is that the European economy needs to have industries that went to other continents again, and this reindustrialization could be an opportunity for Portugal, said the Minister, who is responsible for the internationalization of the Portuguese economy.

Portugal has important assets that it can and should use: «the qualification of human resources, the plurilingual domain, technology, the quality of service and the quality of the knowledge and innovation ecosystem, as well as the areas in which it is dominant today, starting for renewable energy'.

This case study was performed in a Portuguese industrial company founded in 1920, remaining its shareholder body over time and to this day within the same family. It is today and since 2014, managed by the third and fourth generation, assisted by a group of professional managers, one of whom is a member of the Board of Directors together with the family elements (Speitzer& Quinn, 2001). The initial idea of the intervention was prepared for the advanced change in the models and management systems, until then supported in the logics and principles of "Mass Production" (Womack, Jones, & Ross, 2010), for the philosophy of "Lean Production" with all the significant impacts of organizational transformation (Quinn, 2006) and Ledbetter (2018). The work goes through several phases, which analyse the principles of strategic management, definition of objectives and effective implementation of strategies (Grant, 2016). The initial change would always have to be supported in fundamental pillars



of action, in which we highlight the clear definitions of the Purpose, the study of Processes of greater preponderance in the management of the company and the clear involvement of people at all hierarchical levels fostering learning (Shook, 2010) and (Burkett, 2016).

For the development of the company's fundamental organizational pillars, strategic base axes were created, which allowed to elaborate the action plans that support the capacity to implement the basic ideas of each of them (Papanikos, 2010).

II. METHODOLOGY

2.1 CHANGE AND ORGANIZATIONAL DEVELOPMENT

The so-called "Project for Change and Organizational Development" (Kotter, 2008) was the model chosen by top management to ensure the necessary change process, as well as compliance with the business plan, supported on the European Foundation for Quality Management, where the different phases and tools applied are evaluated by the full model score, that reflect the management processes improvement in order to react to the new industrial challenge.

The model to be developed is supported by three fundamental pillars that allow its development in phases, considering the permanent monitoring and evolution: (i) Management System - Consolidation and Sustainability; (ii) Themes: Context, stakeholders, leadership and strategy; (iii) Lean Global Management Philosophy (Womack & Jones, 2010).

2.2 MANAGEMENT SYSTEM – CONSOLIDATION AND SUSTAINABILITY

Considering that we want an innovative and continuously learning organization, we intend to develop from a theoretical point of view the EFQM model and then apply the improvement and management actions in each one of its aspects in order to promote and evaluate the permanent and continuous improvement.

We then describe the model from the generic point of view, showing the improvement actions chosen by the top management of the company, considering the connection of the functional areas to the points treated in the respective activity plans described (Flick, 2002).

2.3 CONTINUOUS IMPROVEMENT

Knowing that the decision on the methodology to be adopted falls on the DMAIC cycle, complemented by the PDCA cycle, it will be interesting to compare the two methodologies and these with the methodology of project management, often used in isolated project management, such as the improvement or the investment in a certain critical process at a given time (Nokes, 2007) and (Basu, 2011).

Thus, in [Table 1] we compare the three methodologies showing their complementarity:

Our choice of follow-up and use was clearly based on the DMAIC cycle, complemented by GP (where applicable) and PDCA (for timely improvement cycles), so we characterized it in detail in [Table 2 and table 3] (Basu, 2011).

Table 1. Methodologies

Project Management	Define	Organize	Implement		Close
DMAIC	Define	Measure	Analyze	Improve	Control
PDCA	Plan	Do		Check	Act

Source: Basu, 2011

The use of the various phases of the DMAIC cycle, as well as of the respective tools, should always keep in mind the involvement of the people of the teams in the areas under analysis (Basu, 2011).

2.4 MONITORING

The Management Follow - up Model is the BSC - Balanced Scorecard (Kaplan and Norton, 2016), described and designed on the basis of strategic maps organized in four perspectives, namely: Financial Perspective; Customer Perspective; Perspectives on Internal Processes and Perspectives on Learning and Growth.

