Quality management in an agricultural research company in the brazilian Amazon

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ABSTRACT

The quality assurance process offers direction on how the team will oversee and confirm the standard of the project during its implementation. This case study aims to analyze the quality management of Research, Development, and Innovation projects at a public agricultural research company unit in the Amazon, located in the state of Amapá. It will also investigate how specific regional characteristics affect project execution while identifying areas for improvement. The study uses qualitative and quantitative methods, and its findings will provide valuable insights for project managers and stakeholders in the field. Data from the corporate project management system was analyzed to verify project execution and identify obstacles. The system data was gathered from the reference Unit, Amapá, and three other research Units of the same company located in the North, Midwest, and South. Biased and emotional language was avoided in favor of a clear, objective narrative. The Cause and Effect Diagram and the Pareto Chart were utilized to prioritize the problems to be analyzed. Technical abbreviations such as Cause and Effect Diagram and Pareto Chart were introduced and defined upon their first use. The document adhered to standard academic structure, formatting, and citation methods. Finally, the 5W2H technique was employed to develop the action plan. Project management is conducted in a standardized manner with monitoring taking place every four months. The primary cause of delays in project activities at the Reference Unit is a shortage of materials, supplies, and equipment during the scheduled period. This issue is mainly attributed to delays in the transfer of financial resources and the challenge of acquiring these items. The action plan recommends diversifying funding sources, modifying the physical-financial schedule, and providing training to teams in risk management and procurement management.

Keywords: Development, Innovation, Amapá, Management, Quality tools.

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INTRODUCTION

The search for quality has been with man since the beginning. The concern with the quality of materials, improvements in production methods, and food storage are some examples of the importance of quality for humanity (RODRIGUES, 2020). Quality becomes more important every day due to consumer demands and the need for more sustainable products, processes and services.

According to Rodrigues (2020), quality is the value perceived by the customer. And quality management in projects aims to ensure that the objectives of the stakeholders are met, through the planning, management and control of the established requirements, providing the customer with the desired delivery (PMI, 2017).

To promote quality management in projects, the techniques and parameters used are according to the type of delivery to be carried out (PMI, 2017). Thus, in Research, Development & Innovation [RD&I] projects in the agricultural area, several techniques and parameters can be used to manage, control and measure the quality of deliveries. Among them, it is possible to use the Cause and Effect Diagram; Pareto chart and the 5W2H methodology.

According to Grisotti and Moran (2020), the Amazon is composed of regions with unique characteristics that require unique development strategies. And that ignorance about the various "Amazons" is responsible for the delay in their development, and the recognition of this diversity should be the starting point for any discussion about development strategies in the region.

Companies with national coverage have the practice of standardizing the processes and techniques used in the different Units, however, Brazil is a country of continental dimensions and the different regions and units of the federation have peculiarities.

As a result of the great diversity of territorial conditions in Brazil, questions arise regarding project management practices, such as: is it feasible to standardize the quality management of projects executed in different regions or units of the federation? What are the impacts of disregarding the peculiarities of each region? Is this valid for Amazon?

The Brazilian Legal Amazon comprises an approximate area of 5,217,423 km2, about 61% of the national territory. It includes the states of Acre, Amapá, Amazonas, Pará, Roraima, Rondônia and Tocantins, which make up the Northern Region of Brazil, in addition to Mato Grosso, and, partially, the state of Maranhão, with a population of about 27.5 million people (SANTOS et al., 2018). Its Human Development Index [HDI] is 0.683, below the Brazilian average of 0.727 (UNDP, 2013).

The state of Amapá is one of the states that make up the Legal Amazon, covering 142,470.762 km2 of territory, housing an estimated population of 861,773 inhabitants. With an HDI of 0.708 and occupying the twelfth position in the ranking of Brazilian states. The state has several particularities, such as terrestrial geographic isolation from the rest of the country, border area, large preservation area (72% of the territory), among others (IBGE, 2020).

In view of the particularities mentioned, this research aimed to analyze the quality management of RD&I projects in a unit of an agricultural research company in the Amazon, state of Amapá, as well as to verify how the specific regional characteristics influence the delivery of results and identify points of improvement.

MATERIAL AND METHODS

OBJECT OF STUDY

The study was carried out based on the analysis of data from a unit of a public agricultural research company, based in the Amazon, state of Amapá.

The Unit is one of the 42 units belonging to the company and has been present in the state of Amapá since 1981, with the objective of generating technologies, products and processes that promote the sustainable development of the state and the Amazon estuary. It operates in several areas of agribusiness, such as: aquaculture and fisheries; agricultural defense; exploitation of forest resources and agricultural production systems.

CHARACTERIZATION OF THE STUDY

The research carried out was a qualitative-quantitative explanatory descriptive case study, in which the project management model used by the Unit of the studied company was analyzed, with the purpose of characterizing it and identifying points of improvement, through the analysis of project execution data contained in the corporate systems.

To analyze the regional peculiarities of the Unit, data from three other research units of the same company, with similar purposes, located in the North (N), Midwest (CO) and South (S) Regions, were used.

DATA COLLECTION

Data from 2018 to 2020 were used, obtained through RD&I project management systems and the deliveries made, specific to the company object of the study. The systems are for corporate use and therefore have restricted access to the company.

In order to analyze the quality management of the RD&I projects of the reference Unit and the other three Units (N, CO and S), used for the analysis of peculiarities, data were collected, such as:

- Number of projects in execution;
- Planned deliveries;
- Deliveries made;
- Types of deliveries;

- Follow-up reports of project activities;
- Reports of problems occurred in the execution of project activities

In addition, the corporate tools and processes were verified to monitor the results and to ensure the quality of the deliveries and their validation.

For the analysis of the reports of monitoring situations and problems, spreadsheets with quantitative and qualitative data were extracted from the company's corporate project management system by the responsible sector and provided for the analysis.

In the comparison between Units from different regions, the report data were transformed into percentages, in order to eliminate size discrepancies between the Units, and analyzed by a simple descriptive method.

The data of activities reported as "Delayed in progress" were submitted to a classification through the application of the cause and effect diagram technique, and subsequent prioritization by the Pareto Chart, then applying the 5W2H tool for the elaboration of an action plan for the reference unit.

