SEVEN
publicações acadêmicas

# The use of quality management tools in the processes of forensic examinations in the institute of criminalistics of the civil police of the federal district: An analysis of its efficiency

Crossref doi
https://doi.org/10.56238/sevened2023.004-032

**Eduardo Dias Leite**
E-mail: eduardo.leite@ifb.edu.br

**Alexandre Laval Silva**
E-mail: 1928064@etfbsb.edu.br

**Lorrayne Pereira da Silva**
E-mail: perelorra@gmail.com

**Maria de Nazaré Santos Reis**
E-mail: maria_santosreis@hotmail.com

**ABSTRACT**
The general objective of the research is to analyze how the use of quality management tools in the processes of criminal examinations carried out by the Efficiency Sector of the Criminal Police Institute of the Civil Police of the Federal District can improve the performance of this Sector, after the inclusion of management tools in carrying out its processes. The Institute has the task of conducting crime examinations, through the collection, analysis and interpretation of material traces. The Sector responsible for examining the efficiency of objects is called Efficiency, in which the examination is carried out to identify whether the objects collected at crime scenes are suitable for the consolidation of the indicated crime. In 2019, steps were taken to improve the management and administration of processes carried out in the sector, all based on Quality Management principles and tools. In this research the relevance that the use of quality tools had in a public sector will be addressed, being demonstrated through the use of data sample, process mapping, graph with the sample of production variation indicators and an interview with the creator changes, so as to bring a complete understanding of the entire process. It is concluded that: With these changes, improvements were quickly noticed, which led the sector to have a significant increase in its monthly production.

**Keywords:** Public sector, Processes, Quality Tools.

## 1 INTRODUCTION

The present work, with the general objective of this study, aims to show how the use of management tools can improve the reality of a sector that provides public services. For a better understanding, it should be noted that public service is an activity developed with the participation of the State, in which it is in charge of providing services that will meet the needs of society.

The work had as its field of research the Efficiency Sector of the Institute of Criminalistics of the Civil Police of the Federal District (IC), which is responsible for carrying out examinations of the corpus delicto, through the collection, analysis and interpretation of material traces, with the objective of producing and perpetuating the material evidence of criminal offense, using scientific knowledge, impartially, in a timely and efficient manner. In this way, to clarify the authorship, the criminal circumstance and the manner in which the criminal offense was carried out, by means of a criminal expert report that points out the material truth, in which the examination is carried out to identify

whether or not the objects collected at crime scenes are suitable for the consolidation of the indicated offense.

In 2019, this sector underwent a reformulation in its processes based on the use of Quality Management tools. This reformulation was carried out using the concepts of the PDCA Cycle and the redefinition of processes and workflows.

The PDCA cycle aims to promote the continuous improvement of processes through a circuit of four actions: plan, do, *check* and act, *and was one of the main tools that guided the continuous improvement in the processes of the efficiency session.* According to Quinquiolo (2002 apud Ingepro 2010), the PDCA Cycle has as its basic function the assistance in the diagnosis, analysis and prognosis of organizational problems, being extremely useful for the solution of problems, being effective in conducting systematic actions in search of continuous improvement.

According to Silva (2014), the use of process mapping brings benefits to organizations, such as cost reduction, reduction of failures, greater speed of information, among others. Process mapping is of great importance within organizations due to the ease of detecting problems, analyzing processes, thus bringing improvements to the institution.

This methodology can be used through tools to organize and standardize work, facilitating the identification of opportunities for improvement for the company, and one of the tools based on these fundamentals would be the flowchart, which was used in this research. The flowchart is a quality tool made by means of symbols to identify each step of a process, all presented in a practical way to obtain an easy understanding.

With this, the research problem will be presented below, considering the reality of the public sector.

## 1.1 RESEARCH PROBLEM

It is known that in the Public Sector several cases of inefficiency in its processes have already been identified, as argued by Berg et al. (2015), there are some ways where inefficiency can manifest itself, among them, he cites corruption, waste when the cost of executing projects is greater than necessary, poorly designed projects, poor organization of processes and also the misallocation of resources.

With the inclusion of article 37 of the Federal Constitution, which was a response to society's discontent with public services, which says that the Public Administration of any of the Powers of the Union, the States, the Federal District and the Municipalities, must obey the principles of legality, impersonality, morality, publicity and efficiency.

The principle of Efficiency was inserted in the Constitution, based on Constitutional Amendments No. 19/1998 and No. 45/2004. The principle in question points out how managers should

guide their conduct when developing the public service, in order to ensure a satisfactory Public Administration with regard to the satisfaction of the public interest.

Thus, Efficiency has become a fundamental right, enlisted in Article 5 of the Constitution, guaranteeing each and every citizen the right to a speedy procedural process. Thus, for the improvement of processes in a public organization, it is essential that the use of Management tools is implemented.

In this sense, the research question can be defined as follows: How can the use of quality management tools in the processes of forensic examinations carried out by the IC Efficiency Sector improve the performance of this Sector?

## 1.2 OBJECTIVES

The general objective of this work is to analyze how the use of quality management tools in the processes of forensic examinations carried out by the Efficiency Sector of the IC can improve performance. To achieve the general objective, the following specific objectives have been defined:

Present quality management tools used in the Efficiency Sector;

- Map the efficiency examination process using the notation recommended by the BPM (*Business Process Management*) methodology;
- Conduct a survey on the advances achieved in the Efficiency Sector;
- Analyze the production of the year 2019 in the Efficiency Sector.

## 1.3 JUSTIFICATION

The research discussed how management tools can contribute to an improvement in the performance of the public service, and thus show how this use can be of great use to organizations that seek to increase their efficiency.

It is believed that the research can contribute in an objective way with regard to the increase in production, optimized organization and process mapping, thus bringing more efficiency, agility and quality in the processes and services provided by State agencies. The description and analysis of the reformulation that took place in the Efficiency sector in 2019 will be of great importance to record the use of management tools, being able to optimize the operation of a session, and obtain better organizational results. As well as documenting the process carried out and publicizing a successful case that occurred in the Public Administration.

## 2 PUBLIC SECTOR AND QUALITY MANAGEMENT TOOLS USED IN THE EFFICIENCY SECTOR

As provided for in the Federal Constitution of 1988, Public Service is any and all services provided by the Public Authorities in order to meet the needs of Society. In article 175, caput, of the Brazilian Constitution, the provision of public services is classified as a duty of the State in the following terms: "It is incumbent upon the Government, in accordance with the law, directly or under a concession or permission regime, always through bidding, to provide public services."

### 2.1 WHAT IS THE PUBLIC SERVICE PROVIDED TODAY LIKE?

Public services are provided by the state, and directed to the collective interest. For these services to be available, it is necessary that they are not provided only as an obligation, but with quality and efficiency.

Even with the advances observed in public administration, the services still have a high level of bureaucracy, there is a loss of time, money and productivity, and what was supposed to be a quality and agile service, happens that from the point of view of society the public services provided could have more quality.

With the need to implement efficiency, agility and organization in the services provided by the public sector, the National Program for Public Management and Debureaucratization (GESPÚBLICA) was established on February 23, 2005. The objective of this program is to collaborate so that there is a continuous improvement in the provision of services to society.

Regarding this program, Paula (2005) says:

> According to MARE (Ministry of Federal Administration and State Reform) technicians, the mission of the Program for Quality and Participation in Public Administration is to implement quality and participation programs in all bodies and entities of the Executive Branch.

As stated by Lima (2013), many have translated that efficiency is doing more with less, however, for an organization to really look for ways to make its production have better results, it would be necessary to do the best with what it already has.

In this sense, the implementation of a managerial culture instead of a bureaucratic culture is extremely necessary for the public sector, as it will be able to speed up public processes, thus bringing improvements in the quality of services provided, and meet the demands of society in a more efficient way.