The philosophy used and recommended by Kaplan and Norton is the organization of the management indicators, by the four elements of the model, we illustrate the specific case of our study:

The report will always be presented in graphs against objectives, considering the historical evolution of each indicator, time and space for eventual comments and frequency of follow-up (Kaplan and Norton, 2016).

2.5 EVOLUTION ACCORDING TO THE SCORE

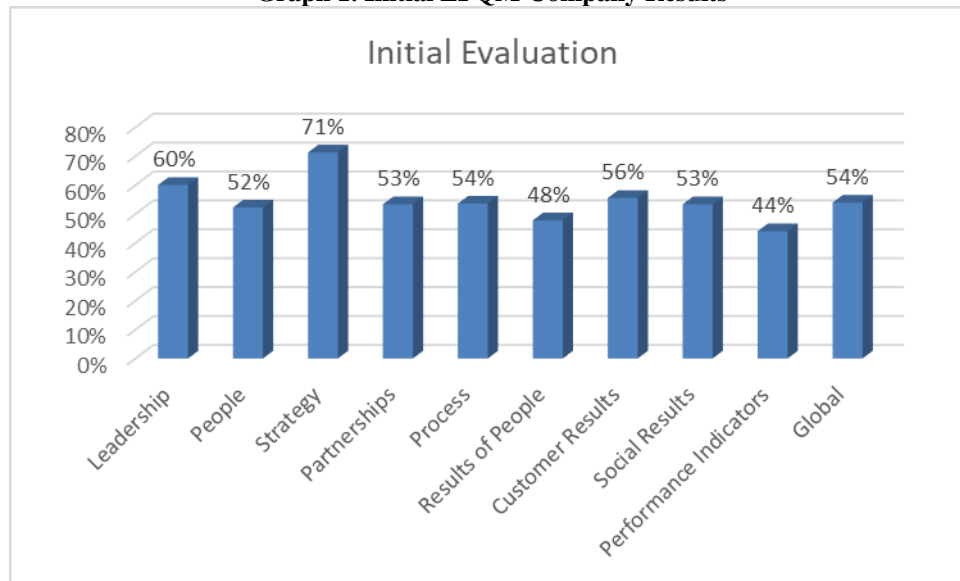
In the tables and graphs below, we can verify the score of each of the areas of the model, which has



as maximum possible score 1.000 (thousand points), divided by the various areas according to their respective percentage weights, still within their two fundamental elements of means and results.

According to the model and with the appraisal applied to the executive management of the company the results were obtained in [Graph 1] (January 2019).

Graph 1. Initial EFQM Company Results

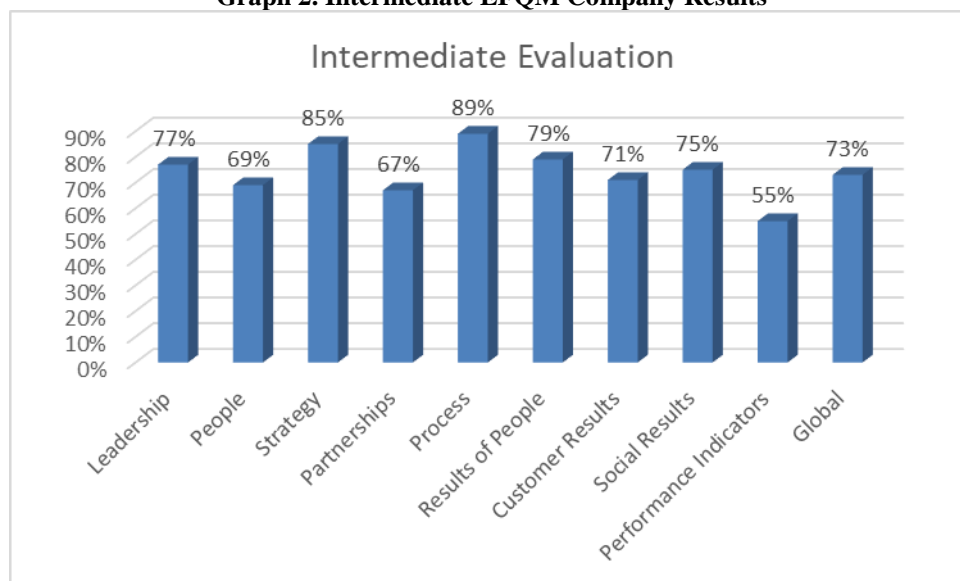


Source: Company data assessment

From reading the results obtained in early 2021, we observed the global value of 54%, representing 540 points in 1000.