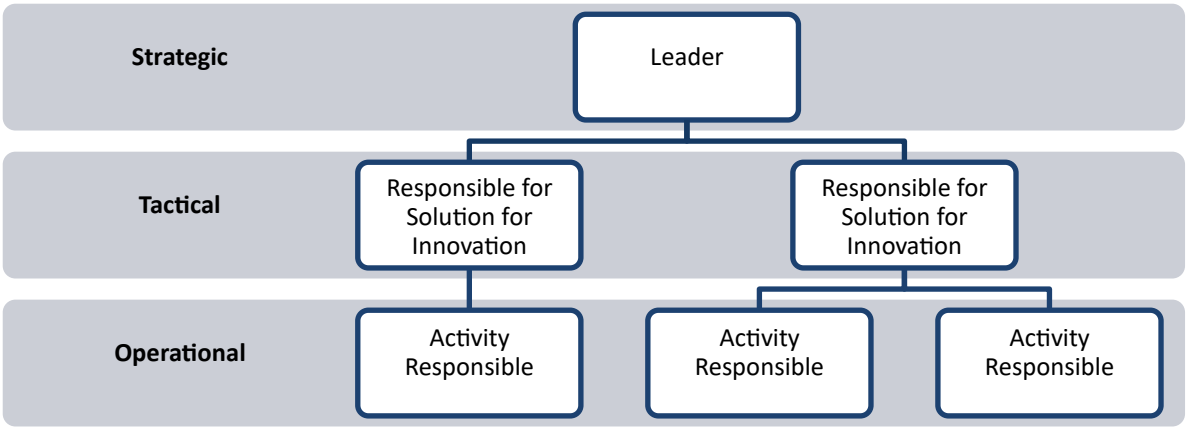
RESULTS AND DISCUSSION

The studied company follows the model of Open Innovation through the Macro Innovation Process, using a computerized system for the management of projects, from their preparation, approval, execution, to the delivery of results (products, processes or services).

The project teams are organized into a "leader", responsible for the management of the project at the strategic level, researcher of the area related to the project; Responsible for the Innovation Challenges, researchers or analysts responsible for the integration of the results of the activities for the delivery of the final results that will respond to the Challenge posed (tactical); and Responsible for the activities, researchers or analysts who develop the operational part of the project (Figure 1).

The studied company works with the Technology Readiness Level [TRL] or "Manufacturing Readiness Levels" [MRL] scale to classify the results. Figure 2 shows the results of the Unit studied according to the classification of the TRL/MRL scale.

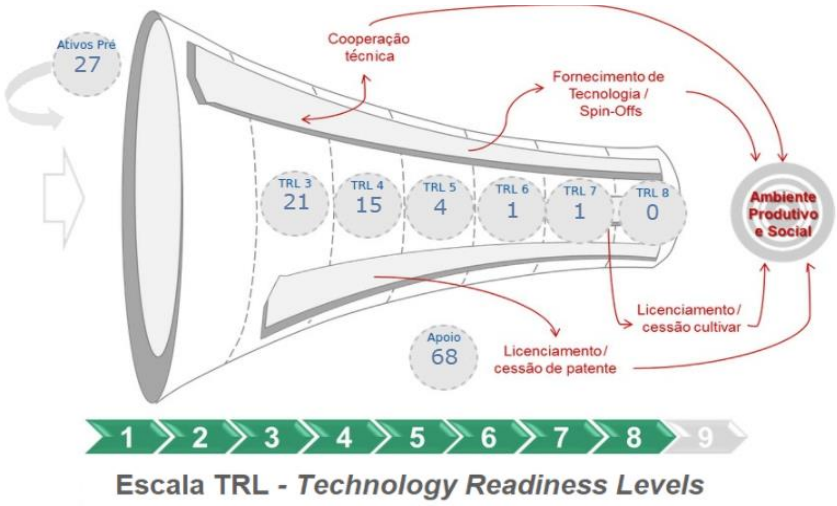
Figure 1. Levels of responsibilities of team members in the project in the studied company



Source: Original survey results

The project management system is standardized for the entire company. And the monitoring of project execution data is carried out through a computerized system, in which the person responsible for the project activities reports the progress every four months.

Figure 2. Innovation funnel of the Research Unit studied, showing the location of the assets, according to the TRL/MRL scale



Source: Project management system of the studied company

In the reports, it is necessary to choose the status of the project activity, among the options below:

- Delayed in progress;
- On-time in progress;
- Performed;
- Not informed;
- Not started and delayed;
- Not started, but on time;
- Cancellation request;

- Completion Request.

In addition, it is possible to choose the type of problem that is occurring in the execution of the activity, among the options below:

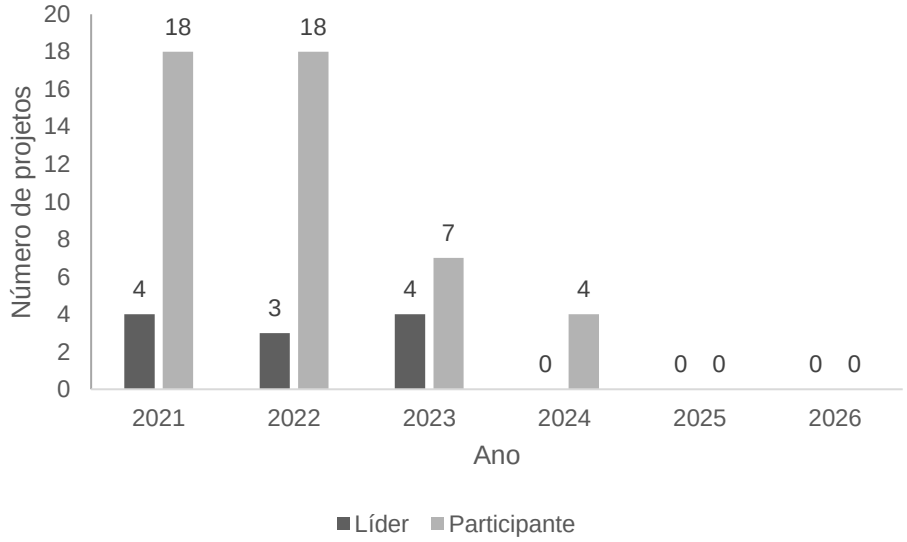
- Removal of a member from the project;
- Delay in the release of resources;
- Shortage of field labor;
- Difficulty in overcoming internal or external bureaucracy (contracts, agreements, licenses, others);
- Difficulty traveling or displacement;
- Lack of support from technical laboratory staff;
- Lack or delay in the acquisition of equipment, materials and supplies;
- No specific occurrence;
- Problems in the conduct of the activity (specify in the comments);
- Funds released in an amount lower than that requested;
- Not supplied.

