

Evaluating the implementation of quality system in a small textile industry of knitting

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Abstract

This study was conducted a small textile industry and aims to assess and investigate the practices used in the implementation of quality management systems and tools to ensure process improvement. The purpose, therefore, is to implement the quality system and also analyze the management practices and tools used to ensure quality, comparing practices and showing the results in productivity and product quality. The research was conducted through a case study, we intend to analyze the reality of the organization in making the visit on-site observation. A case study can thus elucidate a number of issues on the development of quality in the textile industry of small, checking possible kinds of inefficiency or improvement points unexplored. To verify that the controls of the company to support the implementation of quality management system were conducted evaluation, analysis, testing and monitoring in all sectors.

Keywords: System, Process, Tools, Quality Strategy.

1. Introduction

In the study discussed the tools and methodology to implement the quality management system in a small business, a proposal to improve the system's production company used quality management tools, which enabled to develop these activities and at the same time addressing methods and strategies.

The quality of products and services is essentially a way to make the company more attractive and competitive in the market. Within this context it was necessary to develop a plan for improvement, suggesting corrections and assisting decision making.

With this increased the criteria in the processes of quality control will as economic activities grow in the market. In the evolution of own control structure arises need for investments in production processes to assist the organization in its various decision-making levels.

New technologies in textile companies caused the need to invest in development, improvement of quality controls and standards certifications. In this sense making the product more competitive in the market, it makes it necessary to adapt to processes and management.

For this reason, companies seek modifications to suit a more competitive market, but one question is still not very clear, as the company Textiles small can ensure a management system compatible with their needs for control, using policies and practices that ensure the quality of products?

This issue is very important industries in the textile sector are mostly small and medium-sized, according to the Brazilian Association of Textile Industry - ABIT (2011), for this reason there is great need for tools to control. Thus, the implementation of quality management system in a small textile industry must have a model that fits the market.

The study contributes to a new vision of reality in small and medium enterprises, helping to fit in such a competitive market through techniques, tools and methodologies and seeking to increase product quality.

The objective of the research was to identify appropriate practices for deploying a system of quality management and use of tools to ensure the improvement of textile processes, suggesting new methodological strategies that contribute to aid development in small businesses.

The management systems were checked and controlled by management, who knows the profitability of services can manage the cost, quality and revenue.

There were, controls the company's support for the implementation of the quality management system through assessment, analysis and monitoring in all sectors.

In developing this work was performed the implantation of quality management system in a textile knitting, which involved a series of modifications to existing processes in the company.

2. knitting

The knitting that serves as the object of study in this research work with circular knitting machines (monofrontura) and produce half weft knitted by weight in kilograms measure. The meshes are produced by interlacing yarns that knitting is called because it is the use of several needles or needles for cooking.

In the knitting process, titration of wire used depends on the product to be produced, titration is the number of microfilaments existing in the yarn, the yarn used for producing grids have the same twist, the main characteristics required for the knitting yarn are: Uniformity, flexibility, elasticity and strength.

Uniformity - irregularity in the diameter of the wire causes defects such as hole and tissue transparency.

Flexibility - for hosiery item is very important, if the twisted yarn or textured stabilizes the filaments, assisting in production.

Elasticity - being an article that the body shapes that feature assists in knitting, after ceasing voltage, the wire returns to its original compliance.

Strength - influences the resistance of the article, providing greater durability.

In consideration of the relation of wire bonds used for the production of articles of knitwear half the company uses descriptive performed by the supplier, according to information from technical documents polyester yarn sent by the client and have the features that are available in a sheet, which describes the item that is being received.

The analysis began the process through modeling, and for this, we defined parameters for its development, for practical purposes, the steps required to characterize execution of process modeling.

3. Material and methods:

In this study it was used to analyze, redesign and planning of events such as methodology, and yet, as a systematic way to achieve the goal. The planning of activities and changes in the system was the systematic approach, which allowed to establish the relationship between practice and theories so that address the phenomena occurring in the application of quality tools.

The research is characterized as a case study in the form of an exploratory and qualitative study method which is the field research (on-site observation). According Tatim and Diehl (2004), the exploratory research aims to provide greater familiarity with the problem becoming more explicit.

