CLASSIFICATION OF PORTFOLIO AND PROJECT MANAGERS: A PERFORMANCE ORIENTATION

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Abstract: The purpose of this paper is to define the performance-oriented rating criteria for the portfolio and project managers. Therefore, through an action research, this article was based on the analysis of the projects in relation to their requirements uncertainty and technical knowledge uncertainty and also of the life cycle of each project, associated with an evaluation of the technical and behavioral competencies of the project team, here called soft skills and hard skills. The work was carried out from July to September 2018 in an agro-industrial cooperative in southern Brazil. Among the main results, we highlight the implementation of criteria to guide appropriate ways of project management according to their respective characteristics and selection of managers for each specific project; this was possible through a structured view of the project portfolio of the company. As a contribution to this study, we provide an overview of the most appropriate management approaches for each project and structure team competency criteria, so that the project office supervisor can direct team capacity building efforts to more specific competency knowledge allowing Information Technology sector to prioritize value from project deliverables. At the end of the paper, we also propose a structural model for future studies.

1. INTRODUCTION

Project success is a vital component of business success, as projects are structured ways of implementing strategic change (Martinsuo & Hoverfält, 2018). The success of the strategic implementation, in turn, is characterized by the strategic adjustment of the project portfolio and its proper management (Meskendahl, 2010). And project portfolio success, defined as a second-order construct, has five dimensions: strategic implementation success, future preparation, portfolio balance, use of synergies, and average product success (Kopmann, Kock, Killen, & Gemunden, 2015).

Project portfolio management presents a complex set of challenges for decision-makers as multiple projects must be configured and managed to enhance long-term strategic value (Martinsuo & Killen, 2014). In this respect, the fundamental premise of contingency theory is that organizational effectiveness results from the adaptation of organizational characteristics, such as its structure (Donaldson, 2001). From the perspective of contingency theory, for example, it is possible to better plan the project manager and carry out projects of different complexities or conditions according to the situation compared to the "one size fits all" approach (Zhu & Mostafavi, 2017).

However, the overemphasis on the approach focused on compliance with indicators at the expense of project characteristics (PMI, 2018), as a side effect, the improper use of technical and human components makes management difficult and reduces the chances of project success (Awan, Ahmed, & Zulqarnain, 2015). To reduce this effect, it is essential that appropriate tools, techniques and concepts are applied according to the characteristics of each project, as well as other aspects related to the human factor such as the adequacy of their skills to the projects (Martinsuo & Hoverfält, 2018; Millhollan & Kaarst-Brown, 2016).

This article, therefore, aimed to define a portfolio classification criteria and performance-oriented project manager classification criteria. The study was conducted in a cooperative located in southern Brazil and annually invests approximately R$ 2.5 million in Information Technology (IT) projects. The opportunity to intervene is given that the entire portfolio of projects under study is conditioned to the same form of management, predictive approach, even though they are projects with different characteristics and need their own approaches for each situation.

The context presented in this cooperative brought an opportunity for the promotion of applied research, which was followed by the action research strategy (Thiollent, 2009). Therefore, by applying this strategy, this study set out to (1) structure project management approaches according to their life cycle, (2) structure the project environment with regard to requirements uncertainty and technical uncertainty of the team, and (3) evaluate the technical and behavioral skills of the project management team.

At the end of our study, we suggest that project portfolio classification based on life cycle criteria, uncertainty and complexity, as well as an alignment of these projects with the technical and behavioral characteristics of the project manager team can lead to a performance-oriented view that outweighs the concern to use approaches that are not compatible with the real needs of projects. Based on the evidence from our study, we propose a structural relationship model with three propositions to be quantitatively tested as a way to confirm the results discussed in this study.

This article is structured as follows: in addition to this introduction section, we follow a theoretical framework presented in section 2, then we present the methodological procedures applied in the research described in section 3, the results and discussions are presented in section 4 and in section 5 we present the conclusion of our study.