In addition to choosing the situation of the activity and the type of problem, it is possible to write information about the execution of the activity.

CHARACTERIZATION OF THE UNIT

The project portfolio of the Amapá Unit consists of 47 projects, 11 of which are led by researchers from the Amapá Unit, five exclusively with researchers from the Amapá Unit and 42 in partnership with other units of the company or institutions (Figure 3), with 34.52% of the professionals involved in the research projects being external to the Unit.

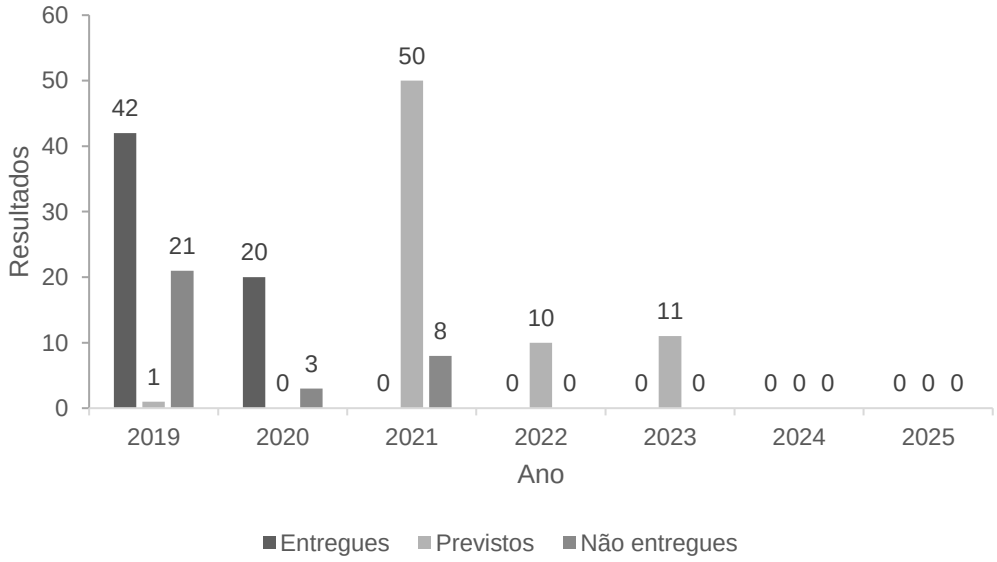
Figure 3. Number of ongoing projects with participation or led by researchers from the Research Unit



Source: Original survey results

The studied Unit delivered 42 results in 2019 and 20 results in 2020, this reduction is justified by the difficulty in carrying out the activities, due to the COVID-19 pandemic. And it reflects in the forecast results for 2021, 50 results, being 400% above the average of the forecast results for the following years, 2022 to 2023 (Figure 4).

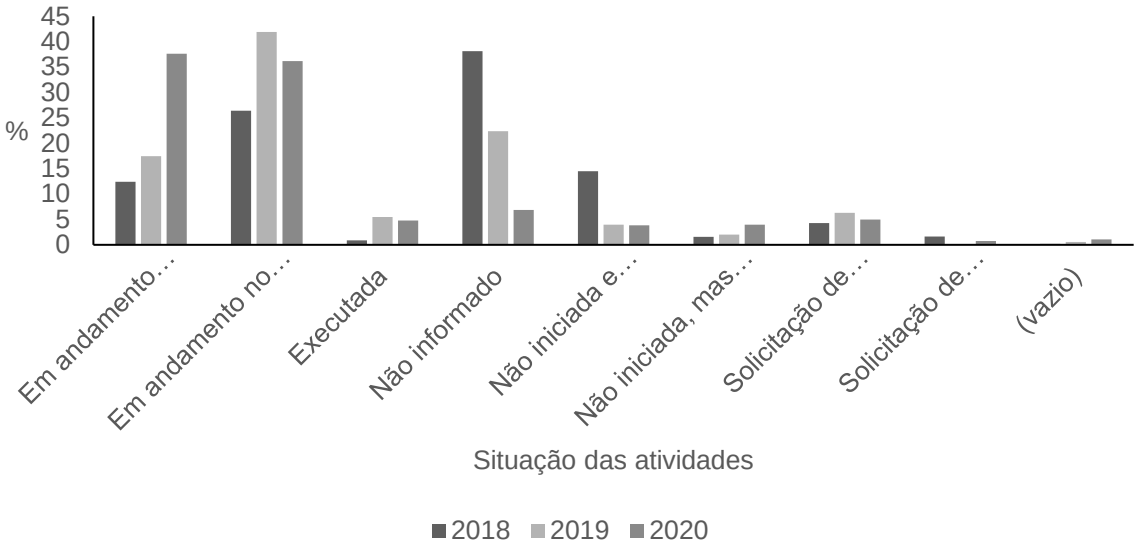
Figure 4. Forecasted, delivered and undelivered research results of the Amapá Unit in the period from 2019 to 2025



Source: Original survey results

In the follow-up reports made during the period surveyed (2018 to 2020), a considerable percentage of activities were observed with no record, "Not informed" (Figure 5). This percentage decreased during the surveyed period, from 38.13% in 2018 to 6.85% in 2020. However, it is still a considerable percentage, since information about the status of activities is essential for project management, including quality management (OTTONICAR et al., 2019).

