

## **Brazilian case study on Strategic, Quality and People Management applied to SAE Baja and Aero teams**

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### **Abstract**

This paper aims to present Business key concepts contributing to Engineering courses development. Therefore, as multiple case study, Mud Runner BAJA SAE team and Equipe Venturi AERODESIGN SAE projects, at well-known and respected Brazilian Public higher education institution, CEFET/RJ. Teams were facing up to competitions promoted by Society of Automotive Engineers – SAE, and this study was developed during 2015 and 2016. The fieldwork was carried out through participant observation teams over three semesters. Thus, it was intended to show how strategic management, quality management and people management, working as management tripod driver, can influence and add value to these team performance. The collected data and experience may be well used not only in Brazilian scenario but also worldwide.

### **Keywords**

BAJA SAE, AERODESIGN SAE, Case study research, Business and Engineering partnership, Education.

## **1. Introduction**

In a world where institutions collapse due to high competitiveness, in which the management of organizations is carried out by professionals with low qualification, diffuse information and low competence to guide corporations, the importance of management grows significantly. Increasingly, private companies, non-governmental organizations (NGOs) and institutions of all kinds are investing in the assertive management of their resources, their positioning in relation to the market, the environment and society and in meeting the needs of their users. More human management focused on solutions and not on problems is a complex challenge, but strategic management, quality management and people should assume as part of their activities.

The present work, through the case studies developed in the engineering teams of CEFET / RJ, aims to present the contributions of the administrative modernization applied to the engineering teams. As elements of discussion, the project seeks to highlight the importance of continued management for any team or organization; The exposition of basic concepts such as strategic management, quality management and people management; The applicability of management tools for decision making, and the management mechanisms that provide a clearer, objective and systemic view of the teams and their management processes.

The research is limited to the application of strategic management, quality management and people in the Mud Runner BAJA SAE and Venture AERODESIGN SAE Engineering Extensions of CEFET / RJ, from the second half of the year 2015 to the second half of 2016. As for the methodological procedures, the research will be descriptive, as it analyzes the correlation and influence among variables; Will be given through the Case Study method, defended by YIN (1989), because it addresses certain particularities and unique characteristics of a group or community.

The research also assumes documentary character, since for its conception it is necessary to study books, periodicals, the internet, digitized articles and academic sites to mark and support the work done. Regarding the technique of data collection used, the participant observation will be applied, because the researcher-author is closer to the subjects studied, interacting fully with them and focusing on qualitative aspects of their object of study.

This article is composed of the theoretical reference on strategic management, quality management, people management, and respective analysis tools used to enhance culture and encourage members of engineering teams to improve their performance in extensions. This paper also presents the case study carried out with the Mud Runner Team and the Venturi Team: the results of the weekly meetings with the teams regarding the strategic management of each extension, the quality of its processes and the valuation of the people and Organizational culture. Lastly, the feedback from the active members during the entire administrative modernization project between the years 2015 and 2016 is highlighted, thus concluding the multiple case study.

## **2. State of Art**

Successful corporations today are those that respond more quickly to market changes, adapt better to new realities, and seize the opportunities that arise from it. In this environment of strong competitive pressures, companies have been mapping their objectives in the short, medium and long term. They define their strengths, weaknesses, threats, opportunities and delimit their main problems by analyzing solutions to ensure the sustainability and sustainability of their functions and teams over time.

### **2.1 Strategic Management**

Dialoging with Chiavenato and Sapiro (2004), in relation to the strong pressures that the companies have undergone, the organizations are obliged to remain in continuous process of alert, adaptation and adjustment to the changing environmental conditions, if they want to maintain its sustainability and survival .