In [Graph 2] we present the results, which we consider to be intermediate for the current management cycle, considering that the end of the observation would be the end of 2021.

Graph 2. Intermediate EFQM Company Results



Source: Company data assessment



We observed that 73% of the total value represented 730 points out of 1,000, and that the improvement was developed in all elements of evaluation, with particular emphasis on the evolution of leadership and processes, not being extraneous to the implementation of the Lean management philosophy (Shook, 2010 and 2018).

2.6 RISK ASSESSMENT

In today's changing context, shareholders have been clamouring for greater transparency about the risk's organizations face. There is growing recognition that proactively coordinating all risks in an integrated way is critical to success, so traditional approaches to risk management are no longer sufficient (Kumar, 2021).

2.7 RISK MANAGEMENT

The risk management model was based on the following five areas considering the business risk control approach (Kendall, 1998): (i) Market Risk - Measured by sales results and margins against the budget, BCG Consulting Group) and Porter's five-force diagram in Grant, 2016; (ii) Credit Risk - Considering the approval and policy of credit to be granted, insurance and obtaining credit from third parties and banking; (iii) Operational Risk - brand image and company reputation (NPS), product quality, project development, contingency plans and incident recovery (DRP); (iv) Legal risk - Management of Contracts, present and future litigation, compliance with commercial, labour and tax legislation; (v) Risk of Information and Communication Systems - Classification of information required in "confidential" and security of information and communication systems (Ross & Francis, 2003).

2.8 INTERESTED PARTIES

Value creation, in fact, is the essence of the existence of companies, was defined as the generation of results for customers and shareholders, based on an evolutionary diagram supported by several pillars and strategic actions that we described (Black, Wright, Davies, 2000): Define objectives in all areas of the company; Solve problems - what problems? - it will be the work to be done; Work to be carried out through the intervention and through the business processes; Involving the teams and having the means available and finally we have to improve and evolve, as: (i) By increasing the knowledge and skills of our people; (ii). Improving attitudes, behaviours, leading by example, this is in fact the management system, including the meetings we hold to track the evolution of processes and objectives (Cameron, Quinn and DeGraff, 2006).

2.9 PERFORMANCE MODEL AND OBJECTIVES

In the concrete case study, the principles of action that support the Performance Model and Objectives were developed: (i) Managing People for improvement, adaptability and results; (ii). Increase performance levels through process practices; (iii). Practice and experiment to become more comfortable in the field of processes; (iv) to work with greater individual and collective effectiveness (Schuh, Lenders, Michael, Hieber&Solveigh, 2008).

2.10 LEAN

The management of the change process that supports the Lean philosophy's implementation path from the behavioural point of view is based on its five-dimensional characterization and on a fundamental missus that is "not to speak in a vague way" (Shook, 2010). The dimensions of support to the process of change are: (i). What typology of problems we are here to solve; (ii) knowledge and skills of the people; (iii) Work to be performed permanently and follow-up model; (iv) Management and Behaviour System; (v) Ability to think every day to improve things (Shook, 2010).

2.11 MODEL LEAN - APPLIED

In the Company case study the Lean management system was designed and conceived in four fundamental areas of basic performance, which are then developed according to the concepts or processes that support them, we represent the conceptual model with the natural interconnection to the defined strategic plan and taking into account the four areas of action that we describe as: Definition of the Purpose of the actions; Involvement of People; Continuous Improvement Cycle (PDCA); List, description and transformation of all company processes, (Shook, 2010).

After the representation and construction of the conceptual model we must implement the Lean - design model, which is the application of the concepts to the company's reality. We represent the scheme of the EFQM model.

The application areas coincide with the conceptual model in terms of macro definition, we will then develop the model in practice and in numbers, (Graph 1).