### 2.2 QUALITY MANAGEMENT TOOLS

According to Pearson (2011), quality tools were not made to be used in isolation, but rather used together to map problems and seek ways to solve them. There is no tool intended for specific

problems, but each tool has characteristics that make it easy to identify which ones and when to use them.

In line with Pearson's (2011) idea, it cannot be assumed that quality tools can be applied identically in all contexts. In other words, the aspects of each company must be taken into account, such as its economic conditions. Currently in Brazil, more companies have been able to adopt quality management, directing it to product quality, waste control, process standardization, etc.

Among a set of principles that can facilitate the application of the tools, the first is the focus on the customer, since markets revolve around competitiveness and meeting the expectations and needs of customers, which leads to the success of the company and its permanence in the market. And in the case of the public sector, the "client" is society, in which the presence of communication between all members is indispensable, and in organizations between levels of hierarchy, as well as between other companies.

According to Rutkowski (1998), the first principle leads to the second, which is the perception of organizations as a series of interconnected processes and activities. In other words, the company is a process that contains several processes. Where employees must know the demands and constraints of their customers' processes.

The third principle, which is the constant search for improvements, is attributed to top management, and is only achieved with the unity and commitment of all. To identify problems and avoid them, it is up to supervisors and managers to come up with attitudes that encourage their subordinates to do so.

The importance of tools for quality is to identify flaws and eliminate these flaws in the process. In this case, it is the method that solves the problems in the production and operational processes, not the tools. Seleme (2012) states that the method can be defined as the logical sequence used to achieve the desired goal, while the tools are resources used in the method. In this sense, the method could be the PDCA cycle, and some of the quality tools would be: the flowcharts used in process mapping, histogram, Pareto diagram, Ishikawa diagram, control chart, dispersion diagram, 5W2H action plan, as some of them will be presented below.

## 2.3 PDCA CYCLE

According to Silvio Aguiar (2006):

> The PDCA method consists of 4 steps:
> PLAN: In planning, the goal of interest is defined and the means (action plans) necessary to achieve the proposed goal are established.
> DO (Execution) For the execution of action plans, people are trained in these plans. Next, the plans are implemented and data is collected that can provide information on the achievement of the goal.
> With the use of the data collected in the Execution Stage, an evaluation is made of the results obtained in relation to the achievement of the goal.

ACTION In this stage, the action to be taken depends on the results obtained, evaluated in the Verification Stage.

When the goal is reached, it moves on to the stage of the results obtained. When the goal is not reached, a new PDCA rotation is made, in order to overcome the difference between the goal and the result. Depending on the management, the PDCA cycle adopts different characteristics.

Pearson (2011) says that the greatest advantages of the cycle are: it can be used in any instance of the company, producing consistent improvements in processes and activities in general, integrating the production stages, involving all actors and making all of them responsible for the quality of the process.

The PDCA cycle comes as a form of continuous improvement, which can be used several times without being exhausted by it, since it brings with it improvements in the organization's culture, thus encompassing all processes. It is one of the main methods used along with a company's process control tools.

The PDCA Cycle is a tool for continuous improvement, it is a basic means to eliminate problems through actions. This cycle can be applied to any type of project, whether simple or complex.

It is necessary to be careful not to take too long in a certain phase, not to focus on unnecessary details, because if this happens, the other phases run the risk of being harmed. Defining a time pattern would be a very important step, and in cases of realizing the need to add something, it can be used in a next cycle.

When the organization is able to apply the four phases, it increases the chances of improvements and achievement of its objectives. All phases are of great importance in their applications, so planning requires a little more attention with regard to supporting the other phases, as there is a higher degree of difficulty, a more complex phase, making this step well done, the passage of the others is facilitated.

According to Vale (et al. 2017), it shows that the PDCA method was used in the juice production process and had positive and efficient results, providing greater satisfaction for customers and the company. In this case, it has achieved gains in demand and customer confidence.

## 2.4 PROCESS MAPPING

Process mapping is a tool that allows you to show the moment in which the organization is and serves to analyze all the components of the process through applied techniques. To make a mapping, it is necessary to have a good knowledge of the activities that make up the processes.

In this sense, Azevedo (2016) states that process mapping begins with data collection through interviews, questionnaires, meetings, field observations, and analysis of existing documentation.

Within the current Brazilian scenario, there are several factors that contribute to public agencies using tools that can help improve service delivery. Among these factors we have competitiveness and quality in organizations.

Competitiveness is not only an economic factor, it is not only competed by technical means, but also by institutional means. Institutions are increasingly pressured by the organizations themselves as well as by society, which constantly seeks a better service and better care. To do this, the organization needs efficiency and quality to be prepared to compete with factors that arise both internally and externally. Talking about quality is difficult to define, because everyone has a conclusion about what it is.

According to Oliveira (2014), regardless of the definition of quality of each organization, one should focus on three characteristics: Focus on the customer, because customers know what is best for them, and in cases of public institutions, the focus is on society; Focus on continuous improvement, that is, observing the changes in customer needs and expectations, and as a last focus, the involvement of everyone in the improvement process, taking into account that the phrase "one swallow does not make a summer", can be applied to any and all sizes of organization.

In this context, Costa *at al* (2015) states that the Process mapping can bring benefits to organizations as it offers a set of techniques that can represent in a simplified way the relationships between the various processes of a company. Therefore, Process mapping is a tool used by organizations to understand in a simple and clear way how a business unit is progressing.

In Silva's (2014) work, it shows that with the use of mapping, the most noticed benefit was the complete visualization of the processes, in addition, ANVISA was a reference in the use of the process mapping methodology, in the period in which the research was carried out.

### 2.4.1 Process Flow Chart

A flowchart is a way of representing a company's processes through symbols, with the aim of making a step-by-step description of these processes. The flowchart establishes a beginning, middle and end, and is always presented in a summarized manner, whether or not there are steps in sequence.

With the flowchart, it is easier to notice the positive and negative points of the analyzed process. This tool allows you to visualize how everything happens at each stage, favoring analysis. If any changes are made, it is notable due to the ease of its visualization and interpretation.

The development of flowcharts collaborates to find better ways to execute the processes, through the AS-IS and TO-BE flowchart. These terms mean the phases of BPM (Business Process Management), a methodology recommended by BPM CBOK (ABPMP 2013) - Business Process Management – Common Body of Knowledge - is a guide consisting of nine areas of knowledge, which

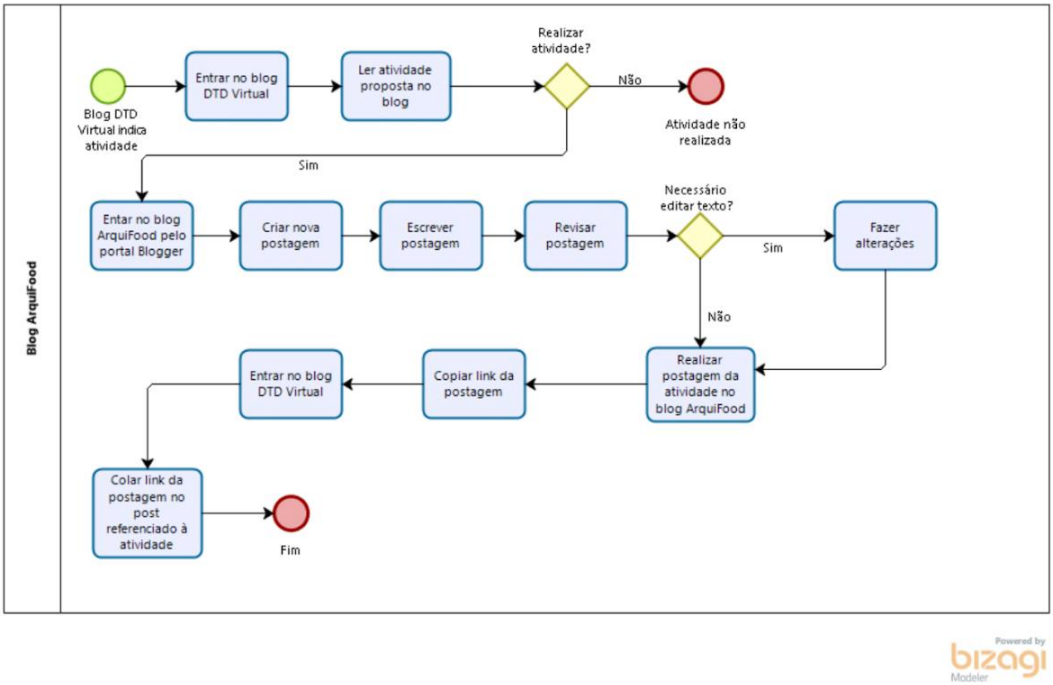
aims to help professionals in the area of business process management. Its main purpose is to detect and provide a broad view of areas that are considered as good practices.