Figure 5. Follow-up reports of the projects being carried out at the Amapá Unit



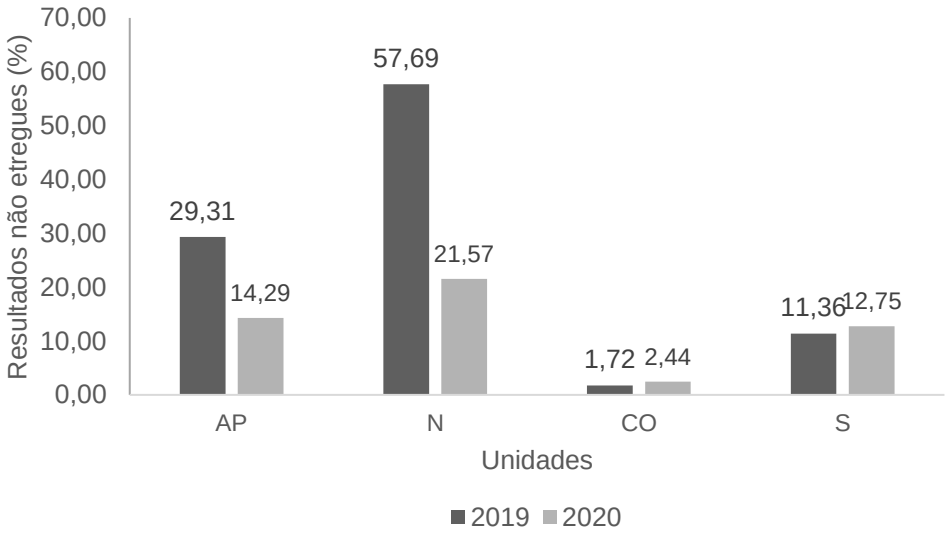
Source: Original survey results

QUIRK ANALYSIS

Although some of the company's corporate units have a project office or organizational structures with a similar function, in the corporate unit analyzed, there is no project office or project managers to assist in their management, since the Amapá Unit does not have professionals trained in project management with the objective of managing the projects executed.

When analyzing the number of results not delivered by the Amapá Unit, compared to the other Units studied, it was observed that there was a decrease in the number of results not delivered from 2019 to 2020; and that the Units in the North region had a higher percentage of undelivered results than the units studied located in other regions (Figure 6).

Figure 6. Results of undelivered projects from the Amapá [AP], North [N], Midwest [CO] and South [S] Unit from 2019 to 2020

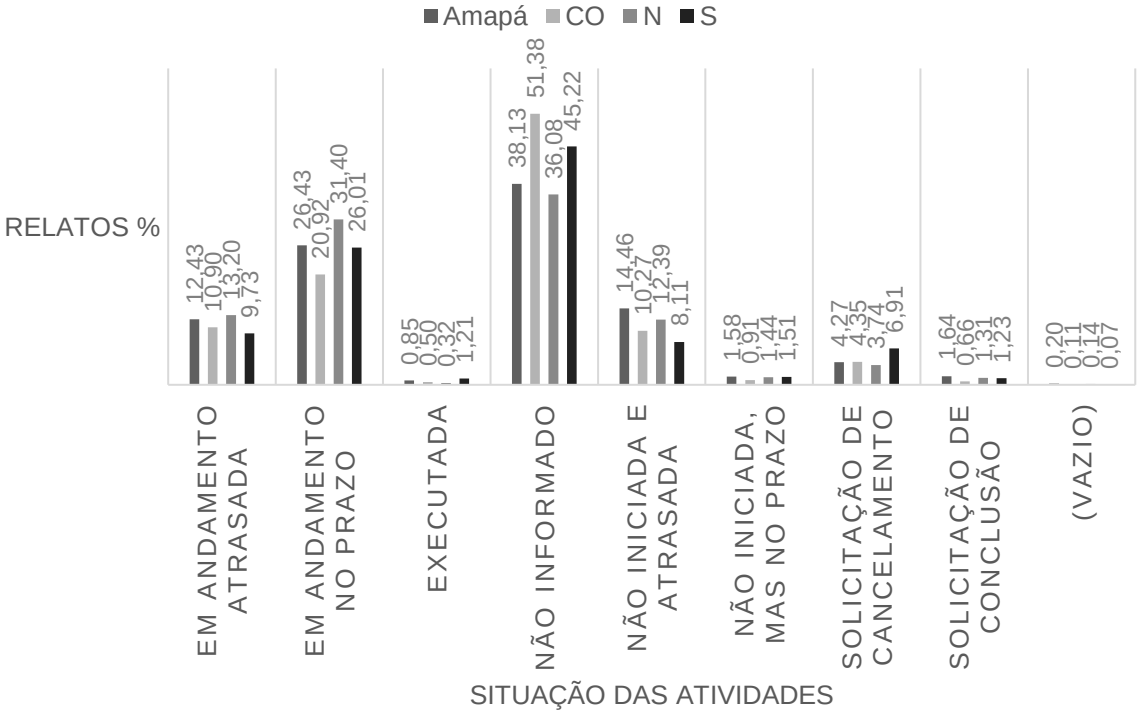


Source: Original survey results

Although the Amapá Unit had a higher percentage of non-delivered results in 2019 and 2020 than the Units analyzed in other regions, it had a lower percentage, that is, better performance than the Unit in the North region, which is also located in the Amazon. The North Unit presented 96.82% in 2019 and 50.94% in 2020 results not delivered more than the Amapá Unit.

