

IMPROVEMENT METHODS FOR THE OPERATIONAL ORGANISATION OF SME's: AN ECUADORIAN CASE STUDY

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ABSTRACT

The small and medium enterprises (SMEs) represent an important sector for the growth of the world economy. In Ecuador the SMEs represent the 16% of the gross internal product and the 84% of the manufacturing companies. Unfortunately this sector has been suffering from competitiveness problems as poor quality, high production costs, etc. This article presents the application of an improvement method adapted to the characteristics of the Ecuadorian SMEs in a SME from the plastics industry. The results from the implementation reflect improvements in the operational performance measured by scrap, complaints, returns and sales per employee.

Keywords: improvement method, operational performance, 5S, kaizen

1. INTRODUCTION

Ecuador is a small Andean country located in north of the South American Continent. Ecuadorian companies are facing hard times because of the politic and economic issues that this country has suffered for the last 2 decades. Although, the Gross Economic Product of Ecuador has grown 2,2 times, the life level of the Ecuadorian people has not improved. Moreover, between 1999 and 2001 the Aggregated Manufacturing Value (VAM) has grown in levels that are under the mean of Latin American Countries VAM (Ministerio de Comercio Exterior, Industrialización, Pesca y Competitividad (MICIP) & Organización de las Naciones Unidas para el Desarrollo Industrial (ONUDI), 2004).

In Ecuador, the economic growth is supported in some extend, by the small and medium enterprises (SMEs). Inside the manufacturing industry, big companies represent the 16% of the business and SMEs represent the 84% of the business. In 2000, the SMEs represented the 15.5% of the Gross Internal Product (GIP) and the 25% of the exports but the competitive level of the Ecuadorian SMEs is lower than the competitive levels of the SMEs of other Latin American countries such as Colombia and Venezuela. Furthermore, the situation of Ecuadorian SMEs is characterized by: a low technological level, poor quality, high production costs, non-specialized workers and low productivity levels (Instituto de Investigaciones Socio-Económicas y Tecnológicas (INSOTEC), 2002; Barrera, 2001). In spite of the drawbacks of Ecuadorian SMEs, they have a great potential to generate employment, income and production (Barrera, 2001).

Due to the fact that productivity and efficiency improvements lead to a reduction in the productive costs and thus, make the enterprises more competitive (Níebel & Freivalds, 2009). I believe that it is time for the Ecuadorian SMEs to work in a formal way to improve their productivity; being productivity the ratio to measure how well an organization converts input resources (labor, materials, machines etc.) into goods and services. Thus the aim of

this research is to adapt the improvement methods to the Ecuadorian SMEs characteristics and apply this adapted improvement method to a SME from the plastics industry.

2. ECUADORIAN SMEs CHARACTERIZATION

The characteristics of the Ecuadorian SME's were taken from three information sources: 1) The secondary data that includes research reports from governmental institutions such as the National Institute of Statistics and Censes, the Institute of Socio Economical and Technological Research, and the Ministry of External Commerce, Industrialization, Fish and Competitiveness; 2) A survey applied to 117 Ecuadorian SME's in 2008 and 3) In depth interviews to the owners and managers of 12 SME's from the Ecuadorian plastics industry.

In summary, the main characteristics of the Ecuadorian SMEs, taken from the primary and secondary data are:

1. Low quality and productivity levels
2. Intensive use of labor with low educational level. 1% has a postgraduate degree, 15% has an undergraduate degree, 6% has a technical degree, 31% has finished the high school, 30% is qualified with no education and 17% is not qualified with none education
3. Approximately 66% of the SMEs produce according to the make to order system
4. The most used method for quality control is the visual inspection by simple observation (57% of SMEs)
5. Only 43% of the SMEs have a formal training plan
6. Only 39% of the SMEs deliver between 90 and 100% of its orders on time
7. 80% of the SMEs have complaints and returns from 0 to 10% of its orders
8. Few enterprises have classified their customers. The interactions with the customers are strictly for placing orders.
9. There are plenty of changes in the production planning. These changes sometimes produce friction between the people of sales and production
10. Low housekeeping level and few visual communication signs in the workshops
11. Most of the companies just use the simple metrics such as kilograms produced and scrap. These metrics are just kept as historical information and they are not used for taking decisions
12. None company uses the 7 basic quality tools and neither maintains groups for solving quality problems
13. 55% of the companies do not use any formal technique for solving quality problems.