The first term AS-IS is the view of the current moment, where it shows how the organization carries out its activities at a given time. It is at this moment that the processes are analyzed, thus identifying flaws, so that a later moment can be corrected, a moment of improvements, in which it is called TO-BE.

The second term TO-BE, also called process design, is the vision of future processes, a moment that brings the best forms of improvement in an organization. These improvements are made based on the previous AS-IS phase, correcting the identified flaws. In this process design, they involve some definitions, such as roles, responsibilities and workflows.

Azevedo (2016) defines flowchart as the "heart" of process mapping, and is widely used to show various information, as in the following figure:

Figure 1: Flowchart




Source: https://arquifood.blogspot.com/2019/10/atividade-30102019-fluxograma-bizagi.html
Flowchart of the ArquiFood Bizagi Blog

The figure above presents a flowchart elaborated with the objective of guiding through steps how a post on the arquifood blog should be made.

## 2.5 PERFORMANCE INDICATORS

Performance indicators are means used to evaluate whether certain actions are contributing to the achievement of the company's objectives and goals. These are measures that the company uses over time for its evaluations. The following is a definition of indicators:

> The indicators are concrete data, but they can prove to be false if the information that fed the data has not been verified with the reality of the company. They are the result of two or more factors that will show us how things are going in the company. We can cite as an example an indicator of sales effectiveness, which can be the result of the number of proposals for the orders actually closed or the ratio between the number of store employees and monthly sales. (SILVA; ALEXANDRO, 2013, p. 21).

Data can be false with unrealistic information, such as salary, has a gross value and net value, and what comes in hand is the net value, because in the gross there are discounts. In the company it is no different, as in the example of effectiveness given above, one thing is the sales data together with the number of employees, another thing is what happens behind the scenes, in practice, that is, the amount of sales of each employee.

Performance indicators present the impacts generated in the company through quantitative, qualitative, and even behavioral aspects. If analyzed well, these indicators can better manage company improvements, strategy implementation, as well as financial and performance results.

The indicators seek to examine the functioning aspects of the organization, some of these aspects are: efficiency, effectiveness and effectiveness.

- Efficiency: it is the relationship between the services and products that were generated with what was delivered, the resources used through costs, that is, if there is more efficiency the lower the cost to have or do something;
- Effectiveness: is the quality of products and services, and quantity, in other words, would be, for example, reaching or exceeding a certain production goal;
- Effectiveness: these are the impacts generated by services or products, for example, a campaign to teach literacy to adults over 30 years of age in a certain city, if this campaign reduces the number of illiterate people, then it was effective.

As a result, performance indicators can be adapted according to the reality of each company.

## 2.6 HOW QUALITY TOOLS CAN HELP IN PUBLIC ORGANIZATIONS' PROCESSES

Quality tools help improve a company's processes by identifying problems and helping to establish resolutions to the impasses encountered, as follows:

> It is important to be aware that quality tools and techniques play an important role in strategic quality. Quality tools aim, by attacking the cause, to extinguish and curb the appearance of problems. (BROW et al 2006, p. 274).

Tools are essential for employees to assess and identify strengths and those that need improvement. They can bring benefits to the company, obtaining more control of expenses and improvement in processes.

It may be that some companies use the tools without a prior analysis, or use something that does not make sense, resulting in possible returns such as demotivation, and spending time on excessive demands. For this reason, it is essential that there is a prior analysis of the tools in order to identify which will be the most appropriate to solve the problem. Tools are indispensable, as they are the basis for the company's progress to flow in a more efficient, effective and effective way.

Once the theoretical framework necessary for the research is presented, the methodology that was used will be presented below.

## 3 METHODOLOGY

The techniques and methodologies in this course completion work were based on bibliographic research, which enabled the advancement of the work together with the research developed in the researched public organization.

According to Ventura (2007), the case study is a practical investigation, which encompasses a broad method of data collection, analysis and planning. He can cite only one case study, as well as several, being of quantitative and qualitative research.

In order to approach the problem, the research was quantitative, qualitative and bibliographic. Quantitative research is a classification of the scientific method that uses different statistical techniques to quantify opinions and information for a particular study. It is performed to understand and emphasize logical reasoning and all the information that can be measured about human experiences.

Qualitative research is a type of research that can be carried out through interviews, and it is not numerical data, but qualitative, while bibliographic research is carried out through the use of theses, dissertations, articles, books, newspapers and websites on the internet to develop and support the objectives proposed in this research.

According to Strauss at al (1998), the research method is a set of procedures and techniques used to collect and analyze data. The method provides the means to achieve the proposed objective, that is, they are the "tools" that we make use of in the research in order to answer our question.

In this sense, the present research used the following procedures and techniques: data sample, as well as a brief report of the instruments used, a representation of the processes in the form of two flowcharts, one representing the processes before the use of management tools (AS IS) and the other with improvements made (TO BE), and analysis and interpretation of data before and after the performance of the Sector, graphical analyses, together with the PDCA management tool, to improve the institution's performance.

The following table summarizes the procedures and techniques that were used to achieve the specific objectives proposed in the work.

Chart 1: Relationship between the objectives and the methodology (elaborated by the researchers)

| Specific objectives | Methodology to achieve them |
|---|---|
| Present Quality Management tools used in the efficiency sector | **Bibliographic research:** Tools found through books, articles, academic works, and were carried out/included in the theoretical framework; |
| Map the efficiency examination process according to the BPM methodology | **The mapping of the processes according to the BPM methodology:** with the definition of the flowcharts AS IS and TO BE carried out through information obtained from the interview with the coordinator of the efficiency sector and also considering the knowledge of an intern in the sector; |
| Conduct a survey on the advances achieved in the Efficiency Sector | Surveys made through the analysis of the process mapping, which are the two flowcharts, report chart and interview. Having as indicators the efficiency and effectiveness, and with this made a comparison of before and after the application of quality tools, and thus identify the advances in the Sector. |
| Analyze the production of the year 2019 in the Efficiency Sector | **Analysis of Indicators:** data were collected from information provided by the institution, more precisely by the coordinator of the sector, and thus, analyze the indicators through a graph of reports in the period of one year, two flowcharts to represent the functioning of the processes and an interview to describe in more detail the evolution of the processes.<br>**Interview:** with the sector coordinator<br>**Process mapping:** with information provided by the sector coordinator and assembly of flowcharts made by an intern in the sector.<br>**Graphic:** with information also provided by the coordinator and thus expressed in a graph of reports. |

Source: Researchers

The interview was conducted by phone call and e-mail, due to the social isolation resulting from the pandemic, these were the means used to carry out this step. The interview consisted of four questions: "What were the tools used by you when the changes in efficiency occurred"; "What changes have you noticed after using these tools"; "Do you consider that the change in processes was important for the improvement of the performance of the sector" and "Is there any performance indicator that shows the improvement of performance in the sector".

## 3.1 PUBLIC ORGANIZATION STUDIED

The research took place at the IC. This is a sector of the PCDF that is responsible for examining the materiality of the crime.