The significant improvements in operational indicators are reflected in the company's economic and financial indicators, through reduction and optimization of costs, and also improve its competitiveness through the adjustment of the sales price strategy to the reality of the markets, greater agility in change and better performance in terms of quality (Nicholas, 2010).



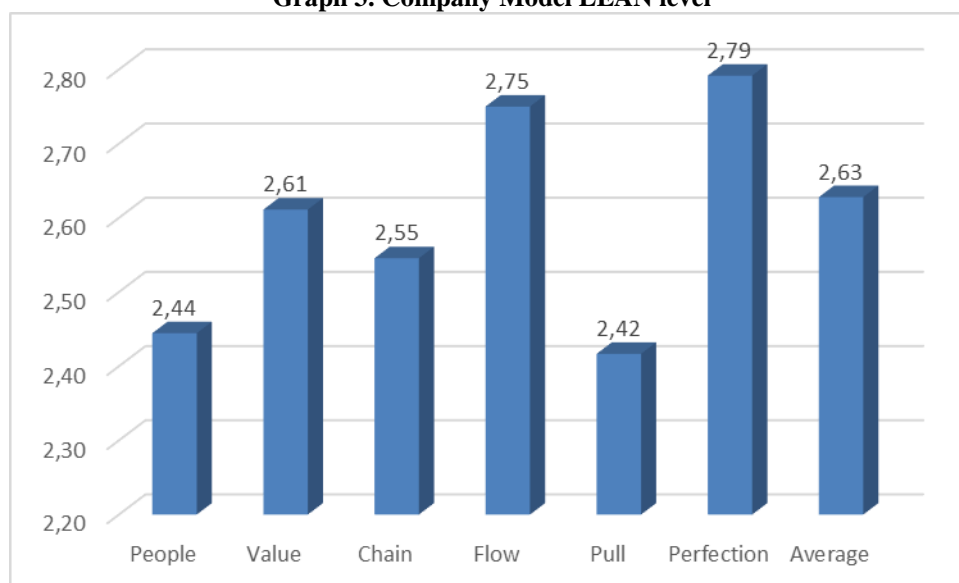
2.12 LEAN IMPLEMENTATION

The evaluation model adopted for the evaluation of the LEAN implementation level was based on the LAI - Lean Advancement Initiative of the MIT - Massachusetts Institute of Technology, which presents the analysis of the system in six fundamental points: Involvement of People; Value creation; Value Chain; Flow of Processes; Notion of "Pull" and Index of Perfection.

The following are four key levels of Lean implementation in organizations: (i) Level 1 (use of Lean tools); (ii) Level 2 (creation of flow in processes); (iii) Level 3 (development of a Lean system); Level 4 (consolidation of the system with industry automation 4.0).

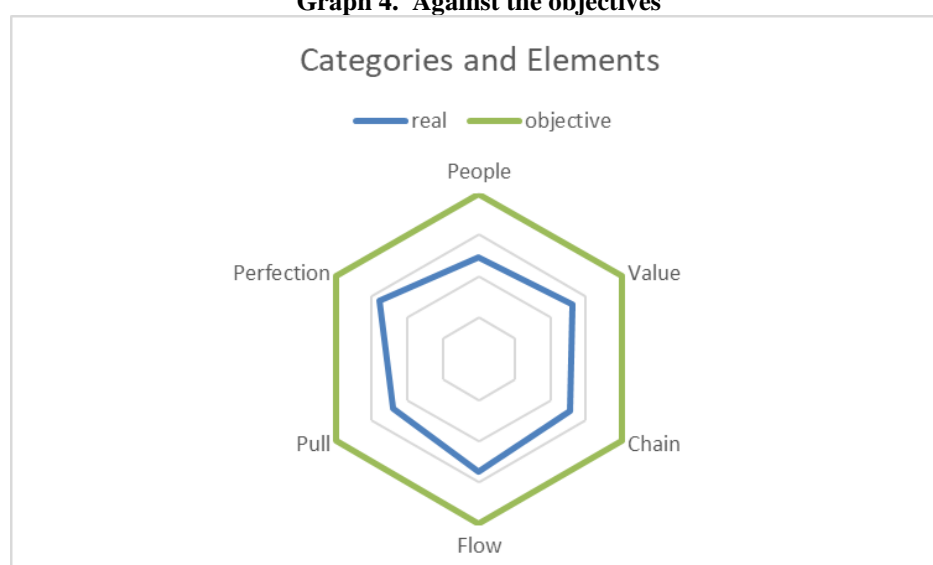
In the case study, in 2021-2022 we present an average score of 2.63, distributed by the six factors according to the following graphs.

