

Using the methodology of Business Process Modeling (BPM) to implement the Quality Management System

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Abstract

This article demonstrates the use of the technique of modeling business processes BPM-Business Process Modeling as a technique for preparing the deployment of a system of quality management in a small business in the textile sector, the methodology of BPM was used as support for implementation of quality management system. The BPM was used to identify the actions needed to improve the system and the communication of those involved. Trying to comprehend, perceive and understand the existing operations in the process of knitting textile production. The study shows the documentation, verification and analysis of the process of knitting. The technique allowed the collection of sufficient data to analyze the critical points for the preparation of the implementation of quality management system. The results presented in the mapping of business processes have made possible the flow analysis, the sequence of activities, documentation and implementation of quality indicators.

Keywords: Mapping, Process, BPM, ISO 9000, Quality

1. Introduction

In this work, we can see the importance of the stages of production and planning processes to increase quality and efficiency in the system. Within this context, were analyzed and documented processes that are present in the XXZ Company, in order to comprehend, perceive and understand the existing operations in knitwear production system.

The purpose of this study is the documentation, verification and analysis by the technique of process modeling (BPM-Business Process Modeling) in preparation for the development of quality management system, the tool of choice for the development of process modeling.

To develop the work of modeling the existing processes in the company was necessary to make field visits to observe the spot. During these visits, we collected information, conducted interviews and photographs to show the details for the planning of activities.

The photographic records are important for detailing the process and hence, allow a thorough investigation of each step of the production system. In this work, we intend to conduct interviews with employees and managers to further elucidate the process of production and the procedures performed.

As one of the requirements of ISO 9000 family is the analysis of the system to be adopted for development of procedures and creation of procedures in the processes is important to have a technique that helps to accomplish this step. For this reason the technical BPM can be used, having a focus on process modeling, detailing and documenting the processes and actions necessary changes.

This detailed design was undertaken to elucidate the changes necessary to increase the competitiveness of the company, and many times just to beat the competition and meet customer expectations, does not guarantee the improvement of the system and not the quality of products.

1.1 Purpose

The main objective of this study focuses on presenting the technical process modeling (Business Process Modeling - BPM) in preparation for implementation of quality management system. The tool that is used in the mapping process, BPMN (Business Process Modeling Notation) for preparation of process diagrams. Furthermore, study of the production process of the textile knitting plans to raise sufficient data to analyze the critical points according to the parameters of the ISO 9000 family.

1.2 Methodology

For a better understanding of the study was an appropriate methodology that can be considered a systematic way to achieve a goal, can be studied as an intellectual and conceptual. How is an intellectual process approach to any problem through prior analysis and systematic of all possible variables access solution.

It is necessary then a model of methodological support, where you can check the performance of processes, and therefore, will be used interviews, questionnaires and visits, which may indicate the process needs.

The methodology used to document the mapping process is performed using the technique to the activities of specification, analysis, process development, design and description of routine tasks. After this step we intend to evaluate the critical points, find the bottlenecks and losses. Fu Ren et al. al. (2002 p.19) collaborate with the ideas for using the methodology of BPM (Business Process Modeling), "Dynamic modeling is a structured approach to analyze and diagnose organizational problems using dynamic models. The dynamic model of the current situation is used to analyze the business processes,

and afterwards, the experimental outcomes with alternative solutions can be evaluated without implementing them in the complex reality."

This study is characterized as a case study, a qualitative research study which will be the method of field research (on-site observation). Thus for the development of 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 research will develop and expand the theme statement in order to answer the problem or to extend the field of study.

Since the method of the Business Process Modeling (BPM) can be defined as a set of systematic and rational that with greater safety and economy, will achieve the goal, is, valid and true knowledge, tracing the path to be followed, detecting errors and aiding the decisions of the researcher.

2. Object of research

The Knitting XXZ-Processing is a company located in Vila Maria, in northern Sao Paulo. It operates in the textile industry producing synthetic mesh (polyester) and natural (cotton), providing services to others knitting.