2. THEORETICAL BACKGROUND

Project portfolio management has a conceptual influence from the financial market. Markowitz (1952), in his classic work presents arguments for maximizing return on investment by selecting projects to bring better results taking into account the risks involved. The work of Markowitz influenced the concept of portfolio balancing later presented by Meskendahl (2010), which suggests that the goal of project portfolio management should be directed to maximizing the contribution of projects to the success of the corporate strategy of the organization.

For Archer and Ghasemzadeh (1999), the project portfolio is defined as a group of projects of an organization that competes for the same resources, and its balance in different dimensions is necessary to optimize the value obtained by the result of projects for the organization. Due to the dynamic nature of portfolio management, focus should be placed on systematic assessments that will increase portfolio value (Rad & Levin, 2006; Petit & Hobbs, 2010). For Müller, Martinsuo and Blomquist (2008), different portfolio control mechanisms are associated with different performance measures.

Therefore, understanding portfolio-level issues need to be considered as part of the capabilities of project managers, not just a concern of top management (Martinsuo & Lehtonen, 2007). Projects that make up a portfolio must be conducted efficiently, while project portfolio management should focus on effectiveness, that is, on the execution of projects that bring the greatest return to the organization, considering the risks involved (Teller, Unger, Kock, & Gemünden, 2012). Also relevant to portfolio success are the skills of the team involved in the project management process (Millhollan & Kaarst-Brown, 2016; Martinsuo & Hoverfält, 2018). According to Rabechini Jr. and Pessoa (2005), project team competencies are strongly related to the ability to solve complex problems in the multidisciplinary context of project management.

Chen et al. (2019) points out that due to the high complexity and flexibility of business activities, project management skills are becoming increasingly important assets. Awan et al. (2015) says leadership skills make a difference in achieving project management goals. Zaman, Jabbar, Nawaz and Abbas (2019), in turn, showed that to companies improve project performance, it is essential that team members have adequate behavioral skills to conduct their activities.

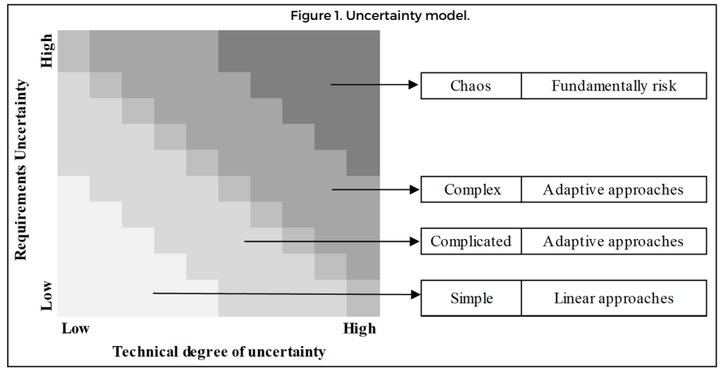
Problems with different characteristics related to different types of projects require different approaches and skills (Thiry, 2004). Taking this into consideration, Project Management Institute (PMI, 2017b) presents project classifications according to their different life cycle characteristics and can range from predictive, iterative, incremental or agile depending on the combination of scope change and delivery frequency (**Table 1**).

In addition to the life cycle that takes into account the amount of scope changes and the frequency of deliveries, projects have uncertainties regarding their requirements, as well as uncertainties regarding technical knowledge of the technologies required to perform certain activities (PMI, 2017a). The variation of requirements and technical uncertainty is represented by **Figure 1**. Among the complexity categories there is a variation between three

Table 1. Project Life Cycle.

Cycle	Description	Change	Delivery
Predictive	Project scope, term and cost are determined in the early stages of the life cycle. Any changes to scope are carefully managed. They are also known as cascading life cycles.	Low	Unique
Iterative	Project scope is usually determined at the beginning of the project life cycle, but time and cost estimates are typically changed as the project team understands the product better. Iterations develop the product through a series of repeated cycles, while increments successively add to product functionality.	High	Unique
Incremental	Delivery is produced through a series of iterations that successively add functionality within a predetermined time frame. The delivery contains the necessary and sufficient capacity to be considered complete only after the final iteration.	Low	Small and frequent
Agile	The detailed scope is defined and approved before an iteration begins. They are also known as adaptive or change-oriented cycles.	High	Small and frequent

Figure 1. Uncertainty model.



levels: (i) simple with linear approaches - usually predictive; (ii) complicated and complex, with adaptive approaches - commonly used hybrid methods; and (iii) chaotic, with agile approaches due to the need for risk management, being an inherent feature of management.