Thus the development of the quality management system, data will be collected by secondary sources (books, articles and manuals) that will provide the necessary clarifications to the problems encountered. The survey was developed in order to extend the theme statement in order to answer the problem or increase the field of study.

To Tatim and Diehl (2004), a case study is characterized by a deeper study of an object, enabling a more comprehensive and detailed, providing a more comprehensive knowledge. A case study must relate a series of paradigms and prejudices with the theoretical, checking reactions and actions or unexplored. Therefore it was necessary to find within the textile industry, a company that was willing to give information regarding its performance about their production processes. This company became the object of study contributing significantly to the investigation.

This methodology should conduct research and development work, ie equip research, enough to perform the procedures, measurement and implementation of quality management system.

And by studying the practices, techniques and tools for quality management system to provide the textile industry of small formalize its processes and procedures for system development.

Since the method can be defined as a set of systematic and rational that with greater safety and economy will achieve the goal, ie, valid and true knowledge, tracing the path to be followed by detecting errors and aiding decisions the researcher.

To Godoy and Alves (2004), the researcher in the analysis phase should be based on literature in his personal and professional experience in her interaction collection-analysis. Must also have ability to describe, interpret and recognize what is relevant. Therefore, it was chosen as a method of exploratory research consisting of interviews, descriptive analysis and field research.

4. Analysis and Results

In society man and machines are developing a process of interaction. In the ongoing pursuit of knowledge and the development of humanity, the social-historical context has been related to mechanical development processes. The relationship with environmental development of production processes that are interrelated to the problems and implications of human development. With this relationship appears to get better idea of the quality of products and services is a way to make the organization more competitive in the market. Thus it is important to develop a plan for improvement, suggesting corrections and assisting decision making.

It is very difficult to talk about the quality in the first place because of the quality factors being closely linked to the perception that because each person perceives the quality of their own way, that because each person has their definition of quality, which is often linked to the price of the product or service and not necessarily the requirements of the concept, and that each person has a different perception.

Juran (1998) believes that quality is linked to the characteristics of products, customer needs and thereby provide the satisfaction of everyone. Thus, the quality is geared towards the satisfaction of the needs and

perceptions of value received. The goal of higher quality, is to provide greater customer satisfaction and it is expected to increase the value added in the exchange held. While providing more or less completely, the quality usually requires an investment and therefore typically involves increased costs. The higher quality, generally, the greater the cost to develop the product.

The idea makes Juran relationship between quality, cost and customer satisfaction, but we need more quality in planning, processes, specialized labor. And so, change in systems, continuous improvement planning, it is difficult to relate all these items for a small business.

[...] A) phase of globalization - is the phase after 1980, full of challenges, difficulties, threats, coercion, contingencies, restrictions and all sorts of hardships for businesses;

b) phase in which the external environment is characterized by complexity and changeability that companies fail to properly decipher and interpret [...] (CHIAVENATO, 2000, p. 4).

Chiavenato comments that these are difficulties in interpreting and complexity of the agents involved.

To understand the importance of this sector, should consider presenting the beginning of industrialization, which had its foundation in the textile industry, thus it is necessary a literature review at the beginning with the history of industry in Brazil.

The textile and clothing in Brazil undergo significant changes from the end of the 80s, with trade liberalization promoted by the government:

Trade liberalization, promoted by the Brazilian government since the late 1980's, made all the links in the production chain Brazilian textile confections were hit by foreign competition, causing a dislocation of production flow and requiring a restructuring of business (CARVALHO& TOTTI, 2006, p. 266).

Valuing quality in companies search for methods and strategies to increase their participation in a rapidly expanding market, causing an uncontrollable quest for quality in processes and services, and to monitor all these changes, organizations are ensuring and improving their processes.

The standardization of processes facilitates the development of the activity stream, provides transparency, organizing routines, reducing costs and avoiding waste.

It presents as a focus of study implementation of the quality system and quality tools used in textile processes for adaptations that are necessary to ensure quality processes.

According to Campos (1992) an honest company can only survive within a society if it is to contribute to the satisfaction of people's needs. This is your main objective (...) the first priority of the company are consumers.

Given the necessary adjustments to make the company more competitive in the market, and lack of norms that has needed to ensure a quality system processes, is the center of the problem, standardize and reorganize routines provides controls for quality. Within this panorama research processes becomes the focus for a vision of quality management in the textile sector.