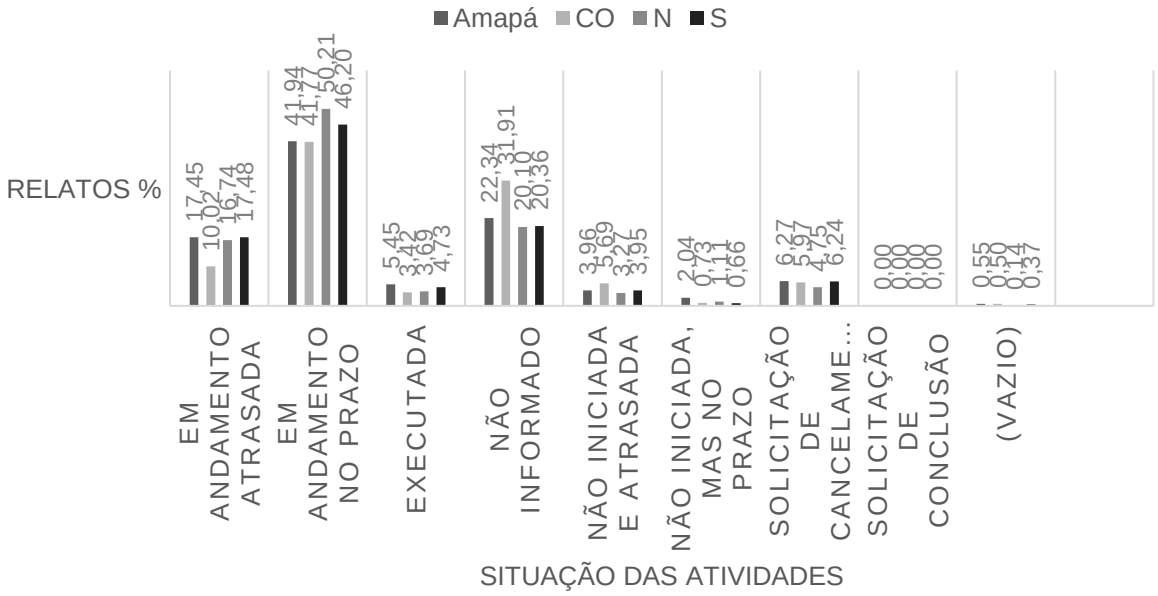
In the comparison of the reports obtained in the reference Unit, Amapá, with the other Units, it was observed that the first presented a number of activities "In Delayed Progress" close to the percentage value presented by the other Units, being respectively in 2018, 2019 and 2020 of 12.43%, 17.45%, 37.60% (Figures 7, 8 and 9).

Figure 7. Status of the activities of the projects in execution reported during the quarterly follow-up, in 2018, in the Units analyzed: Amapá [AP]; Midwest: [CO]; North: [N]; South: [S]



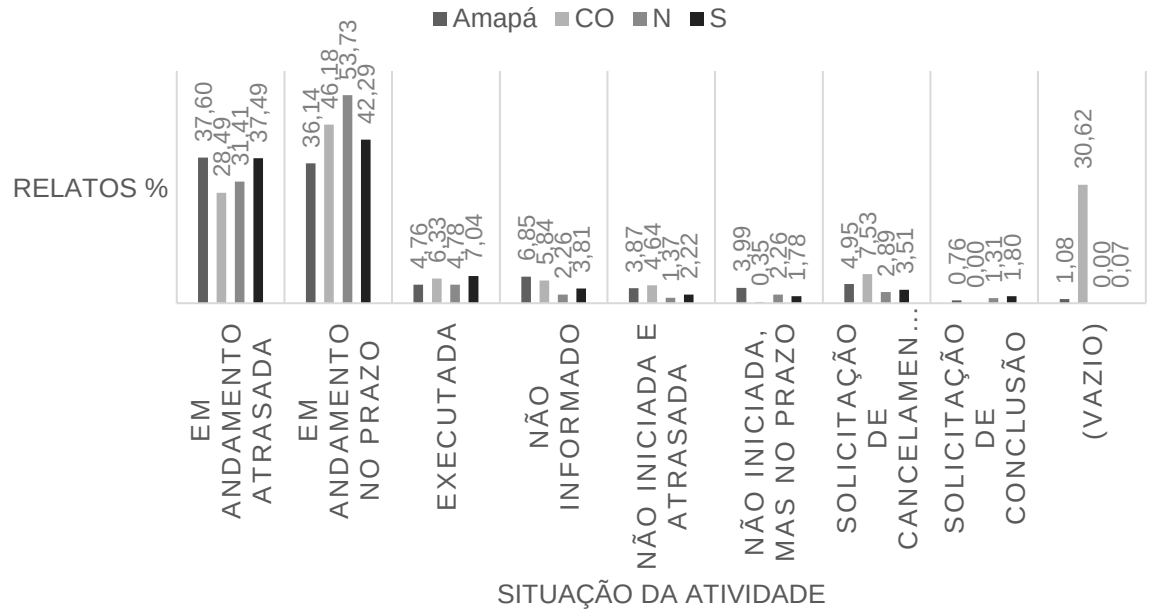
Source: Original survey results

Figure 8. Status of the activities of the projects in execution reported during the quarterly follow-up, in 2019, in the Units analyzed: Amapá [AP]; Midwest: [CO]; North: [N]; South: [S]



Source: Original survey results

Figure 9. Status of the activities of the projects in execution reported during the quarterly follow-up, in 2020, in the Units analyzed: Amapá [AP]; Midwest: [CO]; North: [N]; South: [S]



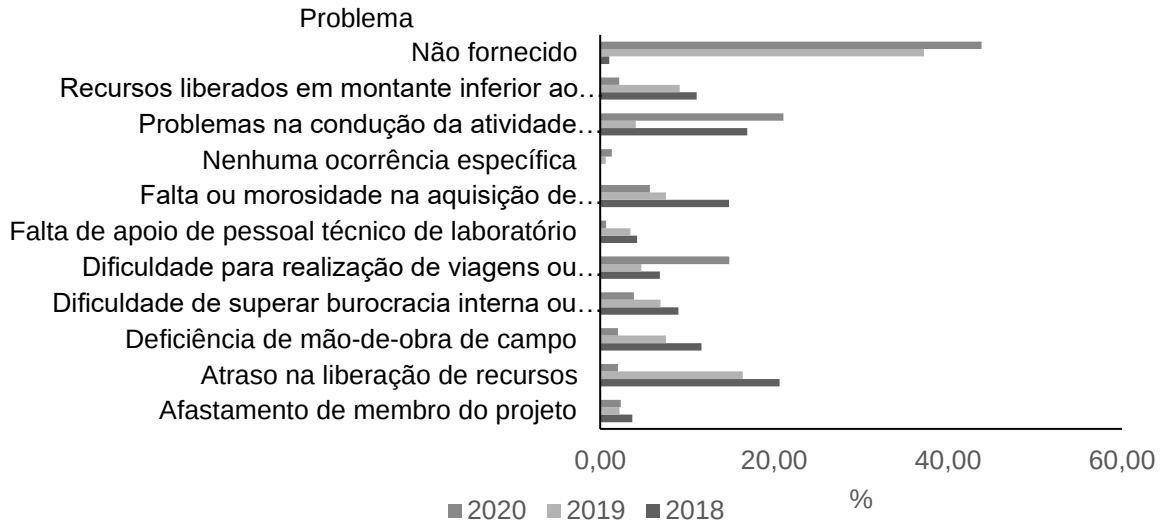
Source: Original survey results

The number of activities reported as delayed increased considerably in 2020 compared to 2019, 115.47%, at the Amapá Unit. This abrupt increase occurred due to the shutdown of several activities due to the COVID-19 pandemic in 2020.