It is understood that the different contexts in which projects are inserted require different skills on the part of managers, which can be classified into two types: soft skills, also known as human and social skills (e.g., communication, team management, empathy) (Lafave, Kang, & Kaiser, 2015), and hard skills, also known as technical skills (e.g., technical, technological knowledge, and authority) (Zhang, Zuo, & Zillante, 2013).

3. METHODOLOGY

The purpose of this article was to carry out an intervention in a Cooperative located in southern Brazil, therefore an applied research that aimed to generate knowledge for practical application. To solve the research problems identified, an action research approach was developed. As highlighted by Lewin (1946), action research is relevant and valid in its ability to address the operational realities experienced by practice.

Thiollent (2009), in turn, highlights that in the conception of action research, the conditions for capturing empirical information are marked by the collective character of the research process. The author further points out that in this type of research, the question of objectivity must be posed in different terms from the observational pattern of classical empirical research, which is often influenced by the positivist philosophy of the science of human nature.

The action research was developed in phases with adaptations in the script suggested by Thiollent (2009): Initially, an exploratory phase (phase 1) was carried out, which consisted of discovering the research field, the interested parties and their expectations to establish a first diagnosis of the situation. Then the research theme (phase 2) was defined, which is the designation of the practical problem and the area of knowledge to be addressed. Then the problem placement stage (phase 3) was carried out, a stage that has the purpose of defining the problem so that the chosen theme acquires meaning. The fourth stage consisted of the definition of the theory (phase 4), structured to guide the actions with strategic and tactical aspects so that the objectives could be achieved. The next stage consisted of the seminar (phase 5), which has the role of examining, discussing and making decisions about the research process. After the seminar, data collection (phase 6) was performed through in-depth interviews with the department supervisor. Then an action plan (phase 7) was elaborated whose objective was to achieve the plan in the initial phases. The implications of this phase were explained and evaluated in realistic terms, avoiding false expectations among the participants. Finally, the last phase consisted of the external dissemination of the results (phase 8) which served to strengthen the awareness of the population concerned. Next, the phases are detailed.

3.1 Exploratory phase

The cooperative in question has approximately 5,700 members, operates in the region for 55 years and has an approximate revenue of R$ 3.5 billion per year. Due to the constant investments made by the company to achieve its strategic objectives, there is a concern for resources to be effectively applied and return on investments to be achieved. During the last 18 years, after the implementation of the Enterprise Resource Planning (ERP) system, new analysis processes have emerged and been restructured in the cooperative in order to sustain and promote the growth of the organization. The IT department played a key role in executing systems development and deployment projects, both on the ERP platform and other specialized systems for managing specific business activities.

The challenge comes as human and financial resources become restrictive to meet all the demands originating from the business areas that now identify the technological tools as vectors of acceleration, automation and good practices regarding business processes. The need to manage the technology project portfolio in accordance with the strategic initiatives has increasingly required the department that identified the need to raise the level of project management maturity within the industry.

In this context, in April 2018, the IT department underwent a change in the hierarchical structure. In order to improve portfolio results, specific oversight was assigned to provide management of the IT project portfolio, which manages a project portfolio of approximately R$ 2 million each year. Due to the difficulty of managing some projects, the new supervision considered that a study was necessary to restructure the way that the internal processes were conducted in the department.

3.2 Research Theme

After the exploratory phase, we understand that the research theme should be directed to the discussion about an adequate project portfolio classification under the supervision of the IT project office, as well as a discussion about evaluation mechanisms of the project managers that were part of the project. the project office team studied so that with these two strands of study they would enable the project office supervisor to more effectively manage their project portfolio and their managers.