In this regard, Figure 1 shows the Juran trilogy of one of the concepts that were used to deploy the system.

The interviews were conducted in view of the needs found in research done by the author of this work in order to characterize the object of study, verify the needs of system implementation and evaluation processes.

It was necessary to describe the processes existing in the company, which was accomplished through on-site observation.

The field survey provided information gathering, observation and evidence for the development of graphical demonstration of the processes and parameters to control. In the course of this work show that the controls proposed for managers to better elucidate the production process.

For Juran (2004), the quality is based on three processes that are quality planning, quality control and quality improvement. Therefore, one must be very careful when selecting practices provide potential benefits and

increase in productivity of the textile industry of small, working with this idea the research aims to relate the following items:

- The adjustments necessary to improve performance management with a focus on quality, influence the reality of small business providing increased productivity;
- The results presented herein increase market competition and influence on productivity, are relevant to the company;
- The practices and strategies used to obtain quality processes are effective.

[...] Made a delivery at a lower cost and with better quality, the activity is not essential to obtain competitive advantage and reduce risks related to changes in technology or selecting other suppliers.

In addition to points made, this strategy can guide the organization to reduce cycle times, increase the speed in making decisions. Reduce overhead costs and focus on core business (BERTAGLIA, 2009, p. 80).

The production system has to have a focus on quality, productivity and ratio of employee knowledge. Thus, the company must be guided in practice controls and developing processes.

The planning of activities undertaken to effect the reorganization of processes have to take into consideration the steps required for the development of this operation.

Evaluating each step so that the changes are effected in the process and seeking compatible tools to assist in the development of process improvements.

4.1 Tests

The statistical modeling contributes to the development of standards, translating the event system in a symbolic language with ease of demonstration. In this sense, the tests performed on the company XXZ, will be translated into the language of statistics.

The company XXZ small textile industry produces knitwear for obtaining quality management system agreed to make significant changes in the production system, which includes tests in product and process. The company is located in the northern city of Sao Paulo has 11 employees and four managers.

To perform the test stitch length used to account equipment called a wire and a tape measure, this test is the point count. The method consists of withdrawing a sample of 30x30 cm mark part with one line stylus along a column located 5 cm from the edge of the mesh, it counts 100 columns (excluding the two marked at beginning and end , dismantle the row and removes the tension is measured and the yarn).

The statistical quality control should be performed on 30 samples to determine the state of process control: check for variation in stability, capacity and possible causes of nonconformity, as directed by Juran (1998). The procedure for testing the examination should contain a series of 20-30 samples of the process. And the collection of samples should be recorded for future reference, in the case of changes in process variation such as a change of operator, machines, or materials.

The calculation of control limits to determine whether any of the test samples is out of control, ie whether all the plotted points are within the control limits.

The weight of fabric weight per unit area of a fabric, the grammage can be obtained in two ways dividing the weight by the sample area or by means of graduated scales for weight measurement, the sample must be removed by cutting mold then one should weigh the sample yielding the weight means weight per weight value mesh per square meter, and for calculating the weight uses the formula:

$$\text{Grammage} \frac{g}{m^2} = P (\text{sample weight}) \div A(\text{area sample})$$

In the test conducted used the precision balance and the die cutting. The table shows the results obtained on the samples tested in a piece of tubular mesh polyester with a width of 2 cm and weighing 1.03 to 30 parts samples drawn polyester width of 14.250 grams. For information presentation opted to group the data in order to facilitate their understanding, as well for the development of table 3 uses to statistical modeling.

The list consists of the following samples: 0.98 to 0.99 - 0.97 to 0.97 - 0.96 to 0.98 - 0.97 to 0.97 - 0.99 to 0.97 - 0, 98 to 0.98 - 0.98 - 1,01-1,02-1,01-1,01-1,00-0,99-0,99-1,00-0,99-0,98 - 0,99-0,97-0,98-0,98-0,97-0,99-0,97.

Sampling works a small group of data to facilitate the calculations, so the table was calculated using the following criteria if $n \leq 25 \rightarrow K = 5$, where $n > 25 \rightarrow K = \sqrt{n}$.