According to Mintzberg (2007):

Planning is thinking about the future, simply taking the future into consideration. (...) Planning is controlling the future, not just thinking about it, but acting on it. (...) Planning is decision making. (Mintzberg, 2007)

Making plans is to know the context, is to know what you want to achieve and how you want to achieve certain goals, is to calculate risks and is to overcome yourself continuously. According to Ackoff (1974),

Planning is the definition of a desired future and effective means of attaining it. It is an instrument used by the sage, but not only by him. When used by men of inferior ability, this instrument becomes an irrelevant ritual that produces short-term peace of mind, but not the future that is desired. (ACKOFF, 1974)

In this way, planning must be aligned with the purpose of the company and where it wants to arrive at a given time, as well as providing basic information so that team leaders and organizations can work out solutions to the obstacles in the way of organizational growth and development. Decisions made by those who do not understand the importance of planning and based on intuition alone discredit the tool and fragment the value of its application to the organizational purpose.

Porter (1886) argues that firms in the globalized world need to continue to pursue new strategies that provide new sources of advantage. In this context, it is necessary to define the concept of strategy and how it is developed in today's organizations. For Carvalho and Paladini et al. (2006),

Strategies are methods for deploying mechanisms designed to produce specific or general results in any activity, service process, or product of the organization. (...) The strategy involves the use of various tools and tends to produce broader results in the organization. (Carvalho and Paladini et al., 2006)

According to the authors, the strategy is put into practice by planning resources and actions to ensure the survival of the organization over time. Strategy is the chosen path for the organization to arrive at a desired destination; planning is already the way the strategies will be put into practice to achieve the proposed goals for the company.

Thus, the area of people management integrates with strategic planning insofar as it reflects the overall objectives of maintaining the status quo, adapting to environmental changes and future-oriented thinking in organizational culture, designing its systems (selection, admission, Development and training, maintenance, evaluation and reward) and the orientation of managers and operational employees towards the strategic paths traced.

In the following image, adapted from Tachizawa et al. (2006), it is possible to observe the interaction between the areas of quality management and people with the organization's key processes. It should be taken into account that the context where the organization is inserted beacon the strategies that will be traced by the areas of quality and HR to the corporation.

There are countless strategic management tools used by organizations to prepare them to meet environmental challenges, both internal (employees, processes, projects, products, services) and externally (economics, customers, suppliers, government, competitors). With regard to the most common management tools used in the strategic planning of the CEFET / RJ engineering teams, the definitions of Mission, Vision, Values, SWOT Matrix and PESTAL Analysis (Political, Economic, Social, Technological, Environmental).

## **2.2 Quality Management**

Carvalho and Paladini et al. (2006) cite that in dynamic and competitive environments such as current and constantly bombarded information, managers run the risk of losing the long view of their organization. Only when managers combine quality with strategy, that is, do they emphasize continuous learning and improvement in their processes and teams, act strategically on the achievement of organizational objectives, and increase responsiveness to the problems of customers and suppliers, is that organizations gain an advantage Competitive position and increase their consolidation in their markets.

The term quality in ISO 9000 was defined as "the totality of characteristics of an entity that gives it the ability to satisfy implicit and explicit customer needs." Quality according to this approach places customer satisfaction as the focus and primary objective of the company.

Juran (1992) identifies three managerial processes that can be disseminated in organizations to ensure the continuous improvement of their products, services and processes. More than an idea, the Juran Trilogy can be defended as a philosophy, which if adopted by any work group, can generate excellent and valuable fruits for any organization. According to the author, management for quality is done using three managerial steps: Quality Planning; Quality control; And Quality improvement.

In the first step, the planning of what will be carried out by the organization and the draft of the main variables that affect the company is done, in order to start the second step of the trilogy, which is the Quality Control. According to Juran (1992), this step consists in "Evaluating the real performance of quality; Compare actual performance with quality goals; And act on difference. " In the last pillar, the work team should "Establish the necessary infrastructure to ensure annual quality improvement; Identify specific improvement needs - improvement projects ". Only in this way, the institution will generate cohesion of the planned activities with the executed ones will increase the quality in its processes, products and people.

The quality tools used in the CEFET / RJ engineering extensions aimed to direct the teams to meet the requirements of the competition and its stakeholders, through improvements in the products, processes and people

involved in the projects. Among the disseminated in the team are the PDCA Cycle, the Brainstorming, the GUT Matrix and the 5W3H1R, which will be explained in the subsequent case studies.