3.3 Problem placement

As mentioned by Thiollent (2009), in applied social research, and particularly in action research, the problems posed are initially practical in order to find solutions to reach a goal or to achieve a possible transformation within the observed situation. Given this, during phase 1, an isomorphism regarding the project management policy was noticed. Despite this situation, we noted that the various projects identified had different characteristics, apparent complexity, budget, risks involved, and the team demonstrated to have more technical knowledge for certain types of projects. The lack of clear project manager selection criteria for each specific project was also identified, as it was so far done subjectively by the supervisor and according to apparent availability at the time of project planning and requirements gathering. This situation was caused by a cultural problem that there was always an urgency to start project planning and, consequently, for the formal start of projects to begin as soon as possible.

3.4 Definition of theory

This study assumes that performance measurement and management supporting decision making improves the effectiveness of achieving desired outcomes (Melnyk, Bititci, Platts, Tobias, & Andersen, 2014). Decision theory (Simon, 1947) has influence on the decision-making model proposed by Snowden and Boone (2007) known as Cynefin, mainly as it helps managers in interpreting the nature and context of situations that require decision making.

Studies have shown the importance attached to behavioral factors, called soft skills, for project managers to succeed in their projects (Araújo & Pedron, 2016; Stevenson & Starkweather, 2010). Contemporary problems that project managers face can be considered as unstructured decision problems, characterized by multiple actors and perspectives (Mateo, De Navamuel, & Villa, 2017). This dynamic work environment requires project managers, behavioral skills that become critical for project deliverables to meet expectations. Therefore, it is assumed that the decision-making model of Snowden and Boone (2007), aimed at measuring and managing performance in line with appropriate skill leveling, improves decision-making, management and provides structure aligned with organizational needs.

3.5 Seminary

The first contact took place in person, where it was possible to know the company, the project office and the management team. An unstructured interview was conducted for 5 hours, where it was possible to settle the company culture, routine and work processes. The company has a project office that manages IT projects and at the time of the seminar contact (June 2018) there were 59 projects registered in the portfolio of which 20 were in progress. The projects in progress totaled a budget value of around R$ 2 million.

In this phase, together with the project office supervisor, the environmental factors in the company that influenced the entire project life cycle and, consequently, the performance of the office and the managers, from the identification of opportunities to the conclusion of the projects, were discussed.

In this phase, it was evidenced that the projects were planned and executed in a predictive way, that is, all project planning was carried out before its start with definition and schedule and cost baseline protocol, this planning was maintained throughout the execution of the projects.

It was also identified that the allocation of project managers for each project to be executed was made according to the momentary availability of each manager, so that there was no technical or behavioral criterion for prior evaluation to classify a manager as fit or not for a particular project type of project.

After the first face-to-face contact, there were three remote video conference meetings with the project office supervisor, where it was possible to deepen the discussion about the critical points raised. Each meeting took approximately 1 hour of conversation, thus totaling approximately 3 hours of remote video conferencing conversations.

3.6 Data collection

During data collection, it was possible to evaluate the project portfolio under the responsibility of the project office, as well as map the characteristics of each project. All information collected was tabulated in a spreadsheet. In this phase it was also possible to evaluate the project office members regarding their technical and behavioral skills. When evaluated on technical skills, managers received competency scores given by the department supervisor regarding knowledge of processes, systems, management tools, among other items. When assessed for behavioral skills, managers received notes from the supervisor regarding empathy, ease of communicating with colleagues, stress tolerance, among other items.

3.7 Action plan

In order to meet the initially identified expectations, an action plan was structured so that it was realistic to the point of being implemented and sufficiently adequate so that the professionals involved could have the perception of the value of change. The projects were analyzed according to the following characteristics: frequency of delivery, degree of change, uncertainty of requirements and technical uncertainty of the team.

Each feature of the projects received a score from 1 to 10 so that all projects fell within this score range and had the same evaluation criteria. The combination of 'delivery frequency' and 'degree of change' characteristics resulted in four possible outcomes: predictive, iterative, incremental and agile (PMI, 2017a).

The combination of 'requirements uncertainty' and 'team technical uncertainty' characteristics resulted in four possible classifications: simple, complicated, complex and chaos. The first classification concerned the life cycle of each project type (PMI, 2017b), while the second classification concerned the uncertainty and complexity of projects (Melnyk et al., 2014; Snowden & Boone, 2007). The combination of the two classifications resulted in suggestions for how projects could be better managed by project managers, and also how the project office could track project performance more effectively.