$K = \text{min class where: } n = 30, n = 30, n = \sqrt{5.47723} \text{ and } K = 6.$

$At = \text{range} = \text{range} = x_{\text{max}} - x_{\text{min}}$, where: $At = 1.02 - 0,0,96 = 0.06 \div 6 = 0.01$

H = Amplitude class

Table 2 - Weight per weight

Class	Interval	Fi	Fac	Fri	FraC	Xi
1	0,96 □ 0,97	1	1	3,33%	3,33%	0,965
2	0,97 □ 0,98	8	9	26,67%	30%	0,975
3	0,98 □ 0,99	8	17	26,67%	56,67%	0,985
4	0,99 □ 1,00	7	24	23,33%	80%	0,995
5	1,00 □ 1,01	2	26	6,67%	86,67%	1,005
6	1,01 ↔ 1,02	4	30	13,33%	100%	1,015
		30				

According to data presented in the table willing and 56.67% of the measurements are in grammage of 0.98 or below, this index represents the highest probability of repetition. The table shows that 26.67% at 0.97 and 26.67% grammage in grammage 0.98.

The measurements are compared by the distance from the sample, analyzing the occurrence determines that between 0.97 and 0.99 are located in items of higher frequency by comparing the distances varied.

The graph (Figure 3) shows the normal level of process capability. The indices obtained in the graph show that there is a regularity, which are respectively $LIE = 0.9310$ and 1.0290 LSE, according to NBR 10591 (2008) variations should remain between 5%.

5. Quality Tools

Through systematic analysis carried out a study focusing on the activities and processes of the company, to begin investigations, interviews were conducted with managers.

Second, the managers the company has no control system or quality, which often leads to wasted time and rework.

According to the manager of the company: "I often request information during a meeting or a negotiation with suppliers or customers, who now have to everything I'm doing to give consent to receive information or material."

In view of the report, we identified the need for a control that provides clear information on the procedures to be performed. It can be noticed that there is a formalized system, and for this, it was deemed necessary to analyze the production system.

Initiated an analysis in the production system, the development of this activity using the technique BPM, process mapping with the objective of analyzing the existing process flow, control the productive system and rethink how to organize the work process.

The technique BPM (Business Process Management) and Business Process Management, the Portuguese term, this technique enables the analysis of structured elements of the system, this method will be designed to support the development of the design of business processes.

The BPM concept has several aspects that are related to information technology, but in the case study because it is a small business uses only the BPM (Business Process Modeling) or AMOP (analysis, design, redesign, process modeling) which has the purpose of developing organizational performance.

LIN et. al. (2002) work with the ideas for using the methodology of BPM (Business Process Modeling), dynamic modeling is a structured approach for analyzing and diagnosing organizational problems using dynamic models. A dynamic model of the current situation is used to analyze business processes, and then the experimental results with alternative solutions can be evaluated without deploying them in the complex reality.

The authors argue that the methodology BPM is a method of process mapping is a technique in which models the processes, analyzes and find spots that need attention. Therefore, it requires a tool that enables the understanding of the flow and needs. By analyzing the organized structure, yet it achieves cost reduction in the development of products and services, reducing the gaps between systems and improved organizational performance, furthermore, it is considered that the tool provides the best communication between actors and greater understanding of the current processes and develop improvements that will provide the simplification or elimination of those who need changes.

The processes are in a continuous textile industry, the work is done by automatic looms, the methodology BPM is a concept that combines the needs of adaptability of the system with the adoption of pre-established procedures and tasks in order to provide better use in process performance. This methodology BPM joins the PDCA cycle as a planning tool.

Cruz (2010), Oliveira and Valle (2012) and other researchers agree that modeling tools to assist in the integration of processes with strategic planning aimed at creating a link between strategic planning and operational in the search for performance.

The mapping process was done mainly to analyze the existing process flow, control the production system and rethink how to organize the work process.

The development of process management in recent years has been characterized by many changes and advances in technology and management, with this modification that is increasingly intense use of the techniques of resource management in organizations.

Maximian (1992) states that an organization is a combination of individual efforts that aims to achieve collective purposes. Through an organization becomes possible to pursue and achieve objectives that would be intangible to a person. A large company or a small workshop, laboratory or the fire department, a hospital or a school are all examples of organizations.

The company she being an organization should focus its efforts on improving processes and mapping helps build a broader view of the system. With this assumption, the mapping can contribute to assembling a system for collecting information to meet the business need.