In the Reference Unit, among the "In progress and delayed" activities, it was possible to observe that most of the reports did not report the problem related to the delay. However, among the main types of problems chosen by the reporters are "Delay in the release of resources", which ranked

first and second in reports in 2018 and 2019, respectively; "Problems in the conduct of the activity", "Lack or delay in the acquisition of equipment, materials and inputs" third place in 2018 and fourth in 2019; "Resources released in an amount lower than requested" (Figure 10).

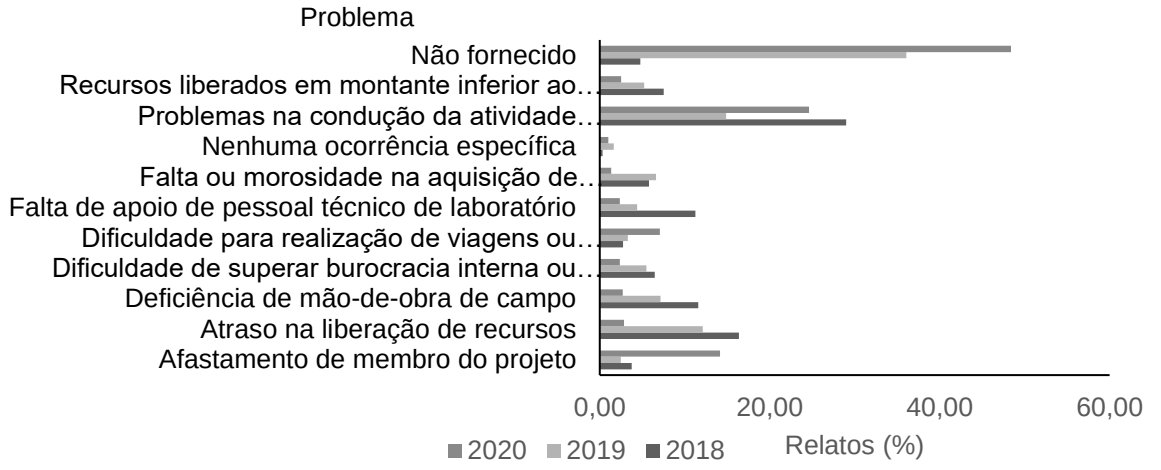
Figure 10. Problems reported for the activities of ongoing projects reported as "Late in progress" at the Amapá Unit, during the years 2018 to 2020



Source: Original survey results

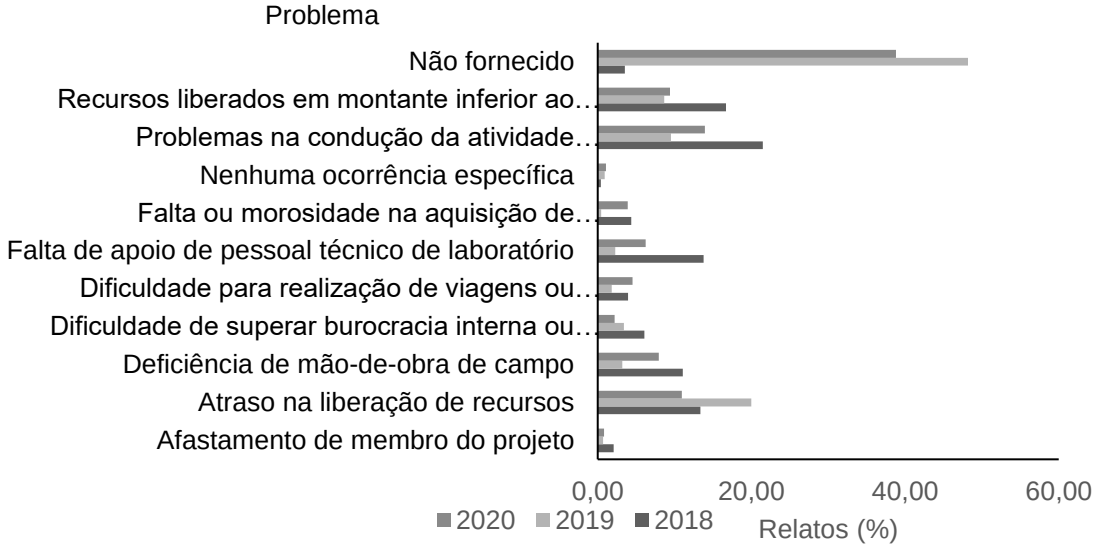
By observing the reports of problems in the other Units studied (Figures 11, 12 and 13), it was possible to verify that among the "In progress and delayed" activities, there was also a predominance of the absence of specific information about the problem that led to the delay. Thus, an improvement for the monitoring of activities would be to make it mandatory to choose one of the problem items, in activities reported as delayed, thus making it mandatory to report the problem and enabling an intervention so that the activity or result is compromised.