Finally, the technical and behavioral mapping served as a complement to the decision-making of which managers would be better qualified to assume the responsibility of managing certain projects. Each manager was assessed on six technical and six behavioral competencies with grades ranging from 1 to 10 for each competency. In the end, to have an overall view of the team, simple arithmetic averages were determined for each competency.

3.8 External disclosure of results

As a way to conclude the activity, an internal tool was elaborated. This one presented the classification of each project according to the analyzed variables and also indicated possible managers for each project according to their previously evaluated technical and behavioral competencies. This tool was presented to the director responsible for overseeing the project office at a new face-to-face meeting. The meeting lasted approximately 4 hours, where it was possible to present each phase of the research carried out and also the final proposal suggested to improve the internal processes of portfolio management of the IT project offices.

4. RESULTS

This section presents the results that were obtained through the action research previously presented.

4.1 Project life cycle analysis

The project portfolio classification by life cycle is presented in **Figure 2**. Note that the analyzed projects are distributed in predictive, iterative and agile approaches. No project was classified in the incremental approach quadrant, which may be justified by the fact that no project had the combination of high delivery frequency and low degree of change relative to requirements.

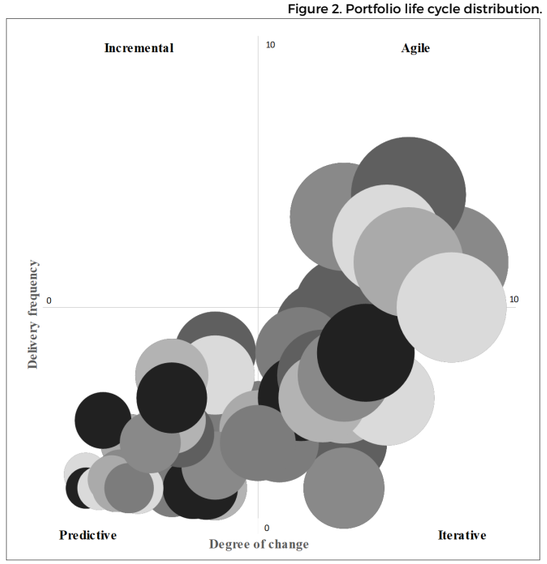
This diversified classification leads, at first, to the understanding that the vision-oriented only to the project management success (traditionally related to predictive cycles) is not sufficient to meet the needs identified in the project portfolio, which corroborates the recommendations from Shenhar and Dvir (2007).

After the evaluation of the entire portfolio, it was decided to narrow the evaluation for the projects that were in the study and execution phase, given that the respective initiatives were in the focus of management and, consequently, of those that adhered the most company strategies.

About portfolio life cycle distribution of ongoing projects, 11 projects corresponding to 55% of the portfolio would be managed more effectively by the iterative management approach; 6 projects corresponding to 30% of the portfolio would fall under the predictive approach; and 3 projects corresponding to 15% of the portfolio would be better suited to agile management.

It is noted that 70% of the project portfolio being executed at the time of analysis would be better managed with iterative and agile techniques and tools, but as noted earlier, the entire project portfolio is conducted in a predictive manner, which may contribute to the difficulty of management throughout the execution of the projects.

Figure 2. Portfolio life cycle distribution.



4.2 Uncertainty and complexity analysis

The project portfolio classification according to uncertainty is presented in **Figure 3**. It can be noted that the projects were distributed in the four possible classifications. It was also found that 26 projects were classified in the 'complex' category, followed by 'complicated' and 'simple' with 15 projects each, and 3 projects were considered 'chaotic' according to the analysis.

The diversification of the distribution presented regarding the uncertainty of the projects represents a problem regarding the proper measurement and management of performance, according to Melnyk et al. (2014) highlighted when inadequate decision-making criteria were used.