### **2.3 Human Resources Management**

To make the employees of a corporation know the real meaning of the joint effort to reach the organizational objectives and thus to benefit lies the main transformation is the most relevant role of people management in the 21st century. From the traditional personnel department of the 1950s through the industrial relations division in the 1960s to the recent human resources area, we are witnessing today the significant changes that point to an innovative people management model.

According to Tachizawa et al. (2006), in this era of digital economy, the internet, e-commerce, the relationship between organizations, companies, suppliers and their customers, people's behavior, intellectual capital management, skills management and knowledge management Represent new concepts that have transformed the traditional administration of human resources.

In this way, the people management area is responsible for establishing policies and practices that lead employees to meet organizational goals and objectives. There are numerous tools used by the people management area to aggregate, apply, reward, develop, maintain and monitor the members of the organization, both new entrants and collaborators of more time to contribute to the organization. Among the existing ones, for this article, the 360° evaluation, the Plans of Offenses, Rewards and Punishments and the Group Dynamics are described.

### **3. Methodology**

The administrative modernization project, in partnership with the aerospace engineering extension team, called the Venturi AERODISIGN SAE Team, and the automotive engineering extension team, Mud Runner BAJA SAE Team, began in September 2015 with the contribution of one Industrial Administration undergraduate student and one Mechanical Engineering student, both from Federal Center for Technological Education Celso Suckow da Fonseca (CEFET / RJ, Maracanã Unit), and fellows of scientific initiation of the Council National Scientific and Technological Development (CNPq), an agency of the Ministry of Science, Technology and Innovation (MCTI).

By invitation of one Department of Management Education (DEPEA) professor, supported by Post-Graduate Mechanical Engineering and Materials Technology professor and Graduate Program in Mechanical Engineering emphasis on Solid Mechanics of Elastic and Plastic Bodies, from CEFET / RJ, a partnership was established amongst the above mentioned students and the professors appointed to promote the project described in this final report. The objective of the project is to reassess and reformulate the management and management processes of the Venturi Team and the Mud Runner Team in order to enable the teams to achieve better results in the competition of AERODESIGN and BAJA SAE, promoted annually by the Society of Engineers Of Mobility (SAE BRASIL).

The methodological procedure defined for this work was the Case Study method (YIN, 1989), since the research is motivated to analyze certain particularities and unique characteristics of a group or community. For the author, the case study is an empirical inquiry about a contemporary phenomenon (e.g., the "case"), set within its real-world context - especially when the boundaries between phenomenon and context are not clearly evident. (YIN, 1989).

Thus, the case study was defined in three parts. In phase A there were: the selection of the cases that would be analyzed, as well as the management tools used, the chosen data collection technique and the search of the theoretical references used to support the research. In phase B, we conducted: the conduction of the case study, with the production of material by the engineering teams, culminating in the case report. In phase C, we succeeded: the exposure of the results achieved with the research and conclusion of the project carried out.

In this way, the project was carried out through face-to-face meetings, through the participant observation method, where the researcher interacts fully with the subjects, without distinction between subject-researcher (Bandeira, 2014). The meetings took place between the strategic team of the team, composed of engineering students (Venturi and Baja Team) and scientific project students.

In relation to the face-to-face meetings, the project leaders provided the participants with some basic information about the meeting, in order to clarify possible doubts about this means of interaction between the fellows and the members of the Venturi Team. They were highlighted at the first moment of the meeting:

1. The purpose of the meeting: what is the purpose of the meeting and what is the purpose of the weekly meetings, stimulating in the members the understanding of why the students were present;

2. The objectives that would be reached at the end of the meeting: what expectations were to be met and what decisions would be taken by the end of the meeting;
3. The objects of discussion: what would be the topics addressed and what problems were raised at the meeting;
4. The meeting time: the expected duration of the meeting was provided, in order to enable the organization of the members with their other external activities;
5. The interactive dynamics developed: at each end of the meeting, the whole group realized a dynamic, mediated by one of the project leaders, where a value and / or behavior would be seen in practice and the team would have the possibility to bring to consciousness that Practice and stimulate it in extension (such as group work, leadership, need for task delegation and communication).