In 2018, the new headquarters of the Institute of Criminalistics was inaugurated, which replaced the old building, where IC operated from 1984 to 2012, when there was a fire. Since then, the IC has been working in five buildings throughout the PCDF complex. This new IC building, in addition to favoring the integration of all sectors of the Criminal Forensics of the Federal District in a single space,

has an innovative and bold project that meets the new technological and labor demands specific to Criminalistics.

The Institute of Criminalistics is located at SPO, Lote 23, conj. A, Ed. Sede, Subsolo - Brasília/DF - CEP: 70610-907. It is responsible for examining the materiality of the offence. It produces material evidence from traces found at the crime scene, using scientific techniques. It seeks information based on traces, which typify the crimes, and which indicate qualifying characteristics, as well as determine their origin.

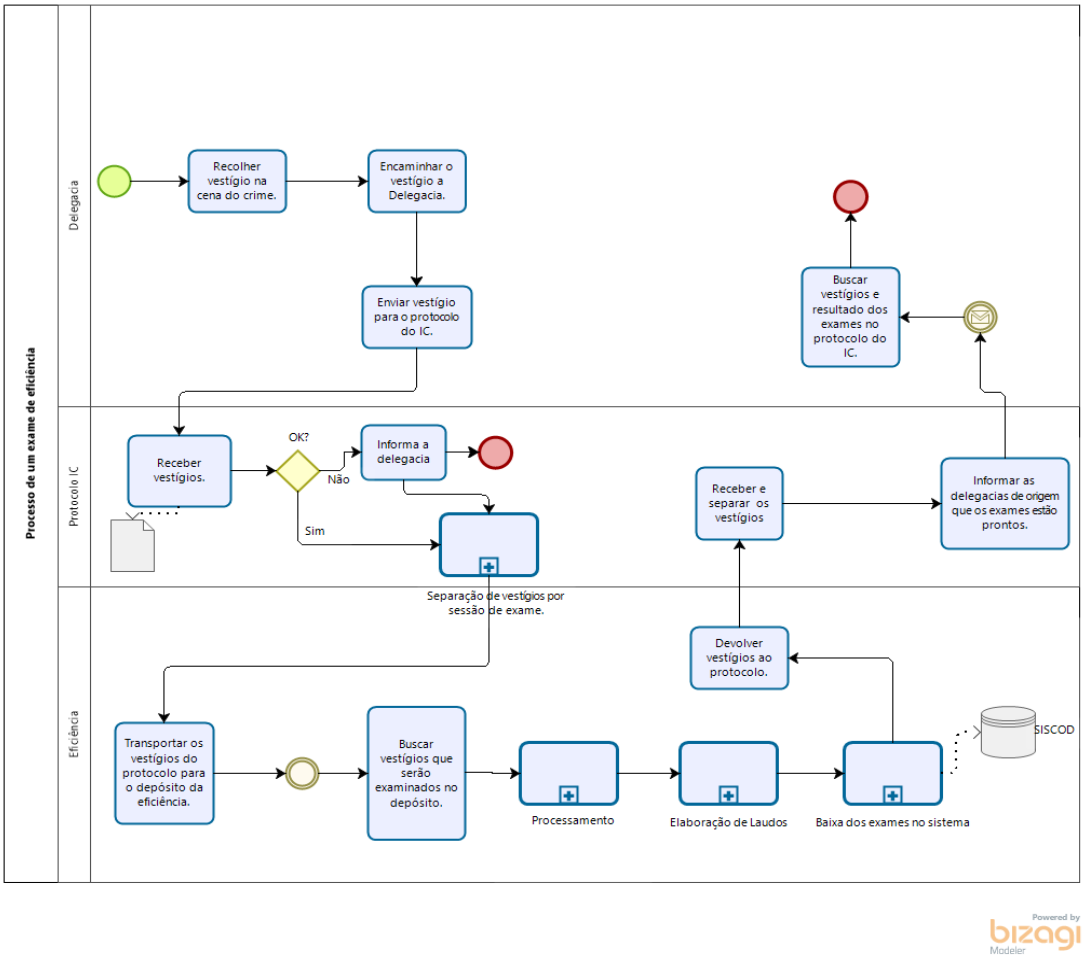
## 4 RESULTS

The results presented follow the order of the procedures and techniques presented above in Chart 1 of this study. As previously mentioned, the research proposes the analysis of data before and after application of the tools, where the events analyzed occurred in the period of one year in 2019, and will be presented according to the following sequence: flowcharts that represent the before and after of the production process, graphical representation of the monthly production number of the year analyzed, and an interview with the expert who coordinated the sector during the research period.

### 4.1 EFFICIENCY INDUSTRY FLOW CHART

The flowchart presented in the following figure is the representation of the activities and sub-processes of the Efficiency sector for the production of its exams, before the changes achieved with the use of the tools.

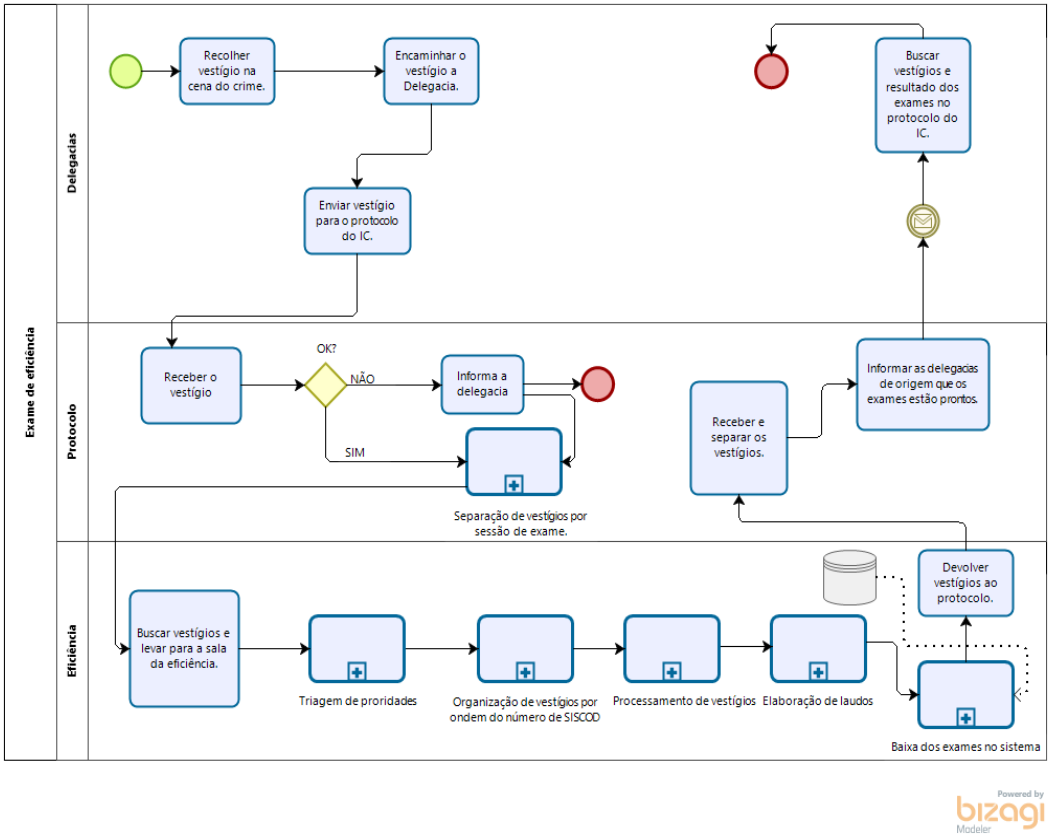
Figure 2: Flowchart prior to the changes




Source: Researcher

In the previous figure, it is possible to visualize how the entire process for the preparation of the exams worked in the efficiency sector, prior to the changes made to improve the performance of the service, it is noted that in the process represented there were no steps for the organization of priorities, where the service was done intuitively and not with an order that enabled an agile service provision according to the needs of the requester.