The XXZ Company operates in the production of knitted fabrics, characterized by the interweaving of yarns, these being in the same sense, circular. This process is carried out with the aid of needles. The process of knitting essential, in this case the knitting is produced by circular knitting machines as an illustration, where the knitted fabric is made tubular and circular using industrial processes, with 20 looms. The company has an average of 90 different types of items (cotton-lycra, lycra, rib, helanca light, etc.).

Founded in 2006, has eleven employees divided into two operations: the administrative sector and the manufacturing sector. It is considered a small business, according to the rules of Complementary Law No. 123 of December 14, 2006. The company operates in the production of knitted fabrics, characterized by the interweaving of yarns, considered small by having a monthly turnover of around U.S. \$ 130,000.00 per month.

The company won the XXZ market since the beginning of its activities, a family business and the owners (four brothers) started the company by his father's idea.

From 2008, they expanded their business by opening a branch that went on to produce the piece of knitting with natural yarn.

In 2011, the owners decided to split the company's management, were responsible for two matrix and two others responsible for the subsidiary.

The company maintains a serious commitment with customers, suppliers, employees, society, constantly investing in development of production in order to provide better quality products.

3. Planning the work

Managers say the company does not have a system of production control or quality, which often leads to wasted time and rework.

According to the manager: "I often ask for information during a meeting or a negotiation with suppliers or customers, right now I have that for all I'm doing to give consent to receive information or material."

In view of the report, it identified the need to implement procedures that assists in control, and provides clear information on what actions should be performed. You can see that there is a formalized system, and for that, it was deemed necessary to analyze the production system.

It starts to analyze the production system, the development of this activity we used the technique BPM, process mapping in order to analyze the flow of the existing process control system of production and rethink how to organize the work process. The technique BPM (Business Process Modeling) or *Modelagem de processos do Negocios*, 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 mapping process is a technique which enables the investigation of processes, analyze them and find detect critical points that need attention. Thus there is need for a tool that enables the understanding of the flow and needs. Its structured analysis also allows for cost reduction in product development and services, decreases in the failure of integration between systems and improves the performance of the organization, besides being an excellent tool to enable a better understanding of current processes and eliminate or simplifying those that require changes.

The mapping process was carried out mainly to document the flow of the existing process control system of production 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 change, which is increasingly intense use of the techniques of resource management in organizations.

Maximiano (1992, p.122) states that an organization is a combination of individual efforts that aims to achieve collective purposes. By means of an organization becomes possible to pursue and achieve objectives that were intangible to a person. A large corporation or a small workshop, a laboratory or the fire department, a hospital or a school are all examples of organizations. The company being an organization should focus its efforts on improving processes and mapping helping build a broader view of the system. Based on this principle, the mapping can contribute to a mounting system for gathering information to meet the need of the company. For this to happen, a production control system must be deployed, providing greater control of processes and 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, p 325), planning is the identification, analysis, structuring and coordination of missions, purposes, challenges , goals, strategies, policies and activities that aims to achieve efficiency and effectiveness concentrating in these activities the available resources of the company / organization.

To conduct the study, there was the need to develop a plan in which could follow the procedures that are being developed and know the purpose of each step. Developing a plan that contains the steps to verify the work processes was defined as described:

1. Check existing processes;
2. Assess the needs of the controls;
3. Check the availability of technical instructions for manufacturing orders to be initiated;
4. Check the processing sequence of orders in manufacturing;
5. Collect information to operate the proposed controls and indicators.

Following the procedures of work, it was found that the company has no quality control. So to meet these needs there was a plan drawn up for the development of controls and indicators that can help the company.

3. 1 The technique and the tool

The process mapping is a technique in which you want to investigate the processes, analyze it and find spots that need attention. Thus a tool is necessary that enables the understanding of the flow and needs. Its structured analysis also allows for cost reduction in product development and services, decreases in the failure of integration between systems and improves the performance of the organization, besides being an excellent tool to enable a better understanding of current processes and eliminate or simplifying those that require changes.

In this sense, we opted for a tool that could achieve the proposed goals and at the same time, could convey to the reader a view of the activities that are being developed, so that we can analyze the process, and critical flaws found.

According to Martins & Laugeni (2005), the process is a logical sequence that allows us to perform a task or activity, a trajectory that is to perform an operation. The analysis, as the authors should be a set of stages that we do to improve process performance.