Revealed these topics for the establishment of the meeting, was discussed between the project leaders and the team members who lead this case study, which productions from the weekly discussions, in order to keep the data and information in full for possible queries Future, would be recorded using photos, videos and / or audio recordings, made using smartphone applications. All the audiovisual material resulting from these meetings was authorized by the team representatives and project leaders as a research and model source for future projects that use it as a study tool.

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## **4. Results**

The results of the tripartite administrative modernization project - strategic management, quality management and people management - are described in the Mud Runner BAJA SAE engineering teams and the AERODESIGN SAE Venturi Team.



Figure 1. Interaction among team members to create Strategic Planning

For organizational purposes, the case studies are separated into two subtopics, since the results achieved by each extension were different from each other, even though the methodology followed the same standardization in both teams.

### **4.1 Venturi Team case study**

The first meeting with the student representatives of the Venturi Team was held on October 9, 2015, where the on-site project was started, with only the students present in the project present. At this meeting, the current problems that the group was suffering and which reduced the productivity, efficiency and effectiveness of team management were discussed. In order to contextualize the work that would be carried out, the PDCA (P - Plan; D - Do; C - Check, A - Act) management tool, also called the Deming cycle, Work, since it provided a broad vision to the team about resource management, activity planning, results checking and feedback between expectations and realities achieved by plans implemented in practice.

In the brainstorming model adopted by the meeting members, all the obstacles faced by the team were evidenced by the members, without judgments or value judgments, in order to bring to the discussion as many problems as possible. Once this was done, the problems were evaluated and grouped into larger topics, from the

inefficient control of deadlines by area leaderships to the disorganized layout of the workshop where the airport model is built, and from the computer lab.

From these topics, the problem assessment tool, called the GUT Matrix (Severity, Urgency and Trend) was used. In this matrix, the highlighted problems were related to a score of 1 to 5 for each criterion, the intensity being decreasing (5 = high intensity for the highlighted criterion and 1 = low intensity for the criterion). Thus, a problem that reached 5 in Severity for the team, 5 in the Urgency of solving that problem by the group and 5 in the tendency to worsen with the passage of time, having these 3 notes multiplied among themselves (5 times 5 times 5, Totaling 125 points), would be a problem that deserves more attention to be solved.

Next, the problems ranked with the help of the GUT Matrix were arranged on the whiteboard in Cartesian axes and a new stage of work began. The activity was based on highlighting possible solutions that could be developed by the team to heal or reduce the incidence of problems. The brainstorming technique was used again without judgments to propose obvious and / or creative solutions that directly attack the obstacles faced.

After this, the ideas were judged by the team according to the pros and cons of implementing each one according to the reality of the organization in which the members lived. The problems were written in vertical order and the respective solutions found in the discussion were arranged in horizontal order.

Subsequently, each of the possible solutions cited in the previous brainstorming were analyzed in detail and some ideas were eliminated and others were grouped together, in order to create more action plans consistent with the current reality of extension, as well as brainstorming problems.

After these observations and evaluations, 24 solutions to the team's problems were discovered. In a meeting, the project group noted that solutions could be deployed in action sheets, that is, a planning containing information on how to put the solution, evidenced in the discussion, in practice, defining the responsible parties, expected results and deadlines. Among some of the existing management tools, the 5W2H tool was chosen, since it allows the use of the tool, A more detailed view of the variables that must be controlled so that an action could be performed on the team.

From this discussion, a 5W2H analysis of some more complex action plans was carried out, in order to build together a checklist of variables that should be met to enable the execution of solutions built in a group, that is, the steps, Justification, local, weather forecast, responsibility, methods and investment would be needed to put the action into practice.

An interesting result from face-to-face meetings and group discussions was the improvements in the tools that the interaction between the project actors provided. The 5W2H tool was empowered by the team with the entry of 2 new variables in creating action plans for the solutions found for the problems: o How Many - How much resources would be needed (equipment, tools, people); And the Risks - post-implementation risks of ideas. Thus, the other plans of action realized in meeting followed this improvement proposed by the members of the team.