Figure 3: Flowchart after modifications



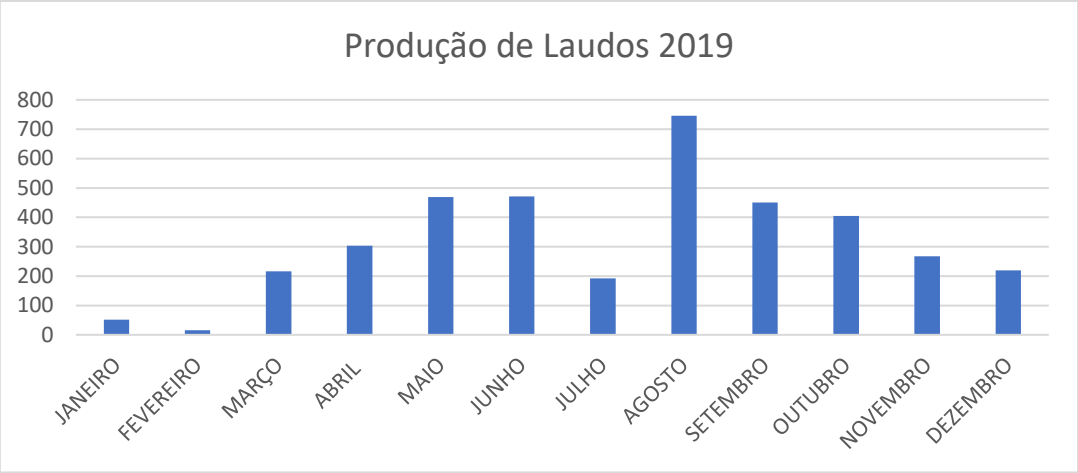

Source: Researcher

In the flowchart in Figure 3, we have the representation of the processes of the Efficiency sector after the strategies used to improve and increase production. It is possible to see that in the process two sub-processes were added that are essential for the results obtained to have been so satisfactory, they are, the priority screening, which aims to select the type of each trace, separating those that have a greater urgency and placing them as a priority and the Organization of traces, where it is time to organize in boxes the order in which the exams will be performed, according to each service priority.

## 4.2 PRODUCTION OF REPORTS

Figure 4 shows the bar graph with the production of reports, an indicator that was obtained through the use of spreadsheets made available by the organization.

Figure 4: Report Production Chart




Source: Researcher

The graph represents the variations that occurred in 2019 in the Efficiency Sector, and shows the results obtained after the implementation of the management tools. The first two months of the year represent well the production that existed before the implementation of the management tools, the production reached a maximum of 52 reports per month.

In March, the necessary changes were initiated to obtain better results, a total change was made in the organization of the traces, to have a better productivity, with these changes, even with the same number of employees in the sector, a significant increase in completed reports was obtained, closing the month with the production of 216 reports.

In the following months, the number of reports produced gradually grew, such as in April with 303 reports and May with 469 reports, which was a very good increase for the sector. In the month of June, there was a result of 471 reports, thus continuing a great amount of exams, proving that the changes made were very efficient.

In July, the number of reports produced was lower than the previous ones due to the fact that 2 employees of the session were on vacation, but even with this deficit the production was much higher than in the months when the management tools had not been implemented, thus ending the month with 192 completed exams. The month of August was the month with the highest production of the year, as it had the collaboration of 2 more interns in the sector, so the month was closed with the preparation of 746 reports.

In the following months, production continued with a very good number of 451 in September, 405 in October and 267 in November, taking into account that in November the sector no longer had any pending reports from the previous year and was only now producing in one month what was received in the same. The year 2019 closed in December with 219 reports completed. It was a year that achieved surprising results that have never been seen before in the efficiency sector.

## 4.3 PERCEPTION OF THE COORDINATION OF THE EFFICIENCY SECTOR

The following are the data from the interview conducted on August 12, 2020 with Criminal Expert João Luiz Neves de Oliveira (Coordinator of the Efficiency Sector), about the changes that occurred in the Efficiency Sector of the Criminalist Institute of the Civil Police of the Federal District.

**Question 1: What tools did you use when the efficiency changes occurred?**

> "With regard to tools, the basic principle of administration, organization, administration, planning and control. We started at that time of last year's carnival. It was in February of last year, when we took all that disorganized liabilities, of traces and organized them in order in SISCOD, among these organized traces, we subtracted what was a priority, that is, police stations that needed prompt care, such as the adolescent police station, the women's police station. The occurrences that already had an investigation instituted, so you would have a deadline to comply and the requests of the justices, most of them the result of reiterations. So, based on this, we used the computerized automation system already present in the Institution, which acted on the documentary record of the remains, in photography, then the organization of the photographic documentation and preparation for return. Once this was done, in the automation for the production of the report, we used the photographic documentation, including the registration of the request, we produced the report, and from this finalization, that is, the production of the report, the identifying and qualifying label of the entire procedure was also produced, to seal the trace previously prepared for return and, consequently, we finalized the process that was to return through the institute's protocol system, that originally received the trace. So, the quality tools were the principles of administration associated with an adequate environment for handling and managing the liabilities of traces and the production of reports within a technology automation system."

**Question 2: What changes have you noticed after using these tools?**

> "Regarding the changes that were felt, the main change was exactly our ability to manage and adapt production according to demand. Not only did we have, but we still have, about 400 requests per month. Our working capacity used to be restricted to 100, at most, 200. When we carried out this entire management process applied to the production of reports, we started to produce what the demand determined, that is, about four hundred reports per month, and in the month of August last year, as you can see in the graph, from the monthly production spreadsheets, at the end of August and beginning of September, We reached 700 reports produced, that is, we started to produce more than what was demanded, which allowed us to reach the end of the year, with a liability of only 100 reports. At the end of December, we left 100 reports for January, that is, the requests of the week, what arrived in the week, we were responding the other week, this within the criminalistics institute never happened. And so we have reached the ideal condition, which is the prompt service that is expected of both the work of the police and the work of justice, since we are contingent on justice."

**Question 3: Do you consider that the change in processes was important for the improvement of the sector's performance?**

> "Effectively, yes, since we were able to produce more reports than were produced, because from the numbers I showed you, if you look at the spreadsheets at the beginning of the year, in January and February, the production was lower than that after the month of March, and you saw that from March to August and September it went to an upward progressive line, depending on the application of the procedure. So, as far as the result is concerned, it was effective."

**Question 4: Is there any indicator that shows the improvement of performance in the sector?**

> "Regarding the performance indicator, it is the number of reports produced, I sent you month by month, January, February, March to December and you can see in the curve that from March we enter an ascendancy of 200 reports, then we get there in August to September at 700, then we fall, why? Because we would already be meeting the monthly demand, actually biweekly, what comes in and what goes out, so in the end we ended up with the pendency from December to January 2019 and in January 2020, we ended up with a pendency of 115 objects to be examined, but what does this represent? The weekly demand. So, our service, which used to take almost six months, that is, it took us six months to give an answer, this in the past, and adopt the system and the entire management methodology, we started to serve with 15 days. So, I think it's a great achievement, and an effective result."

Through the interview and the analysis of the graph of the production of reports (figure 4), it became clear how the production indicators improved, what used to produce 200 reports, started to produce 700, and before it took six months to perform a service and be completed, then it started to be done and completed in 15 days. With the application of the tools together with the PDCA cycle, it had greater control in the management capacity and adequacy of production according to demand, making evident the performance indicators of efficiency and effectiveness, as there were improvements in service, speed without any financial cost.

From the data collected, through the interview, flowcharts and graph the progress of the processes, which provided the basis for the results. Through the analyses, it was possible to notice the indicators of performance, efficiency and effectiveness, and thus show in more detail the evolution of services in the Efficiency Sector.