For this to happen, the control system must be deployed, providing greater control of processes and new routines. It is therefore necessary planning activities to be undertaken and an action plan that can provide the implementation of these activities.

According to Oliveira (2004), planning is the identification, analysis, structuring and coordination of tasks, purposes, goals and challenges, strategies, policies and activities that aims to achieve efficiency and effectiveness in these activities concentrating available resources of the company / organization.

The complexity of the subject leads us to consider the processes, procedures and operations that make this complex activity, mainly by the need to meet targets and deadlines with customers and suppliers.

In pursuit of continuous quality improvement companies use standardized methods and concepts through upgrade, indicators, criteria, standards and procedures that were adequate for evaluation and process control. Since the purpose, therefore, is to subsidize this study, showing the flaws and errors evaluated the performance of the activity. They settled guidelines, criteria and practices for continuous quality improvement by relating the current knowledge of management, planning and rules and laws to improve processes.

The establishment of standardized procedural practices ensures that all actions and tasks were performed efficiently and evenly, as well as the establishment of standardized procedures ensures that all operations or transactions have been recorded in the proper manner and uniform. Reason why, the permanent use of standardized processes in an organization ensures the correctness and consistency of regulatory filings.

Within the proposed activities should take into account the training of personnel, responsibilities and nature of the positions they should occupy, and yet, the periodic training appropriate to their cultural development and functional.

To ensure the implementation of a quality management system we chose a plan in which they determine the steps that should be undertaken to meet deadlines and provide necessary subsidies used the PDCA Cycle.

The data were analyzed to identify the critical points, and also to correlate difficulties. To further elucidate the planning conducted used the method PDCA that is intended to assist in developing the mapping process. The interviews helped to find solutions to the problem and corrective actions have been implemented to ensure improvement to the process and minimize the critical points found that deserve attention because they are harming the progress.

According to Cross (2010), the modeling of business processes is a concept that combines business management and information technology with a focus on improving organizational results is used to analyze, model, publish, optimize and control processes.

Thus, the modeling of processes is a logical sequence that provides subsidies for the development of controls, enabling visibility and tracking through its execution, analyze, model and monitor the system of business management. Continuing on this idea and the implementation of the control indicators will provide the necessary support for the performance monitoring process.

Based on the initial flow, we opted for yet another draw vision (Figure 1), one that illustrates a breakdown of the path taken by the product in the production of these subprocesses, expanding and showing the jobs this lane - lane thus can observe more clearly the critical points, those that require improvements, or even those who have not been explored.

In the graph of capacity of the process verifies that the individual values have a standard deviation point, which indicates lack of control in the process. In the graph of mobile amplitude values are within the control limits. The graph of observation shows that the process has wide variation in twelve measurements. In the histogram capacity can observe that the process is not controlled. But considering the indices presented in CP and $CPK = 1.72 = 1.56$, we can conclude that it is satisfactory as it is within the specification limits, and the index value is greater than 1.0. To continue there is the method of evolution management system quality.

6. Discussion

In the interviews we can verify that the processes are automatic and are not documented, the practices are done by the experience of system components in the textile industry. In this perspective analyzes the object of study a textile company.

The result of the mapping of processes was the development of the manufacturing flow diagram (Figure 4) which enabled a clearer view of certain activities and facilitated the exposure of problems.

Thus, one can say that the practices carried out enabled the procedure and the identification of critical points, from that, you can work directly on the needs found.

The interviews helped to find solutions to the problem and corrective actions have been implemented to ensure improvement to the process and minimize the critical points found that deserve attention because they are harming the progress. Analysis performed identifies a deficiency in the process, the process has little or no control, there is no systematic concerned with quality or process improvement. To meet existing needs, implement controls, procedures and activities that can aid and assist in process improvement.

The evaluation of the quality management system is part of the continuous improvement process should include methods to evaluate the system.

Mattoset. al. (1994) argues that a system of self assessment should focus on methods used by the company, and that includes evaluation of the following: the adequacy of the tools, techniques and methods used to meet the requirements, the effectiveness of using these tools, techniques and methods, the integration degree and uniformity applied to the system and the degree of incorporation of effective evaluation cycle.

Based on literature were adopted to evaluate three parameters:

Process Evaluation: there is a random process stability and the use of statistical modeling productivity index through the information system and controls in place, the system failure rate (stops processes and rework).