In the process management is important to have a broad view of what is being produced, expanding the focus of activities. The synergy should be evaluated between the activities for a better end result.

Thus we opted for technical BPMN (Business Process Modeling Notation). This technique uses a series of icons for the process design (Figure 1), which facilitates understanding of the involved, making visualization of the activities and events that occur during the process.

Baldam (2008), Barbara (2006) and Cruz (2010) confirm that the modeling process aims to document, explore, specify the cycle of the existing production, to facilitate verification and analysis of critical points. What's involved in creating a model, published specifications, action plan, guidelines for planning and design process.

According to Cruz (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.

The mapping involves the study of processes of an organization in a systematic manner and, therefore, allows all operations within the system. Thus, planning should follow a logical sequence that can provide subsidy and that allows control, visibility and tracking of running processes (Figure 2).

The BPMN is a graphical language used to represent business processes. These business processes are represented by a set of symbols, which are arranged in a diagram the business processes. The BPMN was developed by Business Process Management Initiative (BPMI) in 2001.

The BPMN was created, and has the support of leading IT companies in the world such as IBM, SAP, Oracle and Microsoft. Currently, BPMN is controlled by the OMG, the same international organization that controls the UML. In the near future, the trend is that the UML (Activity diagrams) and BPMN will merge.

4. The use of BPM

The processes performed by the company were mostly implanted only in practice, without any description or control, so these descriptions were necessary in order to accomplish the implementation of controls.

Juran (1991) states that the process control is the prevention of unwanted and adverse changes, maintenance of the existing situation, a steady state, thus improving the process is to plan and create desirable and beneficial changes.

The fundamental objective of any organization is to produce something. That is, the production of goods or services. To be effective, production should be based on the division of labor, which is nothing more than the manner in which a complex can be decomposed into a series of small tasks [...] Each person produces the largest quantity of units within a standard of quality through the automation of human activity based on the constant repetition of the same task (CHIAVENATO, 2000, p.127).

It is considered that the importance of the quality management and the tools used to ensure the quality of the products contribute to changes in the market. The search for practice and competition strategies to leverage the products more competitive market causes the search for ways to attract consumers. In this sense, the quality system to be deployed shall follow the theoretical foundations that are necessary for its development, the importance of planning for quality, continuous improvement and effective controls must be present in this operation.

Although this result is not surprising, it may reflect to some extent the companies' limited awareness and understanding of the possibilities of using the ISO system as a tool for organizational development. Companies that consider the certification only as a tool to compete in the domestic and international market, may miss the opportunity to profit from the organizational and performance improving potentials of the system. Furthermore, when certification becomes an end in itself, its competitive advantage can easily be lost, once the competitors also become certified (D. Lipovatz, Stenos F. e A. Vaka, 1999, p. 535).

The production quality varies depending on the types of operations that seek to ensure quality standards for processes and infrastructure. Ensure adequate performance to international standards and thus make the organization more competitive. So, in general, the tools used should emphasize the improvement of processes and performance. This way, it is not just a certification that will ensure product quality, but the ongoing maintenance of certification standards, adequate training, control and standardization of processes.

Adanur and Allen (1995) in their article raises some important questions to better understand the constraints of the implementation of the ISO, although the benefits are long lasting, many small and medium businesses do not yet have this certification due to the cost that this kind of standardization leads. The need to document, establish parameters, hiring specialists and technical specifications cause a cost that often prevents small and medium manufacturers to make these standardizations.

SANTIS (2012, p. 6) states that the process mapping is a technique which enables the investigation of processes, analyze them and find detect critical points that need attention. Thus, it requires a tool that enables the understanding of the flow and their needs. Its structured analysis also allows cost savings in product development and services, reduction in failures of integration between systems and enhances the performance of the organization, in addition to being an excellent tool to enable a better understanding of current processes and eliminate or simplifying those that require changes.

The processes in a system are grouped in a sequential manner to produce something, the efficient production should be based on the manner in which a complex process can be decomposed into a series of small activities that constitute it.

The production processes are important for any company who seeks quality, for this reason in 2000, the family held ISO changes giving emphasis on the processes, the establishment of a workflow helps in analyzing and developing improvements.