These characteristics will be taken into account for the development of the proposed improvement method for the Ecuadorian SMEs

3. THE PROPOSED IMPROVEMENT METHOD

The proposed improvement method will be developed taking into account the characteristics of the Ecuadorian SMEs and the literature review about the existing improvement methodologies. The method will be a composite of the methodologies such as World Class Manufacturing, Lean Manufacturing, Total Quality Management, Kaizen and the SHEN model for make to order SMEs (Muda & Hendry, 2003). I propose a method with 4 steps and 2 transversal principles as shown in the figure 1:



Figure 1: the proposed improvement method

3.1 ORGANIZE THE WORKPLACE

This step includes housekeeping and visual control. In Lean Manufacturing, the first tool that should be applied is the Toyota 5S program and the workplace organization (Liker & Meier, 2006). This is considered as pillar for reaching a high score in the World Class Manufacturing principles (Schonberger, 1996). The concept of workshop organization is also present in the SHEN model in the fourth principle called “simplify the shop floor” where it is stated explicitly to improve visibility, order and housekeeping (Muda & Hendry, 2003). It is necessary that the workplace should be clear of garbage and organized before the implementation of a formal change in the way of working.

3.2 GET TO KNOW THE CUSTOMER

One of the first steps of Lean Manufacturing is to build a Value Stream Mapping that includes the customer as a big player in the productive process with direct link to the production planning and control system (Liker & Meier, 2006). Also, in TQM the customer focus is vital for achieving a higher level of performance (Appiah-Adu & Singh, 1998). In addition, Valsamakis & Sprague (2001) suggest that the small and medium sized manufacturers can develop closer relationships with customers. The customer orientation aspect will be included in the proposed method. The people will be trained in customer orientation so that they understand the needs of the customers and in this way the workers will find a meaning for their jobs. The customer role is very important for the manufacturing planning and control and the quality system; these systems should be integrated with the customers in order to quickly and effectively answer to the changing requirements of the market (Juran & Gryna, 1993).

3.3 INTEGRATE PRODUCTION AND SALES

The relations between production and sales have been widely analyzed by different authors (Soler & Tanguy, 1998; Shapiro, 1977; Parente, Pegels, & Suresh, 2002; O’Leary Kelly & Flores, 2002). Parente and his colleagues (2002) suggest that the relationship between production and sales is very important for the customers and much more important in the make to order companies (Muda & Hendry, 2003). Another important reason for including this step in the proposed method is the clear evidence collected in the in depth interviews that there are big conflicts between production and sales. Based on the literature review, the activities proposed for this step are: 1) Define clear policies and get the support from the top management, 2) Map the areas where the integration of both departments is needed, 3) Enhance communication between marketing and production, 4) Define of new integrated performance measurements

3.4 IMPROVE QUALITY

Thomas and Webb (2003) proposed a conceptual framework for quality model development of SMEs taking into account the characteristics of the South Welsh SMEs: lack of theoretical knowledge of quality techniques, lack of time, lack of human resources and lack of financial resources. This model is sustained in three basic stages: Problem Identification, Problem Solution and System Development. In the first stage, basic quality tools are utilized in order to quantify the magnitude of the problem and provide potential solutions. The second stage proposes the application of quality enhancement tools such as continuous improvement. Finally, the last stage proposed the utilization of tools to sustain the improvement done in the second stage.

Similar to the research of Thomas and Webb (2003), this step proposes the utilization of the 7 basic quality tools and the technique of 7 waste firstly to identify the problem and after that, the utilization of the kaizen technique to improve the process.

4. THE IMPLEMENTATION OF THE METHOD IN AN ECUADORIAN SME

The implementation was developed following the proposed improvement method described in section 2. The SME selected belongs to the Plastics Industry and has 57 employees. The project team members were 2 senior students from Industrial Engineering, 1 employee from the company and 1 researcher. The first month was dedicated exclusively to evaluate the initial situation of the company and to train the general manager and the other managers in the methodology. This training has a dual objective: to transmit the knowledge and to get the approval of the techniques to be applied. After the initial evaluation, the launching event was performed. The launching event was developed as a workshop with some training activities, games and team work. The main objective of the launching event was to deploy the meaning and the guidelines of the project.



Figure 2: Launching event

The implementation of the project was done through the weekly meetings. The agenda of the meetings consisted of 15 min of training, 15 min of checking the performance indicators, 20 of brainstorming of improvement ideas, 15 min for defining the action plan. The meetings were led by the students at the beginning and little by little the leadership of the meetings was changed to key persons of the company.

Initial Situation

The Project team performed a diagnosis during the first month of the study. The main problem is the high level of defective products which means losses of 7.161 USD in returns (December 2009) and also high level of scrap 15,2%. In summary, the initial situation (see table 1):

Table 1: Initial situation

Operational Indicators	
% scrap	15,2%
% returns	1,4%
% complaints	0,5%
Soft Indicators	
# suggestion per employee	---
% implemented suggestions	---
% employees working in teams	0

After the launching event, the improvement teams were defined. There was one team for each area of production (extrusion, sealed, printing, maintenance and warehouse). Also the time, frequency and place of the meetings were set. The general manager and his son used to frequently participate in the meetings. This was very helpful to increase the commitment of the employees to the project. Since the beginning, the employees get involved with the project. Little by little the involvement of the owner's son was increasing till the end when he was designed to continue with the project.