Following the creation of action plans for complex solutions using the leveraged tool 5W3H1R, in a meeting, a solution that would extinguish and alleviate many of the problems of management, communication and team integration would be the creation of the first Annual Strategic Planning (PE) of the Venturi Team.

This plan of action, materialized at the beginning of the first semester of 2016, generated results that can be analyzed in the weekly meetings in person, since the discussions held in the two days of immersion crossed the border of the immersive meeting and promoted the stoning and creation in the meetings Weekly, Mission, Vision, Values, SWOT analysis of the extension, nonexistent until then in the Venturi Team.

It is necessary to point out that in order to arrive at this final model, partial prototypes were made in the weekly meetings that took into account the various missions, visions, values and SWOTs produced by the members that were involved in the participatory Strategic Planning.

They were separated by the captain, Nathalia Paiva, groups of three to four people whose topic of discussion would be the creation of a mission, a vision, values and a SWOT analysis, that represented the team and determined a strategic direction for the extension. On the two-day meeting, they were held outside of the students' workroom so that, in a different environment than usual, they could think about team strategy creatively and dynamically.

After the EP, there were meetings of analysis of the inputs produced in the immersion and feedback from the project leaders, Emanuel Brito and Renato Maliska, on the integration that took place between the members of the Venturi Team and the reflection that generated in the students On the importance of delimiting strategies for the extension and a concrete vision of the future of the aerospace project. It was defined in a meeting that such immersion would happen every beginning of the year as a way to promote union among the members and the new reflection on the perennial or necessity of change in the strategies, purposes and values of the student organization.

Following the project of modernization in the management of the Venturi Team, the essence of the project explained in this case study, it was observed the need to, in addition to renewing the strategic and quality front of the team, focus on the People Management (GP) area. It was found that even with better defined processes among the

members and with a strategy defined and internalized by the team, communication problems between the members still occurred, together with low integration between the new and older collaborators of the extension and weak evaluation processes and Of the team members.

The modernization work on the pillar began with a meeting with the GP team, then responsible for the area, to assess what interactions existed between existing systems in people management and the six pillars of people management (add, apply, Reward, develop, maintain and monitor) of Chiavenato (2006).

In this way, it was possible to understand which systems were present and already developed by the team and which new ones could be created and applied. It was possible to clarify some concepts of people management, such as what is performance evaluation, differences between motivation and incentives and factors of creation of competences, and to gather possible ideas to be implanted in the team as a way to help students to develop as Professionals and people together to the project.

Subsequent to this discussion, the weekly meetings identified the need to design a System of Infractions, Rewards and Punishments in the team, with the purpose of punishing those members who did not fulfill their responsibilities with the project and benefit those who performed their tasks In order to achieve the strategy of the Venturi Team. Using again the brainstorming technique and then filtering out the best ideas to be applied, a qualitative and quantitative system was chosen that would make the interaction of punishments with infractions committed by the members.

Thus, the infractions that a member could commit in the team were defined, the possible punishments for the infractions committed and a scoring scale that related the infractions with the respective punishments. Those who committed less and / or no infraction would be rewarded with benefits proposed by the team at the meeting.

A valuable contribution to this case study is that it was possible to untangle one of the Team's Strategic Planning outputs, which were the values created for the extension (P & C - Passion and Commitment, Synergy and Professionalism) in the 360° Evaluation tool. That is, the criteria (Passion, Availability, Proactivity, Communication, Punctuality and Productivity) that would be scored from 1 to 5 for each of the members evaluated in the 360° were behaviors coming directly from the values (P & C - Passion and Commitment, Synergy and Professionalism) Created in the immersion of the team's strategic planning.

In this way, the values gained tangibility as they were incorporated as a quantitative and qualitative evaluation tool in the 360 ° extension evaluation. Thus, the products of the Strategic Planning were used as inputs in the formation of the organizational culture of the team, combining the pillar of strategic management with the management of people on the tripod of the administrative modernization carried out with the team.