Graph 3. Company Model LEAN level



Source: Company data assessments

Graph 4. Against the objectives



Source: Company data assessments



The values show an implementation level of 66% in relation to the objective, knowing that according to the LAI / MIT model the actual level of (2.63) compared to the maximum of (4) represents that the organization is in the implementation phase process flow and in-line systemic approach represented by level (3).

2.13 THE LEAN METHOD FOLLOWED

The Lean method followed is supported in a system of balancing and integrating three fundamental concepts of all Lean models, which are definition of the Purpose for the realization of all actions, projects and programs, defined as the reason or reasons why it is going to be realized event, whether strategic, tactical or operational (Womack, 2016).

2.14 FLOW TIME

We follow what in practical terms is meant by value and waste, in order to illustrate the ways of acting in order to maximize the former and reduce or eliminate the second, core essence of the Lean management philosophy.

The functioning of the system does not depend on how each part or area acts, but how each one integrates with the others.

2.15 LEADERSHIP WITH THE VALUE CHAIN

In the concrete case study, we intend to support the execution of strategies, implementation and management of the new governance and performance model, in a leadership philosophy known as the "Global Value Chain of the Company - Operational Excellence", which allows the optimization of (Lopes, 2011, and 2016), which is a new approach, less hierarchical, more participatory and responsible (Lopes, 2011 and 2016).

The value chain we speak of enables the company's leadership in an integrated way to achieve the results expressed in the objectives, thus creating value for clients and shareholders (Cameron, Quinn, DeGraff and Thakor, 2006).

In practical and real terms, the top leadership is cemented and implemented through an executive management body "executive committee", represented by the directors and coordinated by the CEO that establishes the connection with the Board of Directors, organ in which it takes place as Executive Director (Lawrence, Lenk & Quinn, 2009).

2.16 ACTIONS PLAN

The set of these actions and their integration with the company's strategic principles base and main performance of the top management, allow a permanent contact with the operational terrain (Gemba) (Womack and Jones, 2006), thus doing

justice to one of the basic principles' leadership role in the logic and spirit of Lean management - "go with your own eyes and lead by example" (Shook, 2010).

2.17 STRATEGY AND DEPLOYMENT – BUSINESS CHAIN

The immediate bet markets are clearly competitive, but they will be future bets, such as: Iberia, Algeria, France and Central and Southern Africa. These markets have different approach characteristics, but there are some common denominators, such as aggressive price policies, the usefulness and appropriateness of the solutions, and a great deal of sensitivity to the various marketing policies, whether they are advertising, or distribution channels and services. after-sales service (Kotler, 2014).

In general terms, a 38% growth has been achieved in which international activity, considering the nuance of the Spanish market, currently accounts for 70% of the company's business, in which it previously represented 59%, knowing that it still exists also a strong growth in the domestic market (Holweg, 2006).

2.18 COMPANY COMPETITIVENESS

The competitiveness of companies is supported by the ability to execute their strategies, which in turn is supported by various elements of development and evaluation, from the constant adaptation of their structure, optimization of business processes in favour of productivity increases and optimization and cost reduction (Haidar, 2012).

The interconnection of these factors with the Research & Development capacity, translated into the creation and launching of new products, services and solutions, for customers and markets, are factors of measurement of competitiveness with particular importance (Grant, 2016).

The cost reduction in the perspective of the optimization of processes reducing the categories of waste related to excess inventories, rework operations and waiting times (Desai & Ferri, 2009). In addition to the three cost areas highlighted, the management costs related to the budgetary deviations that represent in the specific case of (27.9%) are also subject to action, which are in the first line of action of the Company. responsibility of the company's executive management structure, thus promoting accountability and greater effectiveness in solving problems.