According to Juran (1998), the ISO 9000 implementation involves establishing policy, setting objectives for quality, designing management systems, documenting procedures, and training for job skills. All of these are parts of clarifying what people's jobs are. Companies are adopting the process perspective. This concept is emphasized in the 1994 revision of the ISO 9000 standards.

In implementing the ISO 9000 standards, companies are using flowcharts and other devices to emphasize work-process diagnosis and to find opportunities for process simplification and improvement. Metrics are being used increasingly to characterize product quality and customer satisfaction more effectively". So, becoming increasingly important to develop one, the technique that was able to detail the company's existing processes, finding that demonstrating the routines of activities is precisely the one proposed modeling process.

According Santis (2012, p 6), the company being an organization should focus its efforts on improving processes and mapping helps build a broader view of the system. Based on this principle, the mapping can contribute to assembling a system for gathering information to meet the business need.

The ISO 9000 family in its specifications and features provide the basis for the use of techniques and procedures that can establish the level of detail required to implement standards. In this sense the modeling technique provide the necessary subsidy for the development of work, specifications and documentation.

Takashina et al. (1997), argue that the performance indicators of quality are necessary and they need to follow some parameters so that they can achieve their goals, which can be:

- a) an index well associated, explicit, and if possible, simplified;
- b) a frequency of collection;
- c) a designation of those responsible for data collection;
- d) a wide dissemination to the improvement and not for punishment;
- e) integration with information boards or management information system, when they exist.

Thus, to continue the work done there will be implemented controls and indicators that can set the standards for a quality management system.

Results

These experiences through the application process mapping can be observed that the industry has deficiencies regarding its internal controls and you can plan the development of controls for the operations.

A graphic demonstration of the system was designed to provide a degree of detail of the routines established in the work process, which were able to demonstrate clearly and objectively the procedures for greater understanding of the processes as shown in figure 3, which shows a macro view of business processes. This demonstration was possible with the use of BPM and software tool BizAgi.

Process description

The production system shown contains elements of the process of receipt of merchandise this graphic demonstration (Figure 4) aims to provide a degree of detail of the routines established in the work process, it was able to show clearly. According to Juran (1998), performance is evaluated during the operations and performance is

compared with goals during operations. The resulting information is received and used by operational forces.

The main purpose of quality assurance is to check that the control is being maintained. Performance is evaluated after the operations, and the resulting information is provided for both the operating force and others who have a need to know. Others may include plant functional or senior management, corporate teams, regulators, customers and the general public.

Elements of Procedure:

 Top of the production process

 Sell Products-visits to conduct sales or customer retention.

 Buy raw material-As the negotiation with the customer is decided that with the purchase of raw materials.

Yes-Performs the request of purchases.

No-The client is responsible for buying with the vendor trusted.

 Receive material - product sale generates a request for product to be received.

 Make-Elaborate a request of material.

 Check the delivery - given this task can be performed by the customer and the company's purchasing department.

 Material conditions - the raw material is checked.

Yes, raw material in conditions suitable for use

No - no conditions of use

 Material Return - return the raw material out of standards.

 Sort by Quantity and Source - separate material according to its source.

 **Fill out receiving sheet in the spreadsheet that describes the conditions of the material.**

 Check availability of machine that is ready for production

Yes, if you have equipment available to start weaving.

No - There is no free equipment.

 Weaving - Beginning of knitting.

 Stocking - Forward the material to stock.

 Form of receipt of the material - Form prepared to communicate the conditions of material performed by visual test.

 End

The analysis performed shows that the process controls can be deployed from the process of soliciting the material, this control can help establish traceability in the raw material providing improvements in the development of the production process. Of course, this only occurs if the control after the test can

demonstrate their efficiency. And even beyond that of the controls are also implemented measures that can ensure the performance of processes. The result of the mapping of productive processes was the development of the manufacturing flow diagram (Figure 4) which allowed a clearer vision of certain activities and facilitated the exposure of problems.

The practices carried out allowed the procedure and the identification of critical points, from that, you can work directly on the needs found.