#### **4.2 Mud Runner Team case study**

The first meeting with the Mud Runner Team representatives was held on October 9, 2015, where the on-site project was initiated, with only the students involved in the project being present. At the meeting, in addition to raising the awareness of fellows about the purpose and objectives of the project of administrative modernization in alliance with the extension of motorsport, the current problems that the group was suffering and that diminished the productivity, efficiency and effectiveness of the management of the team.

In the brainstorming model adopted by members at this initial meeting, all the obstacles faced by the team were evidenced by those present, without judgments or value judgments, in order to bring to the discussion as many problems as possible. Once this has been done, the problems have been evaluated and grouped into larger ones, from the accumulation of functions by strategic members of the extension, to the inefficient marketing of the selection process carried out by the team, usually in the early part of the semesters of the college. From these topics, the tool was used to evaluate problems, Matrix GUT (Severity, Urgency and Trend), an analysis tool also used in the Venturi Team project.

In the meetings that followed, the problems ranked with the help of the GUT Matrix were placed on the whiteboard in Cartesian axes and a new stage of work began. The activity was based on highlighting possible solutions that could be developed by the team to heal or reduce the incidence of problems. The brainstorming technique was used again without judgments to propose obvious and / or creative solutions that directly attack the obstacles faced.

Afterwards, the ideas were analyzed by the team according to the pros and cons of implementing each one according to the reality of the organization in which the members lived. The problems were written in vertical order and the respective solutions found in the discussion were arranged in horizontal order.

As with the Venturi Team in a meeting, the project group noted that the analyzed and more complex solutions being deployed could be deployed in action plans. Among the tools available to plan the execution of the mentioned plans of action, the 5W3H1R tool was chosen, since it allows a more detailed view of the variables that must be

controlled so that the plans can be carried out by the team. Following the creation of action plans for complex solutions, a solution that would extinguish and mitigate the problems of management, communication and integration of the team would be the creation of the first annual Strategic Planning (PE) Mud Runner, idea recorded in the photo below.

This plan of action, planned at the end of the year 2015 and materialized at the beginning of the first semester of 2016, generated results that can be analyzed in the weekly meetings in person, since the discussions held during the two days of immersion crossed the border of the immersive meeting and Promoted the stoning and creation in the weekly meetings of Mission, Vision, Values, SWOT and PESTAL analysis of the extension, nonexistent until then in the Mud Runner Team.

Unlike the Strategic Planning developed by the aerospace team, the aeromodelling team decided to add to the immersion the development of the PESTAL tool (variables P - Policies, E - Economic, S - Social, T - Technological, A - Environmental, and L - Legal) Which allows the analysis of environmental variables external to the organization, which can positively or negatively impact it.

Having the answers to these variables, built into strategic planning, the team can establish contingent plans to avoid negative influences and action plans to stimulate the positive variables that affect the extension, both at the project level and at the management level. These variables are subject to further analysis with each annual immersion carried out by the team to discuss the strategic directions of the organization.

In terms of strategic planning results, a SWOT analysis of the team and the creation of Mission, Vision and Values were also carried out for the extension, the first in 18 years of existence of the Mud Runner BAJA SAE team of CEFET-RJ.

As in the Venturi Team, the project of administrative modernization turned to the creation of management models that eliminated the problems of communication, integration and punishment of the members and that favored the evaluations, monitoring of activities and rewards of the students that stood out In the extension.

In this way, the Infractions, Rewards and Punishments Systems (SIRP) and the 360° Monthly Assessments were produced in the areas and subsystems of the team. Using again the brainstorming technique and then filtering out the best ideas to be applied, a qualitative and quantitative system was chosen that would make the interaction of punishments with infractions committed by the members. Thus, the infractions that a member could commit in the team were defined, the possible punishments for the infractions committed and a scoring scale that related the infractions with the respective punishments. Those who committed less and / or no infraction would be rewarded with benefits proposed by the team at the meeting.