Figure 11. Issues reported for ongoing project activities reported as "Ongoing delayed" in the North Unit, during the years 2018 to 2020



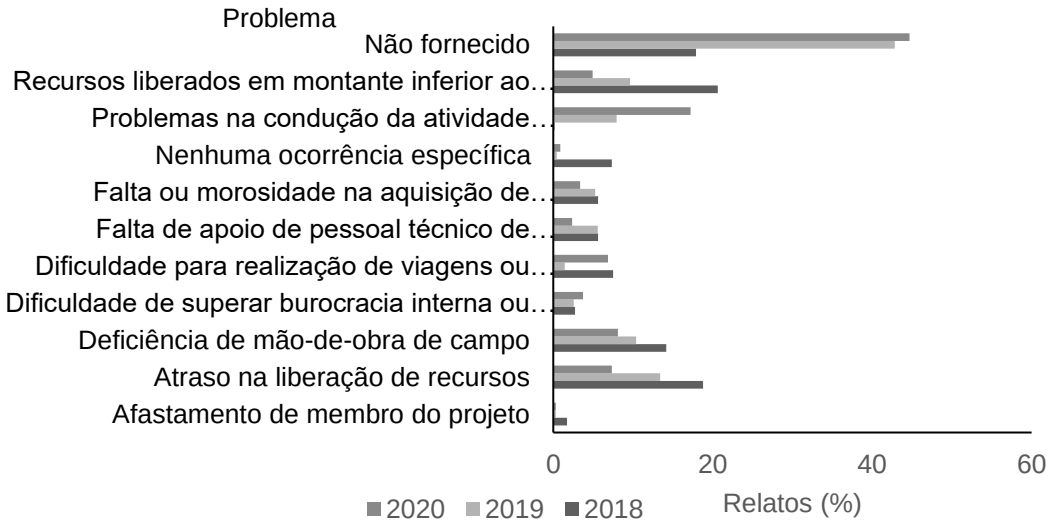
Source: Original survey results

Figure 12. Issues reported for ongoing project activities reported as "Ongoing Delayed" in the Midwest Unit, during the years 2018 to 2020



Source: Original survey results

Figure 13. Issues reported for ongoing project activities reported as "Ongoing delayed" in the South Unit, during the years 2018 to 2020



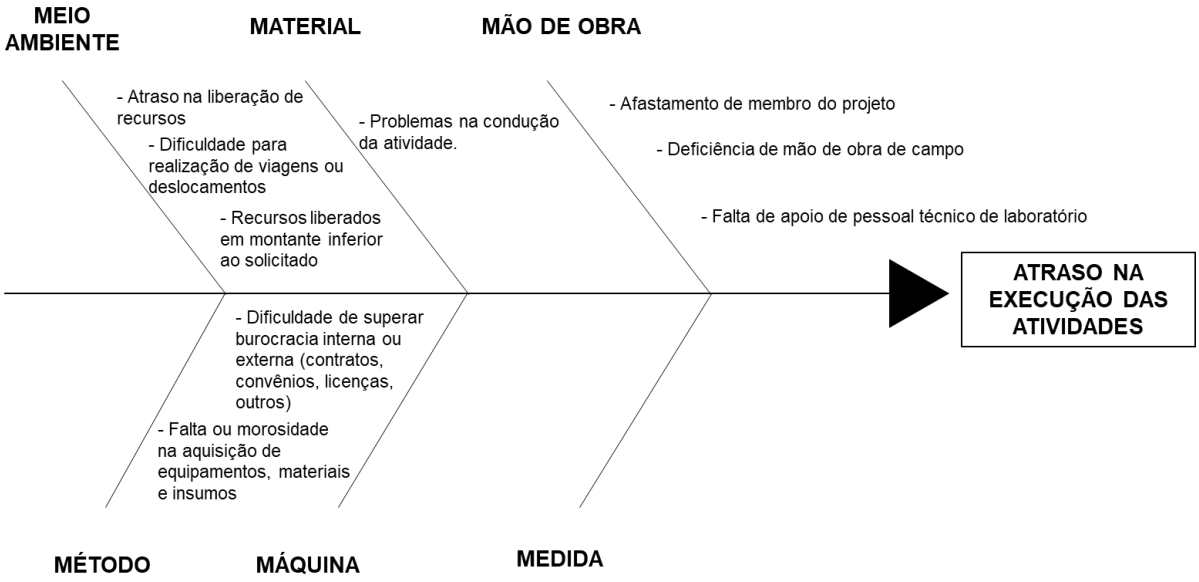
Source: Original survey results

The item "Delay in the release of resources" was one of the most cited items in all the Units studied, ranking second among the items of problems in activities at Embrapa Amapá, during the study period, proving to be an important item for management.

The difficulty in making trips or displacements was an item that was among the four most cited, only in the Amapá Unit, demonstrating that this is a specific problem in this Unit. As well as the difficulty of commuting, "Lack or slowness in the acquisition of equipment" was among the main ones, fourth place during the period studied.

For a better analysis of the problems that led to the delay in projects in the Reference Unit, the reported problems were organized in a Cause and Effect Diagram (Figure 14). It was possible to observe that most of the problems are related to the environment, labor and method.