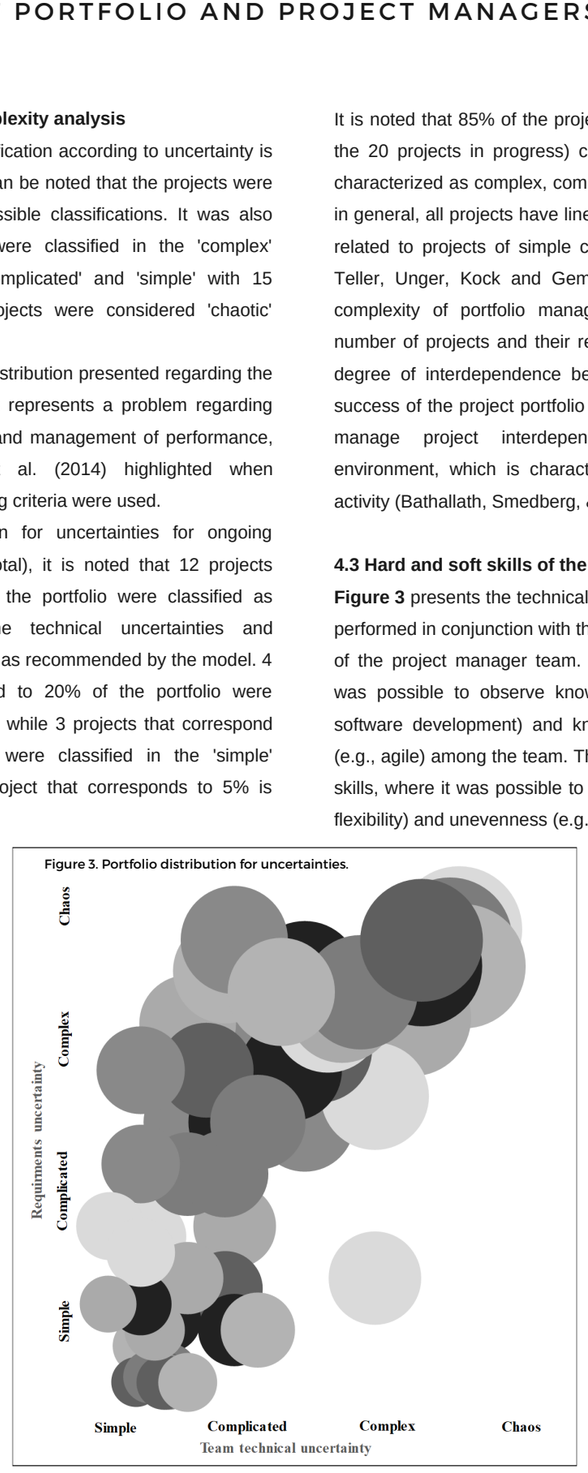
About portfolio distribution for uncertainties for ongoing projects (20 projects in total), it is noted that 12 projects corresponding to 60% of the portfolio were classified as 'complex' considering the technical uncertainties and requirements uncertainties as recommended by the model. 4 projects which correspond to 20% of the portfolio were classified as 'complicated', while 3 projects that correspond to 15% of the portfolio were classified in the 'simple' category, and finally 1 project that corresponds to 5% is classified as 'chaotic'.

It is noted that 85% of the project portfolio (considering only the 20 projects in progress) classified by uncertainty, was characterized as complex, complicated and chaos, however, in general, all projects have linear approaches that are more related to projects of simple complexity. As highlighted by Teller, Unger, Kock and Gemünden (2012), much of the complexity of portfolio management is due to the total number of projects and their related parties, along with the degree of interdependence between these parts, and the success of the project portfolio is influenced by the ability to manage project interdependencies in the portfolio environment, which is characterized by a highly complex activity (Bathallath, Smedberg, & Kjellin, 2016).

4.3 Hard and soft skills of the team

Figure 3 presents the technical and behavioral assessments performed in conjunction with the IT Project Office supervisor of the project manager team. Regarding technical skills, it was possible to observe knowledge leveling points (e.g., software development) and knowledge unevenness points (e.g., agile) among the team. The same is true for behavioral skills, where it was possible to observe leveling points (e.g., flexibility) and unevenness (e.g., communication).