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A valuable contribution to this case study is that it was possible to unravel one of the team's Strategic Planning outputs, which were the values created for the extension (Low, Innovative Spirit and Legacy) in the 360° Evaluation tool. That is, the criteria (Passion, Availability, Collaboration, Proactivity, Organization, Productivity and Punctuality) that would be scored from 1 to 5 for each of the members evaluated in the 360° were behaviors derived directly from the values (Bajiotism, Innovative Spirit and Legacy) In the immersion of the team's strategic planning.

In parallel to the discussion meetings of the pillar people on the Mud Runner Team, the project leaders held periodic weekly meetings with extension quality leader Gabriella Machado in order to fortify and create clear work streams for the newly- Created area in the organization. Thus, as in the scheme of weekly meetings with the strategic team, brainstorming discussions were held with the leader and problems in the area were healed.

At the first meeting, quality concepts, commitment to the project and team processes were defined, as well as the forms of supervision that the leader and his / her members could carry out to keep the project in compliance with the competition standards, Such as the creation of procedures, updating of the team organization chart, development of extension process monitoring indicators.

In the following meetings with the leader of the area, the work that should be carried out was defined so that the management of the quality of the team maintained the efficiency (linked to the resources) and effectiveness (related to the fulfillment of the objectives) of the other subsystems subordinated to the area in question. Thus, as the first



pendency delivered by the leader and his team responsible, were the indicators of monitoring and monitoring members and their activities.

A spreadsheet was produced in the Microsoft Excel tool with relevant information regarding each of the monitoring and evaluation management tools, called "Indicator Identities". Following the creation of the indicators for monitoring the processes of the team by the area of quality, in meeting, identified the need for procedures to be created in order to manage the team's knowledge in the manufacture, assembly and maintenance of its automotive model and standardize The activities and methods of work of the areas that perform them within the team.

Applying to the quality area more management tools for the administrative modernization of the team, it was observed that the organization of the Mud Runner did not reflect the reality of the extension: the flow of power between the members was distorted; Some extension posts were not covered; Areas were not included in the organizational design. Starting from the recognition of this problem and after some meetings with the team using the brainstorming tool, also used in the previous stages of this work, a new structure was elaborated that represented the organizational reality of the extension.

## **5. Final Considerations**

The purpose of the project described in this paper was to demonstrate to CEFET / RJ students, as well as to other sectors of society, that it is possible to combine management efforts and knowledge with engineering projects in order to create strategic and competitive teams. Evidence of the interconnection between the leading students of the project, Emanuel Brito and Renato Maliska, aimed at optimizing team management, and the student body responsible for the aerospace and automobile extensions of the institution, through weekly face-to-face meetings and discussion meetings was the Chosen to represent the initiative.

Regarding the strategy, both the Mud Runner BAJA SAE Team and the Venturi AERODESIGN SAE Team continue to do annual immersions to discuss the Strategic Planning (PE) of the extension. The mission of the project, as well as the vision to be achieved at the end of the year and the values that sustain the team's culture are reviewed and updated at these annual meetings, thus ensuring integration among the members and strengthening the identities of the groups, which Are stronger, collaborative and synergistic.

Both the Mission and Vision of the teams and the Values that were projected at the strategic level of the extensions are also disrupted at the tactical and operational levels of the projects. As for example, the values of the teams can be seen, which gave light to the criteria used to evaluate the performance of the employees in the 360 ° evaluation.

Also in relation to the strategic pillar, both teams value the sense of purpose in their activities, from the strategic level to the operational level. The golden circle, a tool widely discussed in face-to-face meetings, currently has its philosophy inserted from internal presentations of areas, subsystems, strategic and general meetings and even classroom presentations for the recruitment of new members.

Regarding quality, the Mud Runner Team has created an area in the extension responsible for the quality of the extension as a whole. Nowadays, this area is divided into People, Processes and Projects and it has been taking care of accompanying the members in their passage through the team, to perfecting the processes and controlling the indicators of the areas and subsystem. In the Venturi Team, the Management area was created, divided into Marketing and People, showing the concern to ensure the project's approach with external stakeholders (contact with partners) and internal (care and attention to employees) of the team.