Organize the Workplace

The 5S technique was developed during the first two months of work. The training and the red tag strategy was done at the weekly meetings with all the blue collar employees. Also, a cleaning campaign of two days was implemented with all the employees. After the red tag strategy and the cleaning campaign many useless articles, equipment and tools were discarded. Around two tons of articles were sold. An audit sheet was also used to evaluate the initial 5S situation; extrusion was graded with 71%, printing 72%, sealing 70%, warehouse 69% and maintenance 71%.



Figure 3: useless articles

An audit team was defined with three employees from different departments of the company. The assignment of the audit team was to perform every week and audit of the different areas of the workshop. The aim of the audits was to develop a competence between the areas. Thanks to this competitive environment, the different areas make an effort to improve their 5S rates. After 4 weeks of work, the maintenance team was awarded due to their excellent performance (78%). The award consisted in a dinner at a fancy restaurant of the city.

After the 5S award event, the other teams were jealous and they started to complain but after two weeks they understood that the only way to win the prize was working on 5S and not complaining. The second award was for the warehouse team who reach 82% in the 5S audit.

Get to know the customer

At the beginning of the project, the only interaction point between the customers and the company was the sales department. The first activity developed in this arena was the ABC classification of the customers. As a result, it was identified that almost 10% of the clients generated the 79% of the sales and also it was determined that only 2

clients generated the 80% of the returns. Based on this information, the visit plan was developed. The aim of the visits was that the employees understand the use of the products. The blue collar employees and the quality coordinator were designated to perform the visits and the interviews. Afterwards, they should present a report of the visit to their colleagues at the weekly meetings. During the project, 2 visits were concreted. Thanks to the visits, the process of the client could be understood by the blue collar employees and some suggestions were made for improving the product.

Integrate production and sales

In first place, two meetings were arranged: one with the employees from the sales department and the other with the employees from the production department. The aim of these meetings was to understand the needs and complains between each department. With the information collected in these meetings, an action plan was designed and presented to the top managers for discussion and approval. Among the principal needs that both departments agreed were: the need of technical training for the sales agents, the need to review the policies of delivery periods and the need to improve the communication. In addition, some critical activities and the potential problems were identified (see table 2).

Table 2: Potential problems between production and sales

Activity	Potential problems
Quotation	The Price is not correct Missing simple or buying order
Change in dimensions of a product	Sales do not inform to production about the change
Production planning	Changes in priorities Orders without a formal requirement Late orders Urgent orders

A technical training session about raw materials, process and products for the sales agents was held. In addition, the time delivery policy was redefined based on the market standards and the capability of the production process. Finally, a planning meeting was defined to be help every week in order to improve the communication between the two functions.

Quality Improvement

For this step, we started with the 7 wastes, from the 7 wastes we chose product defect because that was the most critical aspect for the company at that moment. Once we chose product defect, we trained about the 7 basic quality tools and made emphasis in the cause effect diagram. Using the Pareto Diagram we found that the majority of the quality problems (64%) were generated in the extrusion area; therefore, we narrowed the analysis to this area. Inside the extrusion are we found also the most repetitive types of defects such as black dots, width variation and others.

Furthermore, we used the Failure Modes Effects Analysis (FMEA) in order to figure out the causes of the most relevant problems. With these results we performed a focus group with supervisors and operator in order to generate improvement ideas. The first improvement idea implemented was a technical training for the operators about the correct utilization of the extruding machines. Also the training about techniques for cleaning the machines, a dirty machine produces black dots in the products. Another idea implemented was the organization of the warming up periods for the extrusion machines because too long warming up periods are one of the causes for black dots in the materials.

5. RESULTS AND DISCUSSION

After the implementation of the proposed improvement method, the main problem of the company was reduced considerably. The scrap was reduced from 15.2% to 7.4%. In addition the % of returns was reduced from 1.4% to 0% and the complaints from 0.5% to 0%. In addition there were soft indicators that increased such as suggestions and % employees working in teams (see table 3). These results are consistent with previous studies that found that lean manufacturing practices have a positive impact on performance (Mazany, 1995; Mukhopadhyay & Shanker, 2005)

Table 3: Final indicators

Operational Indicators	
% scrap	7,4%
% returns	0%
% complaints	0%
Soft Indicators	
# suggestion per employee	0,2
% implemented suggestions	75%
% employees working in teams	76%

6. CONCLUSIONS

This article presents an adapted improvement method for the Ecuadorian SMEs based on the characteristics of the SMEs and the existing improvement methods. The proposed improvement method is a combination of Lean, TQM and SHEN techniques.

The proposed improvement method was applied in a small plastics company with good results in the operational performance measured by scrap, complaints and returns. In addition, soft indicators were improved.

These results should be taken with care. More applications in SMEs from other industry sector are needed in order to confirm the applicability of the proposed improvement method

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