Figure 3. Portfolio distribution for uncertainties.



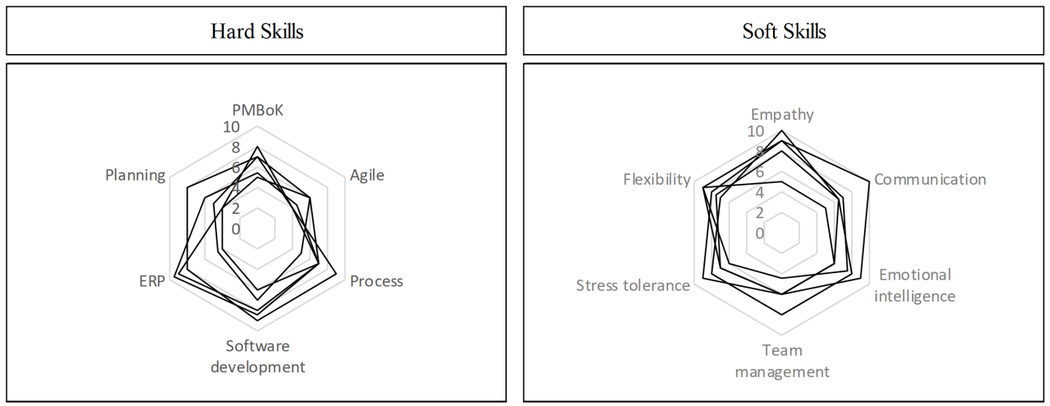


Figure 4. Hard and soft skills of the team.

Competency analysis plays an important role as it provides input for the team supervisor to direct training efforts and feedback to managers. As well as the allocation of managers in new projects according to the most required skills according to the characteristics and particularities of the project. When it comes to behavioral competencies, relevance becomes more evident, as highlighted earlier, because neglect of this dimension results in higher project failure rates (Awan et al., 2015). As stated by Rabechini Jr. and Pessoa (2005), project team competencies are strongly related to the ability to solve complex problems in the multidisciplinary context of project management. As presented by Chen et al. (2019), project management competencies have been presented as important assets for organizations, so proper importance can make an important competitive differential for organizations.

4.4 Proposed structural model

Finally, based on the observations made in this study, we propose a structural relationship model with three propositions to be tested as a way to confirm the results discussed in this study. As noted earlier, problems with different characteristics related to different types of projects require different approaches and skills (Thiry, 2004), as well as different portfolio control mechanisms are associated with different performance measures (Müller et al., 2008). Project portfolio management, therefore, should also focus on project execution considering the risks involved (Teller et al., 2012) and maximizing the contribution of projects to the success of the corporate strategy (Meskendahl, 2010). Based on this, we present propositions P1 and P2 of our study:

P1: Project classification according to life cycle has a positive and significant relationship to project performance.

P2: Project classification for uncertainty has a positive and significant relationship with project performance.

We also infer that project team competencies impact project-related problem solving and, as a consequence, influence project performance (Martinsuo & Hoverfält, 2018; Millhollan & Kaarst-Brown, 2016; Rabechini Jr. & Pessôa, 2005). As highlighted by Chen et al. (2019), project management skills increasingly become important assets within companies, and behavioral skills make a difference in achieving project goals (Awan et al., 2015; Zaman et al., 2019) because project managers should consider addressing various types of project interdependence, including resource, technology, technical, learning, and market interdependencies (Bathallath et al., 2016). Based on this, we present proposition P3 of our study:

P3: Project team skills positively moderate propositions P1 and P2.

Thus, the proposed structural model is presented in **Figure 5**.