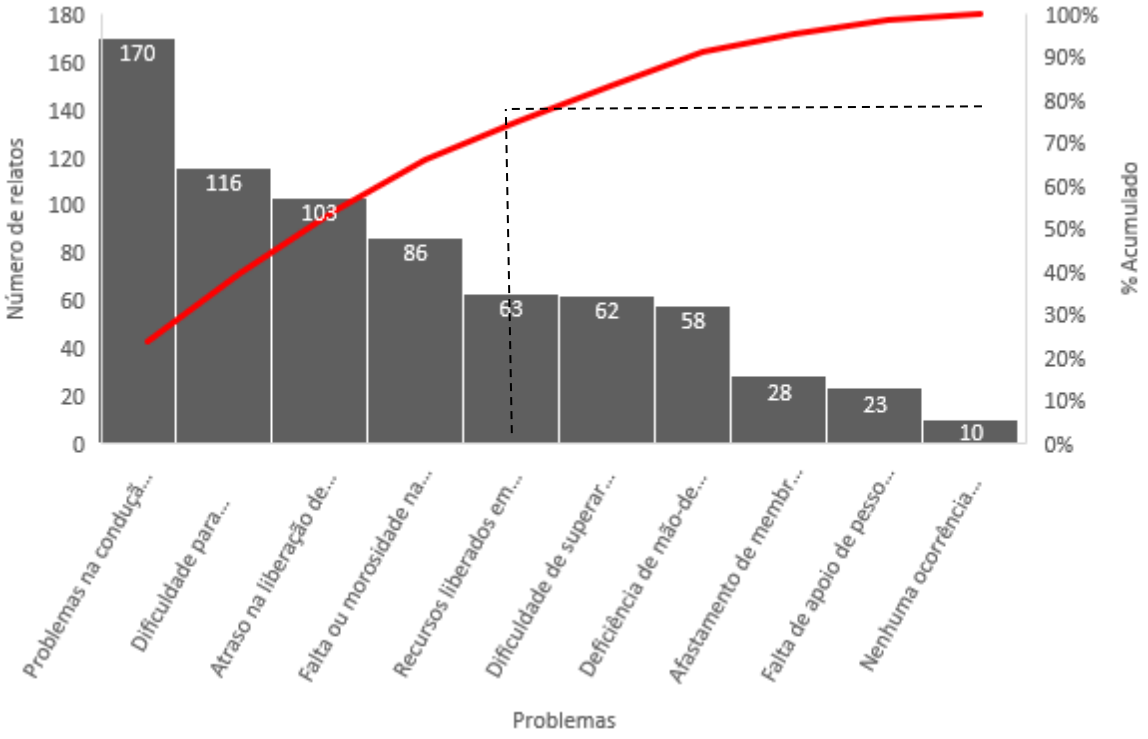
Figure 14. Cause and Effect Diagram of the overdue activities of projects executed by the Amapá Unit in the period from 2018 to 2020



Source: Original research results

Subsequently, the prioritization of the problems was carried out through the elaboration of the Pareto chart (Figure 15), which showed that 80% of the reported problems are related to "Problems in the conduct of the activity", and these reports, for the most part, are related to the lack of materials for the execution of the activities; difficulty in making trips or displacements", due to lack of resources or delay in the release of the resource; "Delay in the release of the resource", due to the delay in the release of financial resources by the financing agent; "Lack or delay in the acquisition of equipment, materials and supplies", related to the absence of essential materials for the execution of activities; "Resources released in an amount lower than requested", due to budget cuts by the financing agent.

Figure 15. Pareto chart of problems related to the delay in project activities executed by the Amapá Unit in the period from 2018 to 2020



Source: Original research results

After prioritization using the Pareto chart and analysis of the qualitative data of the reports, the 5W2H tool was applied as a proposal for an action plan for the reference unit (Table 1).

Table 1. Table 5W2H for the problems prioritized through the Pareto chart, related to the delay in project activities executed by the Amapá Unit in the period from 2018 to 2020

Root Cause	What?	Who?	Why?	Where?	When?	How?	How much?
Problems in the conduct of the activity (specify in the comments)	Improve the acquisition of materials necessary for the execution of research activities	Responsible for procurement activities and sector	Avoid delaying or paralyzing activities due to lack of materials	Research Sector (Project Proposal/ Material Procurement Process)	In the preparation of the project/ request for acquisitions / moment of acquisition of materials	Plan the early acquisition of materials/Seek less bureaucratic and more effective procurement paths	Free of charge
Difficulty traveling or displacement	Set aside material and financial resources for the beginning of the fiscal year.	Responsible for procurement activities and sector	Avoid the paralysis of travel due to lack of financial resources	Research Sector (Project Proposal - Physical-Financial Schedule)	In the elaboration of the project	Plan for the early acquisition of materials needed for travel (e.g. fuel) / diversify sources for project financing and reserve financial resources of greater	Cost of adapting the proposal for submission to other funding agents.

						flexibility for the annual period prior to the release of financial resources	
Delay in the release of resources	Adapt project budget planning to the annual financial release schedule	Activity Leader/ Project Leader	Avoid delaying or paralyzing activities due to lack of financial resources	Research Sector (Project Proposal - Physical-Financial Schedule)	In the elaboration of the project	Plan for the advance procurement of materials for the annual period prior to the release of funds	Free of charge
Lack or delay in the acquisition of equipment, materials and inputs	Develop/use more efficient strategies for the acquisition of equipment, materials, and inputs	Procurement Team	Execution of acquisitions on schedule	Procurement (Procurement Processes)	Prior to the material acquisition period	Use specific legislation for Research, Development & Innovation procurement purposes to simplify processes/ Generate a supplier bank	Cost of team training/Cost of hours worked to generate a supplier database
Funds released in an amount lower than requested	Diversification of resources and preparation of risk plan	Project design team	Prevent the execution of activities from being impaired/unfeasible due to lack of financial resources	Research Sector (Project Proposal - Management Plan)	In the elaboration of the project	Develop risk response plan (risk management)	Cost of adapting the proposal for submission to other funding agents/ Cost of preparing a risk management plan for the project

Source: Original research results

As a proposal for improvement in the execution of projects and delivery of results by the Reference Unit, it is also suggested:

- Increase in the number of reports to monitor project activities, changing the period from quarterly to monthly;
- Implementation of a project office and the training of a project manager, for a more effective monitoring, aiming to reduce the response time to problems that occur;
- Implementation of project risk management, with preparation of risk management plan;
- Implementation of a system for recording and sharing lessons learned;
- Continuous use of the "Plan, do, check and act" [PDCA] cycle to solve the identified problems.

FINAL THOUGHTS

The studied corporate unit presented several points of improvement to be worked on in relation to quality management, with emphasis on the delays in the execution of activities and consequent non-delivery of project results.

The deliveries of project results not carried out by the studied Unit were considerably higher than the deliveries not made by the units located in other regions of the country, although the number of activities reported in arrears was similar. This fact requires the attention of the management of the Company and the Units to verify the causes and solution of this situation.

It was also observed that most of the problems that cause delays in project activities in the reference unit, Amapá, are related to the lack of materials, inputs and equipment in the scheduled period, which is mainly due to delays in the transfer of financial resources and the difficulty in acquiring materials, inputs and equipment. Thus, the action plan suggested the diversification of financing sources, adequacy of the physical-financial schedule, taking into account the financial release period in previous years and the training of teams in risk management and acquisition management.

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