## 5 FINAL THOUGHTS

As presented in the results, the intermediate objectives were achieved and the general objective of the present research - to analyze how the use of quality management tools in the processes of forensic examinations carried out by the Efficiency Sector of the Institute of Criminalistics of the Civil Police of the Federal District can improve its performance, was also achieved.

This research, developed in the Efficiency Sector of the Institute of Criminalistics of the Police of the Federal District, was of great relevance to show how improvements in the service to society can be obtained, through commitment and inclusion of tools that seek effectiveness, as well as being useful for the Institute with regard to information on the functioning of the analyzed session.

Important data were obtained for the analysis of the results of this research, after collecting, it was possible to produce two process mappings that represent all the necessary steps for the elaboration of the efficiency exam, that is, the service provided by the Sector. The first mapping shows the complete process of what the actions were like before the changes were made, while the second represents the updated process with all the new steps.

The mappings are a very important representation to be able to visualize the processes in a clear way, and to understand how the workflow was and how it is in the Sector. Production data for each

month of 2019 were also obtained, which are represented by a graph, which shows the variations in the monthly results. And finally, an interview was made with the Expert who was the coordinator of the Sector at the time the research was carried out.

With all the data analyzed, it was possible to conclude that with the use of the tools and following the principles of management, the Efficiency Sector had a surprising improvement in its monthly production, as before 16 reports were produced and completed in one month, and after the application of the tools 746 reports were produced, as was the example of August 2019.

Therefore, answering the main problem of the research: Can the use of management tools in carrying out processes improve the performance of a sector that provides public services? The answer is yes. With the research done, together with the research done and analyzed, it was remarkable and it was clear the improvement of the institution's performances, being straight to the point, what used to produce 200 reports, started to produce 700, which used to take six months to perform a service and be completed, then started to be done and completed in 15 days.

The main results were obtained through the elaboration of mappings, which facilitates the identification of the functioning of the processes of the analyzed Sector, and which can be used by other sectors for future training, or just for a better visualization of their processes. Another significant result was through the graph that clearly represents the progress that the sector has made during the year that the new organization was implemented.

The results obtained in the research corroborate the article published by Vale et al. (2017), which concluded that the use of the PDCA tool was efficient and provided greater satisfaction to the researched company and its customers.

According to the research carried out by Silva (2014), it was clear how easy it was to visualize the processes, and with this visualization it allowed us to see everything that was being done and thus define improvements.

In this sense, in the present research there was a reduction in the rates of problems, and the clients started to trust the process more, results that are identified with the improvements of the research carried out at the Institute of Criminalistics.

For future work, it is recommended that the mapping of processes in other sectors of the Institute be elaborated, as this visualization is extremely important to analyze and obtain a good functioning of the processes, as well as a performance evaluation with the employees, and thus acquire other points of view in the improvement of efficiency as a whole within the organization.

## REFERENCES


AGUIAR, Silvio. *Integração das Ferramentas da Qualidade ao PDCA e ao Programa Seis Sigma,* Nova Lima, 2006.

ArquiFood. Atividade 30/10/2019 Fluxograma do Blog ArquiFood Bizagi. Disponível em: <https://arquifood.blogspot.com/2019/10/atividade-30102019-fluxograma-bizagi.html> Acesso em: 11/08/2020.

AZEVEDO, Irene Conceição Gouvêa. Fluxograma como ferramenta de mapeamento de processo no controle de qualidade de uma indústria de confecção. 2016. Congresso Nacional de excelência em Gestão. Área de temática: Gestão de Qualidade.

BERG, A.; BUFFIE, E. F.; PATILLO, C.; PORTILLO, R.; PRESBITERO, A.; ZANNA, L-F. Some misconceptions about public investment efficiency and growth. IMF Working Paper. International Monetary Fund. Dec., 2015.

BORGES, F.H.; BRUNO, D. M.; VALE, P. D. Aplicação da ferramenta PDCA: um estudo de caso no processo de produção de suco concentrado. XXXVII Encontro Nacional de Engenharia de produção. Joinville, Santa Catarina, 2017.

BROWN, S. et al. Administração da produção e operações: um enfoque estratégico na manufatura e nos serviços. 2. Ed. São Paulo: Campus/Elsevier, 2006.

[Constituição (1988)]. Constituição da República Federativa do Brasil de 1988. Brasília, DF: Presidência da República, 2016. Disponível em: <http://www.planalto.gov.br/ccivil_03/Constituição/Constituição>.

CORDEIRO, José Vicente B. de Mello. Rev. *FAE*, Curitiba, 2004.

COSTA, A. P. R.; FERREIRA, R. C.; LEAL, F. *Mapeamento de processos em uma unidade hospitalar:* Proposta de Melhorias baseadas em conceitos Lean In: ENCONTRO NACIONAL DE ENGENHARIA DE PRODUÇÃO, 35., Fortaleza, 2015.

LIMA, Paulo Daniel Barreto. *Excelência em gestão pública:* a trajetória e a estratégia do gespública. Rio de Janeiro: Qualitymark Editora, 2013.

OLIVEIRA, Saulo Barbará de. *Gestão por Processos:* fundamentos, técnicas e modelos de implementação. 2ª edição Rio de Janeiro: Qualitymark Editora, 2014.

PEARSON, Education do Brasil. *Gestão de Qualidade*, São Paulo, 2011.

PAULA, Ana Paula Paes de. *Por uma nova gestão pública:* limites e potencialidades da experiência contemporânea. Rio de Janeiro: Editora FGV, 2005.

Revista *Ingepro* - vol. 02, no. 09 setembro de 2010.

PEREIRA, Ricardo A. de Castro; CAMPOS, Francisco de Assis Oliveira. Corrupção e ineficiência no Brasil: Uma análise de equilíbrio geral - Estudos econômicos - São Paulo, 2016.

RUTKOWSKI, Jacqueline. Qualidade no Serviço Público – Um estudo de caso. Belo Horizonte, 1998.

SELEME, Robson; STADLER, Humberto. *Controle de Qualidade:* as ferramentas essenciais,

Curitiba: InterSaberes, 2012.