The report the cost analysis from the perspective of the quality costs according to the methodology of (Crosby) (Russel & Taylor, 2014), that allows the observation and the decision making and measures more directed and effective to each one of the



elements of cost and consequently a greater preponderance in its rationalization or optimization. From the analysis to the data of the table we observed that the prevention category (35%) is connoted with rationalizations of structure and framework costs, the evaluation category (25%) is related to models and methods of quality management betting more and more on scientific aspects of statistical control and self-monitoring (Piper, 2010-2011).

In the following categories we relate internal and external faults, internal faults (30%) typically related to manufacturing nonconformities or support areas, which must be followed and corrected by quality reports and external faults normally attributed to defects found supplies or third-party information.

The improvements of (14%) already verified and of more (12%) objectified, will surely be implemented through the combination of sales growth and cost rationalization, concretely doing more with less (Womack and Jones, 2012).

2.19 MANAGEMENT INDICATORS ANALYSES

The management indicators were outlined in three fundamental categories, which allow us to follow and evaluate the performance of the processes, as well as the operational and financial impact of the integration of the various categories, which are: Competitiveness Indicators; Economic indicators; and Operational and Financial Indicators (Hejazi, 2015).

2.19.1 COMPETITIVENESS INDICATORS

The main competitiveness indicators adopted and developed, through their application and adaptation to the reality of the organization and business, with the principles of increasing the qualitative and quantitative competitiveness indexes.

From the observation of the evolution of the competitiveness indicators, we can highlight the qualitative improvement through the NPS – Net Promoter Score (80%), by listening to customers' opinions about the company's performance in various parameters (Kaplan & Anderson, 2007 and 2016).

2.19.2 OPERATIONAL, ECONOMIC AND FINANCIAL INDICATORS

The evolution of the economic and financial indicators, first phase, but mainly the link between the operational indicators and the economic and financial indicators that translate into a consequence of the good performance of the previous ones (Damodaran, 2019 & 2020).

The evolution of the economic and financial indicators treated are clearly the consequence of the

operational indicators (Kracklauer, Janssen & Dorr, 2010), as shown in table, where the evolution of values is in stock rotation (3.2%); Working Capital (4.65%); EBITDA margin (15.6%); and Net Cash Flow (46.7%).

The clear implication of value creation comes from sound management to reflect the results of the actions, in the return results to shareholders, represented by the Working Capital, EBIT and Net Cash Flow indicators (Emiliani, 2007).

III. RESULTS

We would like to understand the impact of all the actions plan in the improvement results for the indicators, that will impact the EFQM score at the end, this is the normal management flow of a company.

According to (Cameron, Quinn and DeGraff, 2006), the implementation of a management model will lead management to a leadership style conducive to value creation and results in terms of quality, human and financial capital based on effective organizational performance.

Development and implementation of the strategic plan: Strategic Map, Actions and Strategic Objectives, until then non-existent.

Plan of Activities: Annual objective, maps of implementation of the strategy, deployment by functional areas and documents related to the strategic plan, which allow the common guidance of management units, such as (i) Market Studies; (ii) Business Plans; and Quality Plans (Womack, 2007).

Project of Change and organizational development according to Kotter (2008), was the model chosen by the top management as a way to guarantee the systemic implementation, based on the following pillars of action: (i) Top Management Actions; Definition of Objectives; and (iii) Implementation Practices, supported by the change in Company Culture (Values and Behaviour).

(Context), the systemic thinking of Katz and Kahn (in Grant, 2012), through the open systems model, evidence the general environment and the organizational context creating the process of functioning through the inclusion of resources to the production of "outputs", modified by the elements characterizing the context, such as: (i) Culture; (ii) Objectives and Strategies; (iii) Behaviour; (iv) Processes; (v) Technology; and (vi) Structure. In our localized approach at the level of the EFQM model.