The results presented in the mapping of the business processes made it possible to analyze the flow, so, we draw a sequence of activities, document and implement controls indicators. Data collected in the interviews provided to identify problems and develop corrective actions, among which are:

Problems identified:

- Process goods receipt without control;

- Lack of information to receive material causes delays in delivery of the “goods”; it needs authorization to unload the material;

- Production processes: that isn't documented;

- The activities have no description or documentation, which causes rework and idle;

- Production process does not have a schedule of equipment, causing idle or waiting for equipment;

- Process inventory has no control causing lack of material or purchases in excess.

Aimed at improving the operations developed process improvements observing the displayed map.

Corrective actions

It was detected, in interviews, that the mapping helped identify the problems of control in the preparation of process flow and the demonstration of system operation contributing to the understanding of the activities and correcting the problems. Thus we present the corrective actions:

Receiving: elaborated a form that can control the entry of merchandise;

Information: the form of receipt that contains the following information: customer name, material type, delivery date, visual test conditions of the box, etc..

Production Processes: for the process flow diagram was developed that shows the process steps.

Description of activities: to define the activities proposed under the responsibility of the sector.

Production: produced a form of machine programming

Stock: elaborated a form of inventory control

In the study, the determination of the criteria for standardization: wire, ongoing product, final paper and process control, according to criteria established by regulation.

The determination of the indices of performance measurement is to evaluate the capacity, flow performance and product quality. Since the family has the ISO 9000 requirements for obtaining certification: documentation, standardization of processes and detailing.

Allowing for a more detailed processes and routines becomes a necessity, even if not get certified.

The quality management in ISO 9001:21008 is the basis for ensuring the quality of the products marketed, since the intention is to ensure competitiveness in the market, being an international certification provide greater competitiveness.

The processes of the production system suited to the requirements provided information necessary for their management.

This change in management made by the owners seek new measures to act in the market, that way, look for people interested in sharing knowledge and ideas about form and make the company more competitive. The company sought to invest in the development of production in order to provide better quality products.

5. Final Thoughts

To map the processes so that it can enter improvements they will require an appropriate communication to reach all stakeholders. Thus, it is very important technique and the tool that will be used.

According Santis (2012, p. 99 - 110), 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.

It was therefore important to define how and technical BPM tool (BPMN) for proper communication that can convey the flow of production processes and describe each part of the production system.

By documenting, we intend to run a simple communication, clear and objective. This way, the software BizAgi can help achieve this goal. This practice helps in organizational communication, showing more clearly the process and achievements such as reducing points of failure and the improvements that should be implemented.

This idea that it considers important to us to analyze the production system of the textile industry, and the company needs to follow new trends. The new practices, management techniques and use of quality tools that can be used to obtain the quality products. In the textile sector there was a search for advanced systems and automation, the companies increased new technologies and invested in research to increase competitiveness.

Only with proper maintenance of program quality, training programs and much effort on the part of managers is that the organization will have continuous improvement. Often small businesses are prevented from making improvements due to the costs of these techniques and tools. As follows from 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 the relationship of the collaborator's knowledge.

By documenting the existing system of production the company intends to analyze the critical points, in order to plan measures to improve quality, thereby reducing errors in manufacturing and in turn, reduce the cost of rework and ensuring quality.

Process modeling is a technique that helped to demonstrate the production flow which is very important for the implementation of a management system. Thus, the details of the process meets the requirements described in ISO 9000 family of standards. The BPM can meet the requirements in ISO family, collaborating with standardization of processes facilitates the development of the flow of activity, provides transparency, organizing routines, reducing costs and avoiding waste.