Product review: there are failure rates Article by controlling

Preliminary results presented in the mapping of business processes enabled the analysis of the flow, so we can draw a sequence of activities, document and deploy indicators controls.

7. Conclusion

Anyway, to map the process so that improvements can join, you will have good communication that reach all stakeholders. It is therefore important technique and a tool that is used. Thus, it was important to define how and technical BPM tool (BPMN) for proper communication can convey the flow of production processes and describe each part of the production system.

By documenting, we intend to perform a communication simple, clear and objective, the BizAgi software can help achieve this goal. This practice helps in organizational communication, showing more clearly the process and results achieved as a reduction of failures and identifies improvements that should be implemented. This idea that you consider important for us to analyze the system of production in the textile industry, and the company must follow new trends.

Adanur and Allen (1995) in his article raises some questions that I think are important to better understand the limitations of the ISO implementation, although the benefits are enduring, many small businesses still do not have this certification due to the cost of this type of standardization brings. The need to document, establish parameters, hiring specialists and technical specifications lead to a cost that often prevents manufacturers of small and medium enterprises to make these standardizations.

During the modeling process can perceive and understand a little of the importance of production processes. Production systems now have a focus on quality, productivity and value of knowledge workers.

By documenting the current system of production, the company intends to analyze the critical points, to plan measures to improve quality, reduce manufacturing errors and, in turn, reduce the cost of rework and ensure quality.

Process modeling is a technique that has helped to demonstrate the production flow is very important for the implementation of a management system. Thus, the details of the process can meet the requirements described in ISO 9000 standards.

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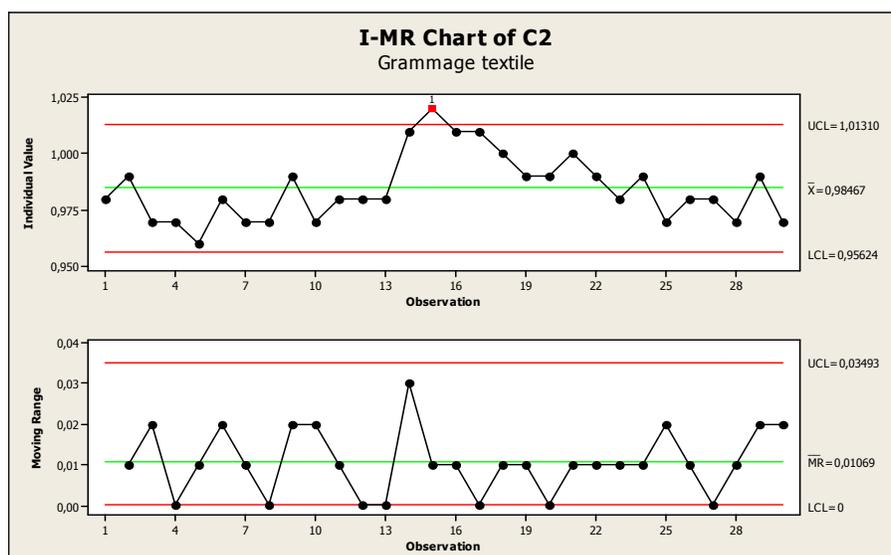