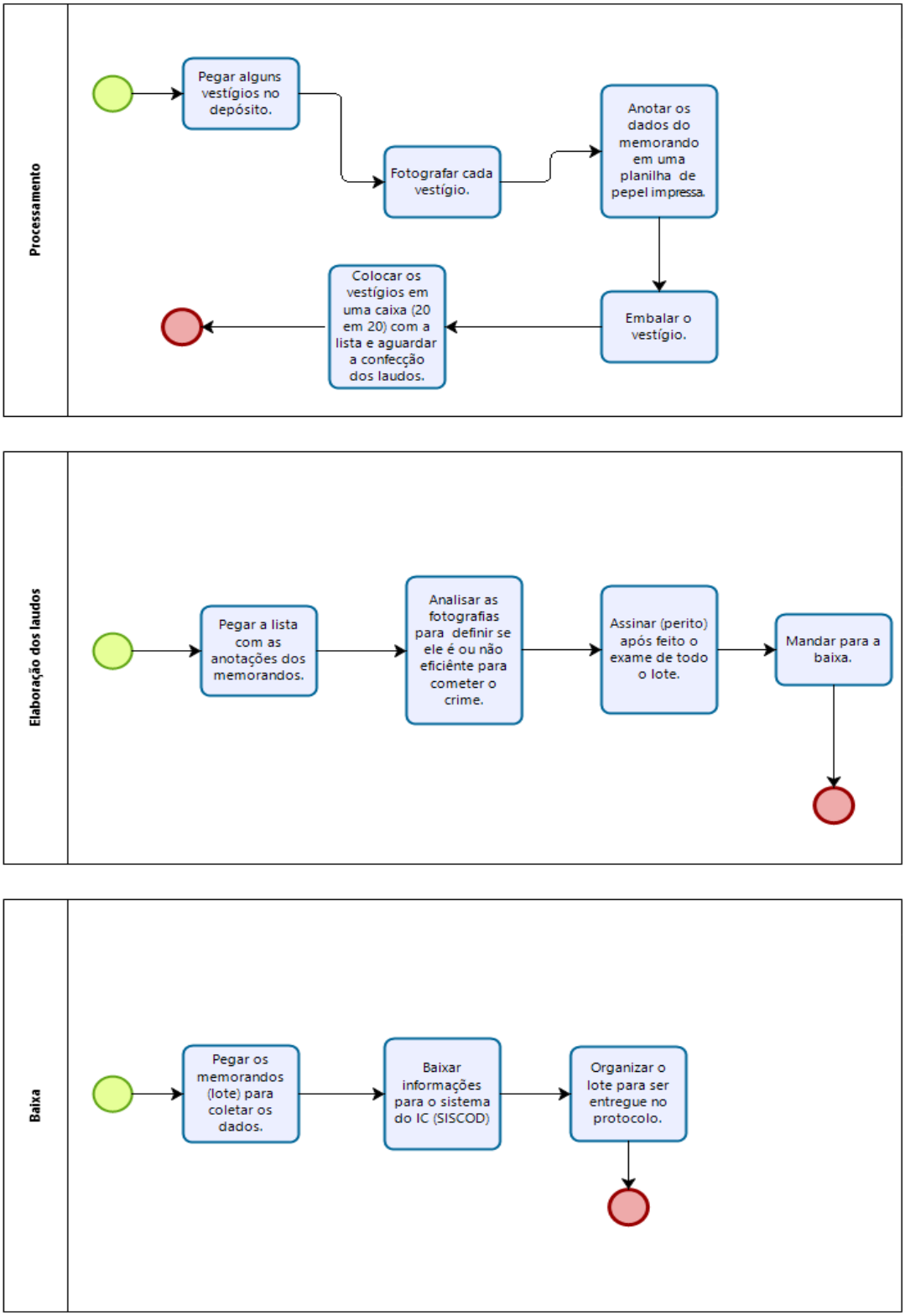
SILVA, Alexandro Fernandes da. Indicadores de Desempenho – Um estudo de caso na empresa net serviços. João Pessoa, 2013.

SILVA, Jéssica Sousa. O Mapeamento de Processos Organizacionais no Setor Público - Estudo de caso do escritório de processos da Agência Nacional de Vigilância Sanitária – ANVISA. Brasília, 2014.

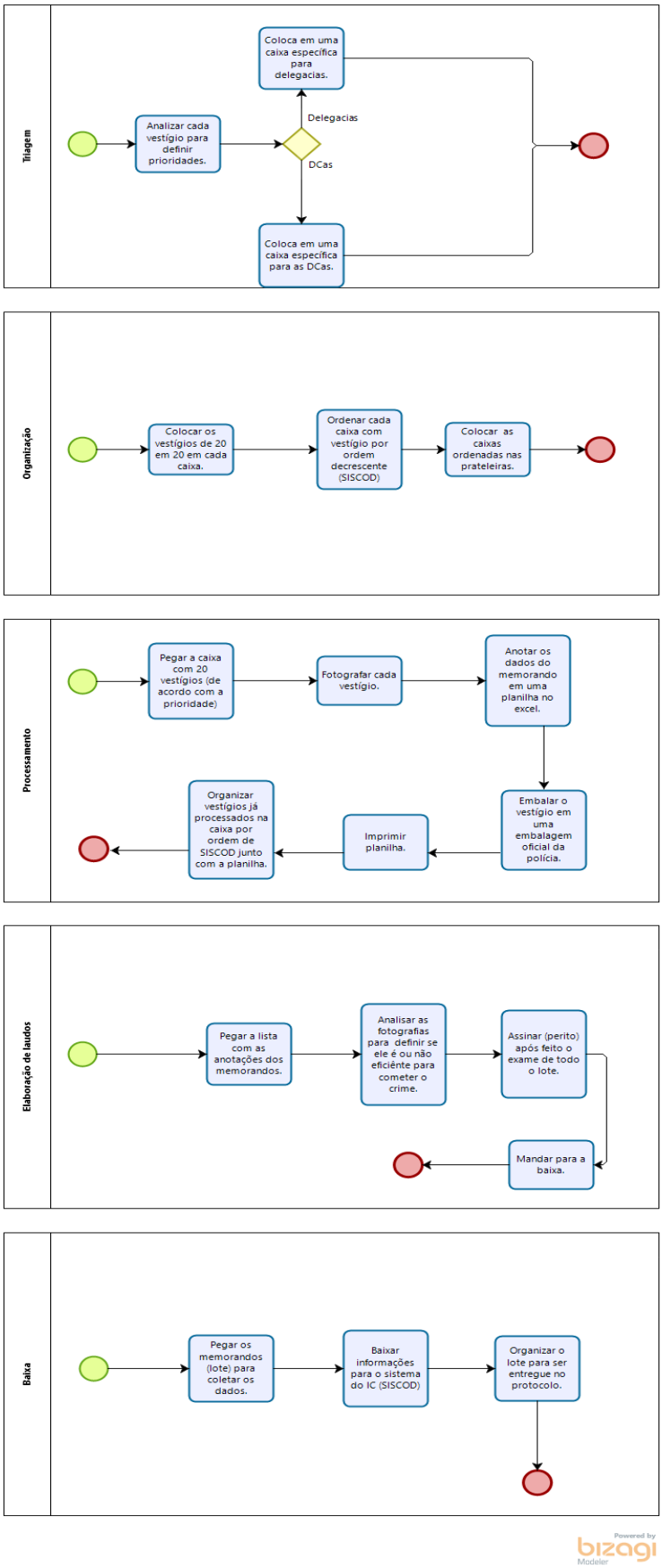
STRAUSS. Alselm L.; ROCHA. Luciene de Oliveira. *Pesquisa qualitativa:* técnicas e procedimentos para o desenvolvimento da teoria fundamentada, 2º edição Porto Alegre: Bookman, 1998.

VENTURA, Magda Maria. Pedagogia Médica - O Estudo de Caso como Modalidade de Pesquisa - Rev SOCERJ. 2007.

## ANNEX A – FLOWCHART 1 SUBPROCESSES



# ANNEX B – FLOWCHART SUBPROCESS 2



## ANNEX C - FLOWCHART BREAKDOWN 1

| Activity | Executor | Detailing | Registration | Applications |
|---|---|---|---|---|
| Collect trace at the crime scene. | Agent. | When a crime occurs and at the crime scene there is a trace that may have supposedly been the weapon used, it is collected for a series of examinations. | Trace collection record. | Millenium |
| Forward the trace to the Police Station. | Agent | After collection, the trace is forwarded to the nearest police station. | X | X |
| Send trace to the IC protocol. | Delegate | After evaluating which tests are necessary to identify the use of the trace, it is sent to the IC. | Memorandum | Word |
| Receive traces. | Agent. | In the protocol, the traces are received and recorded in the system. | Record of receipt of traces. | Millenium/SISCOD |
| Separation of traces per examination session. (sub-process) | Agent, intern. | In the protocol, each trace is separated and which test it requests, so they are stored in a warehouse that has several shelves, each one identified with the CI sessions. | X | X |
| Look for traces and take them to the efficiency warehouse. | Agent, intern. | The agent goes to the protocol and looks for the traces that have arrived and takes them to the warehouse. | X | X |
| Look for traces that will be examined in the warehouse. | Agent, intern. | Every day an agent goes to the warehouse and picks up a quantity of traces to be carried out. | X | X |
| Processing (sub-process) | Trainee. | See sub-processes of **"1.Processing".** In the processing, the photographs of the traces are taken so that the expert can evaluate when the reports are prepared, as well as a new package is placed on the traces and there is a collection of data according to the memorandum of each trace. | Memos data sheet. | Word |
| Preparation of Reports (sub-process) | Expert | See sub-processes of **"2. Preparation of Reports".** At this stage, the responsible expert analyzes the photos taken of the traces and with his knowledge concludes whether or not the material is | Elaboration of efficiency exams. | Millenium/SISCOD |

| | | | | |
|---|---|---|---|---|
| | | efficient to commit the act that is being accused. | | |
| Removal of exams from the system | Agent | View subprocesses of **"3.Low".**<br><br>The discharge is done by an officer, who collects the memos of each trace, with the results of the examination, and updates the situation of each one in the police system. | Recording of exam results. | Millenium/SISCOD |
| Return traces to the protocol. | Agent | The agent returns all the material that has already been analyzed to the protocol. | X | X |
| Receiving and separating traces | Agent | A protocol agent receives this material and separates it according to its place of origin. | Receipt of traces with result. | Millenium/SISCOD |
| Inform the home police stations that the exams are ready. | Agent | As soon as the material is all separated and organized, the protocol sends a notice to the police stations that the requested exam has already been met. | Publication of exam results. | Millenium |
| Search for traces and results of the tests in the CI protocol. | Agent | An agent in charge of each police station goes to the IC protocol to look for the trace with its due result. | X | X |