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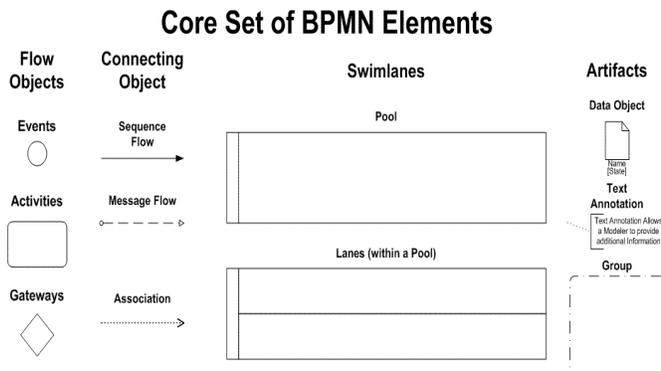


Figure 1 - Series of icons used by BPMN

Source: http://www.bpmn.org/BPMN_Supporters.htm

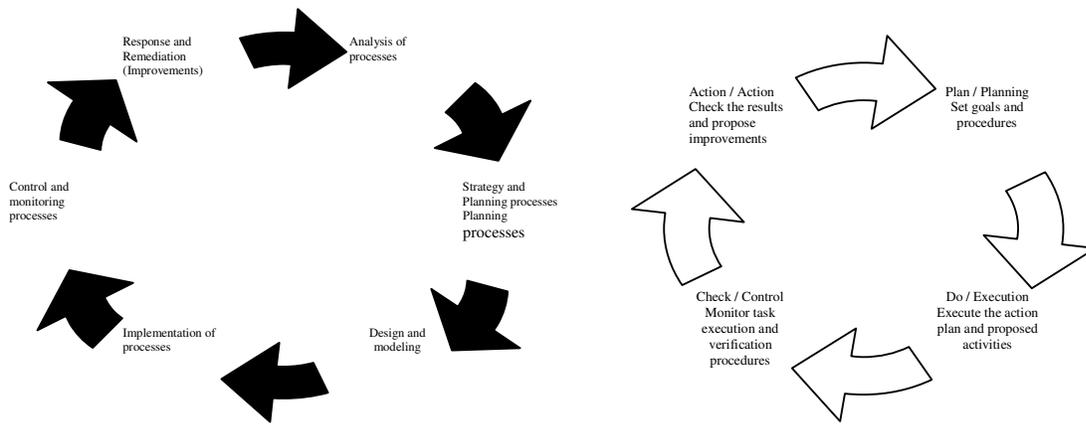
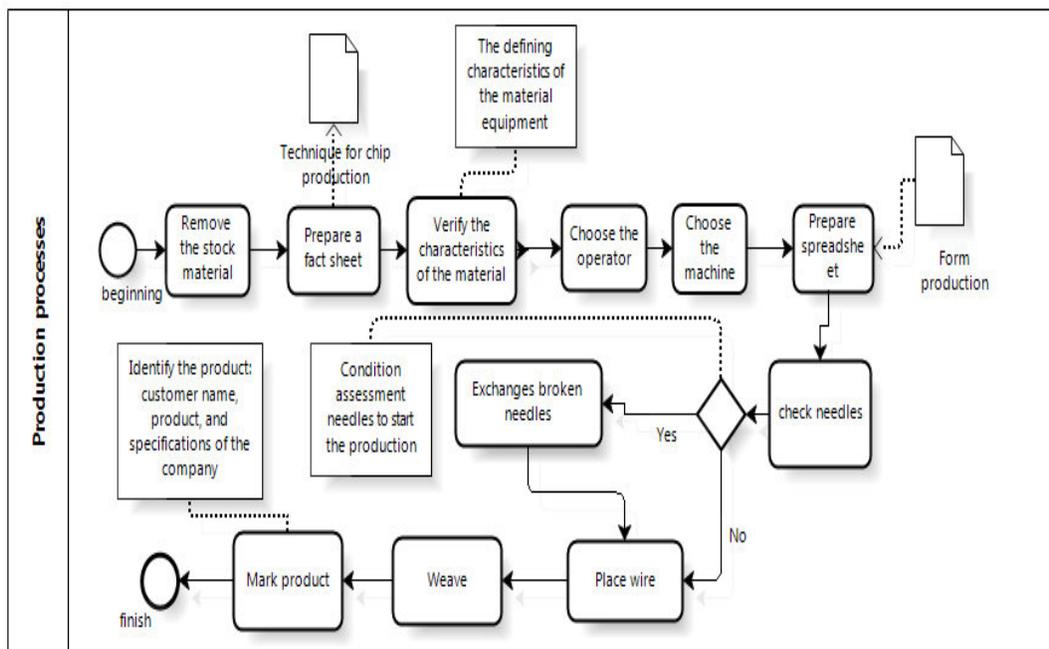