Figure 1- Grammage Chart

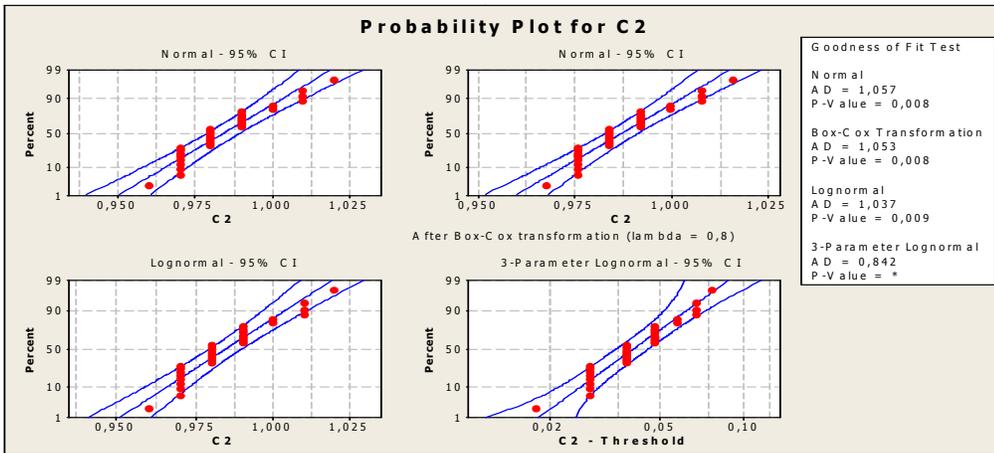


Figure 3 - Probability Grammage Chart

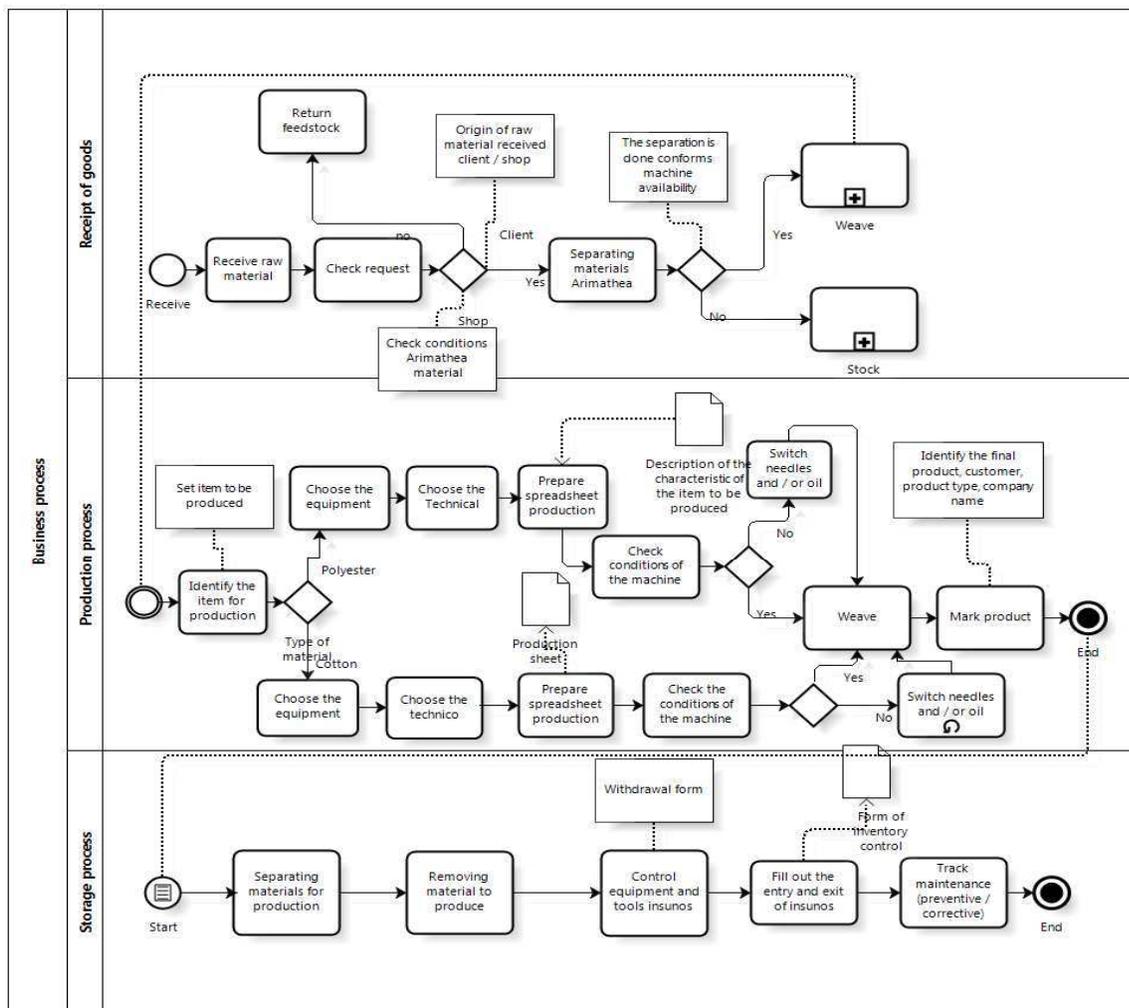


Figure 4 - Diagram Company