Phased implementation, with the creation and development of pilot areas, is particularly



beneficial to the organization's culture, and also engaging people and the cascading communication process, as qualitative process, that is reflected in the improvement indicators result, already reported in tables 10, 11, 12 and 13, taking in consideration the risk management approach, where the results are demonstrating the improvement % in the key performance indicators, from the first period up to date.

The entry into the "way of life" of the company when defining the long, medium and short-term improvement cycles, in which the use of the DMAIC and PDCA cycles in an integrated and complementary manner (Basu, 2011), through the Lean tools.

According to (Kaplan and Norton, 2012) the use of the Balanced Scorecard allows the organization and correct allocation of the management indicators, thus ensuring its correct and effective follow-up to the objectives.

Improvement of the overall EFQM index by 35%, passing from one year of 540 to 730 points, that is the main key performance indicator we have used to understand the overall improvement.

Implementation of the corporate risk management model based on five pillars: (1) Market Risk; (2) Credit Risk; (3) Operational Risk; (4) Legal Risk; and (5) Information Systems Risk (Kendall, 1998).

The development of the model considering the Stakeholders: Clients and Shareholders, leading to value creation, which according to Black, Wright and Bachman (2000) is achieved by setting goals in all areas of the company, solving problems, optimizing the processes of the business and involving the teams with the appropriate means. According to Cameron, Quinn and DeGraff (2006), the strength of value creation stems from the model of action and achievement of objectives through the LEAN transformation (Shook, 2010).

Strongly active behaviour of top and middle management, according to (Quinn, 2004), transition from the normal state to the fundamental state of leadership.

Management of skills, knowledge and talent, providing the success of the teams (Cascão, 2014).

Strategy and Deployment: always associated to the business chain supported by the diversity and segmentation axes, marketing policies and established criteria, such as geographic distribution network (Kotler, 2014).

Company competitiveness - supported by cost optimization of internal business processes, considering the categories of: (i) Excess stocks; (ii)

Rework Operations; (iii) Waiting times; in addition to the budgetary deviations that represented (27.9%) deviations in costs, which is one of the rationalization opportunities.

Implementation of the analysis of quality costs, in four categories: (1) Prevention (35%); (2) Evaluation (25%); (3) Internal failures (30%); and External Failures (10%).

Leadership Behaviour, according to Shook (2010), should be focused on management by example, having all people involved and committed, putting know-how ahead of "think what," instilling principles of continuous improvement, testing before opting for solutions to market problems or needs, building trust in teams and people, developing mutual trust, developing people first and foremost as products, accomplishing all this and dealing with day-to-day functions.

Analysis of the data and results of the management indicators, which according to (Hejazi 2015) were divided into categories: (i) Competitiveness (with changes between 40% and 80%), whether qualitative or quantitative; (ii) Operating, Economic and Financial (with changes between 3.2% and 46.7%).

IV. CONCLUSION

According to (Grant, 2012) it is fundamental that the strategies supported in the motivation of the people and in the definition and follow-up of objectives, are implemented by appealing to what are called successful strategies through the execution capacity, by the functional areas.

Areas in which the priorities for action are defined, the strategies to be developed, the target areas of action, indicators of progress and objectives, according to Grant (2002), allows the success of the implementations.

Risk Analysis and Initial Diagnosis - the involvement of the most experienced teams in this phase was central to defining the main problems and opportunities for improvement, according to (Shook, 2010), (Womack and Jones, 1996).

The task holders in the various processes are the most knowledgeable of their difficulties, and if they know how to solve it is another issue, for that we had to change (Abzari, Mehdi & Fatemeh, 2011).

We evaluated the LEAN implementation levels according to the LAI (LEI Advancement Initiative) Model, through the six parameters of the defined scale: (1) Involvement of People; (2) Value Creation; (3) Value Chain; (4) Flow of Processes; (5) Notion of "PULL"; (6) Index of Perfection,



obtaining (66%) of the level of implementation, considering the scale we will have more (34%), of opportunity for improvement.

We conclude definitively that modern management systems can adapt to centennial organizations and function in perfect harmony with the experience demonstrated over time, considering that the critical success factors are based on the formation and transformation of leadership styles, and effective management programs communication, (Mann, 2016& Lopes, 2016)).

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