## ANNEX D - FLOWCHART BREAKDOWN 2

| Activity | Executor | Detailing | Registration | Applications |
|---|---|---|---|---|
| Collect trace at the crime scene. | Agent. | When a crime occurs and at the crime scene there is a trace that may have supposedly been the weapon used, it is collected for a series of examinations. | Trace collection record. | Millenium |
| Forward the trace to the Police Station. | Agent | After collection, the trace is forwarded to the nearest police station. | X | X |
| Send trace to the IC protocol. | Delegate | After evaluating which tests are necessary to identify the use of the trace, it is sent to the IC. | Memorandum | Word |
| Receive traces. | Agent. | In the protocol, the traces are received and recorded in the system. | Record of receipt of traces. | SISCOD/Millenium |
| Separation of traces per examination session. (sub-process) | Agent, intern. | See sub-processes of **"1.Separation of traces by examination session".** In the protocol, each trace is separated and which test it requests, so they are stored in a warehouse that has several shelves, each one identified with the CI sessions. | X | X |
| Look for traces and take them to the efficiency room. | Agent, intern. | Every day the intern or an agent goes to the protocol to check if there are new traces to be examined, in order to pick them up and take them to the Efficiency's own warehouse. | X | X |
| Priority triage (sub-process) | Agent, intern. | See sub-processes of "2**. Screening."** In the triage, the intern or an agent, analyzes trace by trace, to check where it came from, if it came from a DP, or from a DCa (priority), so he puts it in different boxes, so that when there is processing, he always starts with what has to be delivered faster. | X | X |
| Organization of traces by wave of SISCOD number (subprocess) | Interns | See sub-processes of **"3.organization".** To organize it, it is necessary to separate 20 traces in each box, all in descending order (SISCOD number). | X | X |

| | | | | |
|---|---|---|---|---|
| Processing (sub-process) | Interns | See sub-processes of **"4.Processing".** In the processing, the photographs of the traces are taken so that the expert can evaluate when the reports are prepared, as well as a new package is placed on the traces and there is a collection of data according to the memorandum of each trace. | Memos data sheet. | Word |
| Preparation of Reports (sub-process) | Expert | See sub-processes of **"5. Preparation of reports".** At this stage, the responsible expert analyzes the photos taken of the traces and with his knowledge concludes whether or not the material is efficient to commit the act that is being accused. | Elaboration of efficiency exams. | Millenium/SISCOD |
| Removal of exams from the system | Agent | View subprocesses of **"6.Low".** The discharge is done by an officer, who collects the memos of each trace, with the results of the examination, and updates the situation of each one in the police system. | Recording of exam results. | MILENIUM/ SISCOD |
| Return traces to the protocol. | Agent | The agent returns all the material that has already been analyzed to the protocol. | X | X |
| Receiving and separating traces | Agent | A protocol agent receives this material and separates it according to its place of origin. | X | X |
| Inform the home police stations that the exams are ready. | Agent | As soon as the material is all separated and organized, the protocol sends a notice to the police stations that the requested exam has already been met. | Publication of exam results. | Millenium/SISCOD |
| Search for traces and results of the tests in the CI protocol. | Agent | An agent in charge of each police station goes to the IC protocol to look for the trace with its due result. | X | X |

## ANNEX E - DETAILS OF THE SUB-PROCESSES

### TRIAGE

| Activity | Executor | Detailing | Registration | Applications |
|---|---|---|---|---|
| Analyze each trace to set priorities. | Trainee | At this stage, each trace is analyzed to see whether or not it belongs to the police stations that require priority, such as the Child and Adolescent Police Station, or if it has any repetition and needs urgency. | X | X |
| Place in a specific box for DCas. | Trainee | After the necessary separation, the traces are separated into different boxes, and those from the DCas are placed in a box and placed at the beginning of the production "Queue". | X | X |
| Put it in a specific box for police stations. | Trainee | After the necessary separation, the traces are separated into different boxes, and those from the police stations that do not need urgency are kept in a box that goes to the end of the production "queue". | X | X |

### ORGANIZATION

| Activity | Executor | Detailing | Registration | Applications |
|---|---|---|---|---|
| Place the traces every 20 in each box. | Trainee | A maximum of 20 traces are placed in each organizer box. | X | X |
| Sort each box with trace in descending order (SISCOD) | Trainee | All traces are sorted by SISCOD number wave. | X | X |
| Place the ordered boxes on the shelves. | Trainee | The boxes are placed in production order on the shelves. | X | X |

### PROCESSING

| Activity | Executor | Detailing | Registration | Applications |
|---|---|---|---|---|
| Pick up the box with 20 traces (according to priority) | Trainee | The boxes are picked up in the right order for production. | X | X |
| Photograph every trace. | Trainee | Each trace is photographed from 2 different angles (front and back) and the memo is also photographed. | Registration in the IC system. | Photolink |
| Annotate the memo data in an excel spreadsheet. | Trainee | With each trace photographed, the data from your memo is placed in a spreadsheet that is used for archiving. | Memorandum data logging. | Word |
| Pack the trace in an official police package. | Trainee | All traces are repackaged with official envelopes. | X | X |
| Print spreadsheet. | Trainee | After all traces of the box that was produced are placed in the spreadsheet, it is printed, and placed inside the box, to identify each piece of content that contains it. | X | X |
| Organize traces already processed in the box in order of SISCOD together with the spreadsheet. | Trainee | After the boxes are photographed, they are placed in order for the reports to be made. | X | X |

## PREPARATION OF REPORTS

| Activity | Executor | Detailing | Registration | Applications |
|---|---|---|---|---|
| Take the list with the notes of the memos. | Expert | The expert makes his expertise with the support of the photographs and the list that is made with the data of each memorandum. | X | X |
| Analyze the photographs to determine whether or not he is efficient in committing the crime. | Expert | In this analysis, the Expert looks at the photos taken of each trace, looking at all the details to define whether or not the object is responsible for the accused crime. | Viewing the photos. | Photolink |
| Sign (expert) after the examination of the entire batch has been done. | Expert | After the examinations are done, the Expert signs the reports issued. | X | X |
| Send it to the low. | Expert | After the reports are made and signed, they are sent to the discharge stage. | X | X |

## LOW

| Activity | Executor | Detailing | Registration | Applications |
|---|---|---|---|---|
| Pick up the memos (batch) to collect the data. | Agent | The first step of the write-off is to get the memos with their reports ready, so that all the data can be included in the system to be used as research when necessary. | X | X |
| Download information to the IC system (SISCOD) | Agent | The necessary data is all put into the police system. | Low | Millenium/SISCOD |
| Arrange the batch to be delivered in the protocol. | Agent | After all the reports are downloaded, the box is organized and sent to the protocol. | X | X |