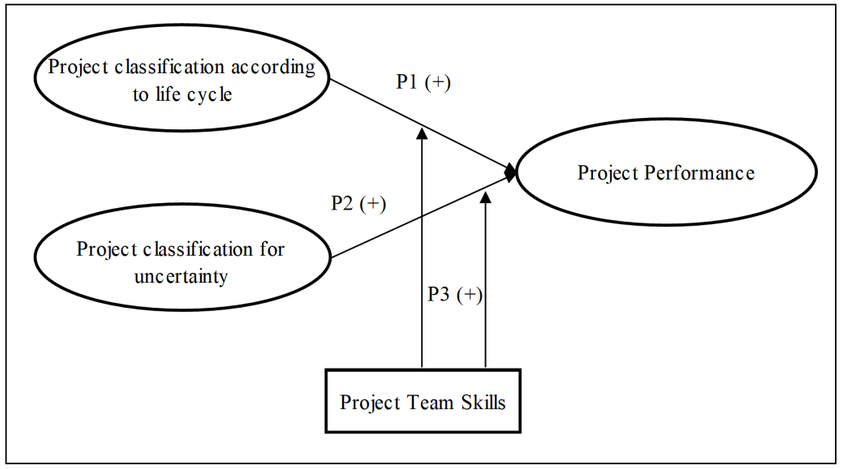


Figure 5. Proposed structural model for future studies.

Based on the structural model presented, our study aligns with the body of literature which infers that an appropriate project portfolio classification based on the life cycle and the uncertainties attributed to the project and the project team condition the most appropriate ways of managing and Project monitoring, as well as technical and behavioral competencies of project managers and project teams play a moderating role in project performance.

The proposed structural model still provides an opportunity for research into the resulting impact on a project governance structure within organizations, as project governance refers to the governance of project groups within an organization and includes issues such as project governance institutionalization of project management methodologies, reporting systems, project selection techniques, and program and portfolio management (Ahola, Ruuska, Artto, & Kujala, 2014; Too & Weaver, 2014) as highlighted by Turner (2008) that portfolio management is an important step in aligning the project portfolio with business strategy.

5. CONCLUSION

This study aimed to present project portfolio classification and project managers classification, performance-oriented. Through an action research, it was possible to obtain a problem in the organizational process, being performed a model of analysis of the project portfolio of the cooperative studied. The model allowed the project office supervisor to classify the project portfolio by uncertainty and life cycle, such as assessing project managers for soft and hard skills.

The work had as a limitation the application of the classification only to the project portfolio of the IT project office, because in the organization there is a project office in another department (Engineering) that could also benefit from the findings made from the analyzes employed. The assessment of behavioral competencies performed by the manager incurs possible prejudices and distortions by the subjectivity present in the analysis criteria, negatively sensitizing the level of reliability of this analyzed variable.

Another limitation in our study was that we performed only one cycle in the methodological process of action research, and with that we obtained evaluation information and proposed ways that we believe are more appropriate to the situation observed. Because the long timeframe for starting new projects and training of project managers is so long, we interrupted our intervention to the point that we could not follow the results even more intensely, because a long follow-up would be necessary.

Regarding the project life cycle analysis, it was possible to indicate that 49% of the total portfolio (59 projects) can be better managed iteratively, 46% predictively, 5% would benefit from the agile management approach. One noteworthy aspect is that no project has been ranked in the incremental quadrant. The in-depth analysis also allowed us to identify that of the 59 IT projects mapped in the organization, in relation to uncertainty, 45% were classified as complex, 25% as complicated; 25% as simple and 5% as chaotic.

The intervention that also focused on mapping the technical and behavioral of teams competencies based on the perception of the manager, showed us more developed and leveled points of the team as well as behavioral and technical needs of the project manager team. This will enable the project office supervisor to direct training and qualification to their managers as the projects need to be classified for life cycle and uncertainty. Therefore, the tool, when analyzed in an integrated manner, allows the project office supervisor decision-making criteria to guide the best project performance. The tool can also be used to support feedback and performance evaluation processes, indicating opportunities for improvement due to the need for projects.

Finally, we believe that this study has a very relevant practical feature and we still understand that the criteria used in this study can be applied in other project offices, not only in the IT area and not only in cooperative project offices, as in this case of this study. Therefore, we strongly recommend that the criteria used in this study be tested in other professional environments, regardless of sector, as well as that the structural model proposed through the presented propositions be tested quantitatively for validation and thus have hypotheses tested.

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CLASSIFICATION OF PORTFOLIO AND PROJECT MANAGERS:

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