On this pillar, the management tools were developed and today are ubiquitous in the discussions and meetings of the teams. Brainstorming techniques, the PDCA cycle, and 5W3H1R analysis are often used by employees to increase the number of proposed solutions to problems, reduce the uncertainty of their action plans, and make assertive decisions about project continuity.

Regarding people management, performance evaluation through the 360° Assessment and the Handbook of Offenses, Rewards and Punishments, have now increased the promotion of feedback among team members and discouraged belligerent behaviors to day-to-day organizational. Through these tools, communication between members is now more assertive, more objective, and less noisy. The members understand that they should act by example in their routine activities in teams: that transparency, ethics, commitment to the project, leadership, punctuality and organization in the deliveries are of paramount importance for the good individual performance and consequently of the team as a whole.

At the end of the pillar, one more gain for the extensions was the incorporation to the teams of members of Administration and Foreign Languages Applied to the International Negotiations (LEANI), that formerly only

possessed Engineering students. In this way, the projects have expanded the intellectual capital of its staff and have gained new and versatile skills, essential for extension to respond to the demands of the environment, survive and develop over time.

Regarding the national competition held by SAE, the Mud Runner team in 2017 is the best BAJA team in the State of Rio de Janeiro and is in the top 15 in management in the National competition today, leaving the 40th position in 2015 and increasing 25 positions in management. In relation to the national competition of SAE for AERODESIGN, there is no individualized note for the annual improvement of the management in aeromodelling teams. Thus, even the final report of the project having topics on the evolution of the management performed in the team, it is not possible to establish a correlation between the note of the report and the development of the management of the air project.

It is possible to conclude that the project aimed to present, through the Case Studies of the Venturi AERODESIGN SAE aerospace team and the Mud Runner BAJA SAE motorsport team, CEFET / RJ engineering extensions, the contributions of strategic management, quality and applied personnel To engineering teams, in addition to exposing the applicability of management tools for decision making, which, when practiced, provide a clearer, more objective and systemic view of the extensions and their processes. It is recommended, for future studies, that the administrative modernization project be continued through new team monitoring and development work, in order to continue generating process optimizations and improvements in the management of the CEFET / RJ engineering extensions.

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## **References**

- Ackoff, R. L. *Planejamento Empresarial. Livros Técnicos e Científicos* Editora. Rio de Janeiro, 1974.
- Carvalho, M. M.; Paladini, E. P. et al. *Gestão da Qualidade: Teorias e Casos*. Editora Campus. 12ª edição. Rio de Janeiro, 2006.
- Chiavenato, I. *Recursos humanos: o capital humano das organizações*. Editora Atlas. 8ª edição. Rio de Janeiro, 2006.
- Chiavenato, I.; Sapiro, A. *Planejamento Estratégico: Fundamentos e Aplicações*. Elsevier Editora Ltda. 13ª edição. Brooklin -SP, 2004.
- Juran, J. M. A. *Qualidade Desde o Projeto: Os Novos Passos para o Planejamento da Qualidade em Produtos e Serviços*. Editora Cengage Learning. São Paulo, 1992.
- Lobo, R. N. *Gestão da Qualidade*. Editora Erica Ltda. 1ª edição. São Paulo, 2014.
- Mintzberg, H. *Ascensão e Queda do Planejamento Estratégico*. Bookman Editora. Porto Alegre-RS, 2007.
- Porter, M. E. *Estratégia competitiva: técnicas para análise de indústrias e da concorrência*. Editora Campus. 7ª edição. Rio de Janeiro, 1986.
- Tachizawa, T.; Ferreira, V. C. P.; Fortuna, A. A. M. *Gestão com pessoas: Uma abordagem aplicada às estratégias de negócios*. FGV Editora. 5ª edição. Rio de Janeiro, 2006.
- Yin, R. K. *Case Study Research - Design and Methods*. Sage Publications Inc., USA, 1986.

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