Figure 2 - Cycle of BPM and the PDCA cycle used for planning
 Source: adapted by the author



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Figure 3 - Process Flow

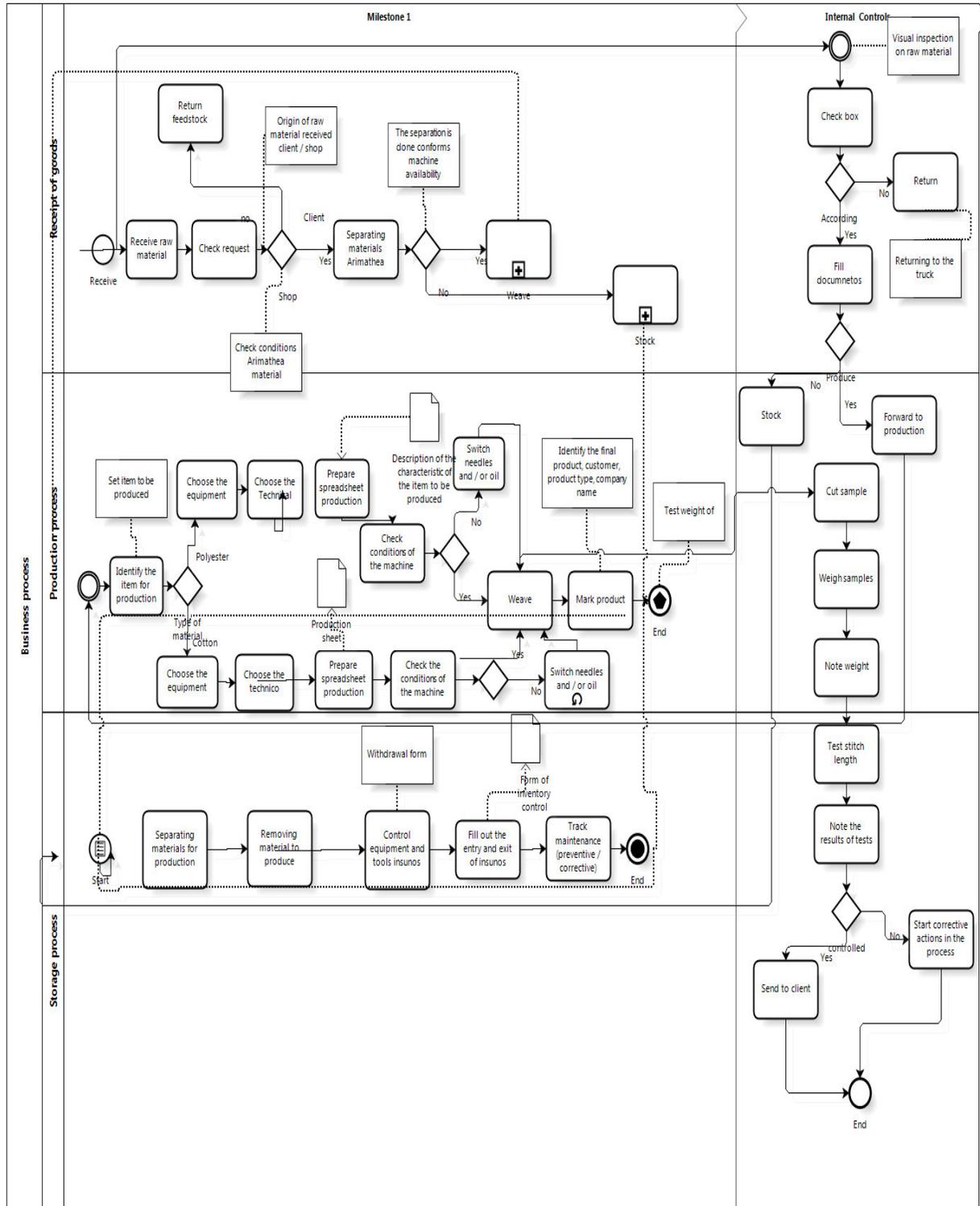


Figure 4 - Diagram of Process