# INTEGRAÇÃO ENTRE UNIVERSIDADE E STARTUPS À LUZ DA SINGULARIDADE E DA RACIONALIDADE LIMITADA

# INTEGRATION BETWEEN UNIVERSITY AND STARTUPS IN THE LIGHT OF THE SINGULARITY AND LIMITED RATIONALITY

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**Abstract**
The article aims to answer the following research questions: What challenges does the academy face to improve the critical thinking of its entrepreneurial students using the action learning approach? And, what are the reactions and alternatives that students present to the singularity and limited rationality when solving a problem? To this end, a qualitative approach is used through participant observation in three case studies of companies participating in an interdisciplinary project developed at one of the best Brazilian federal university. From the cases, it is possible to perceive points such as: Prevalence of fear of failure by students; Initial research using an optimal and generic solution from the scientific literature or similar examples; Students' understanding that internal organization and learning management are more important than the technical solutions; The singularity of the startup problem, coupled with the limitation of facts and data, led the group to decide more on startup studies than generic bibliographic research on the problem or the benchmarking; and The solution validation process was carried out by the legitimacy of the entrepreneur, instead of statistical or economic validation.

**Palavras-chave**: Limited rationality. Singularity. Startups. Learning by action. University entrepreneurship.

**Resumo**
O artigo tem como objetivo responder as seguintes questões de pesquisa: Que desafios a academia enfrenta para melhorar o pensamento crítico de seus alunos empreendedores em uma abordagem de aprendizagem pela ação? E, quais são as reações e alternativas que os alunos apresentam à singularidade e à racionalidade limitada na resolução de um problema? Para tanto, utiliza-se uma abordagem qualitativa por meio da observação participante em três estudos de caso de empresas participantes de um projeto interdisciplinar desenvolvido em uma das melhores universidades federais brasileiras. A partir dos casos, é possível perceber pontos como: Prevalência do medo do fracasso pelos alunos; Busca inicial de uma solução ótima e genérica na literatura científica ou em exemplos semelhantes; A compreensão dos alunos de que a organização interna e a gestão da aprendizagem são mais importantes do que as soluções técnicas; A singularidade do problema da startup, aliada à limitação de fatos e dados, levou o grupo a decidir mais por estudos sobre startups do que por pesquisas bibliográficas genéricas sobre o problema ou benchmarking; e O processo de validação da solução foi realizado pela legitimidade do empreendedor, e não por validação estatística ou econômica.

**Keywords:** Local Innovation Agents. Design thinking. Innovation. Micro and small enterprises.

## 1 INTRODUCTION

Nowadays, companies are required to stand out from the competitive landscape. This is intensified in dynamic environments, especially for emerging companies like startups (Lacerda et al., 2017). However, startups have weaknesses in management because smaller companies struggle as they grow. Because of that, more and more of these companies seek professionals prepared to assume managerial positions. When the startups face this new need, the training of

professionals prepared for the new reality is demanded from higher education institutions (Beni et al., 2017).

In this challenging context, the importance of reflection on the teaching and learning methods applied in educational institutions emerges. As management education evolves, the use of new resources as a way of facilitating learning is necessary (Urias & De Azeredo, 2017). Thereby, one of the teaching methods that has been gaining ground in management education is action learning. Action learning suggests that students do meaningful learning activities, think about what they are doing and contribute to the development of competences through direct contact with real problems (Prince, 2004).

From the context in which these startups are inserted, there is opportunity for research and for extra classes projects that could help these companies to use new concepts, trends, and tools for their business success (Lacerda et al., 2017). Scholars and practitioners expose some limitations on traditional methods and their contribution to the development of new skills relevant to entrepreneurs (Bell & Kozlowski, 2008; McCarthy & Anderson, 2000; Pedler, 2011) making it a promising field of study (Corbett, 2005).

This article explores a research opportunity from two analysis lenses, in teaching entrepreneurship: the singularity and limited rationality (Kassean et al., 2015). The singularity is related to the entrepreneurship, so that a startup is worth of a temporary and subjective window of opportunity, related to path-dependence (Wang & Ahmed, 2007). The limited rationality is the absence of historical basis and uncertain decision criteria (Marafon et al., 2015; Meyer et al., 2002). Thus, building knowledge becomes a vital focus on startups (Lacerda et al., 2014).

Considering the presented context, the article aimed to answers the following research questions: (i) What challenges does the academy face to improve critical thinking in its entrepreneurial students in an action-learning approach? And (ii) What are the reactions and alternatives that students present to the singularity and limited rationality in solving a problem?

## 2 LITERATURE REVIEW

### 2.1 Action Learning

In order to transform students into prepared professionals, undergraduate courses must stimulate the use of creativity, communication, teamwork, problem-solving skills, in addition to the technical skills of their areas of expertise (Vieira et al., 2013). The change in teaching methods becomes essential, since traditional teaching methods do not contribute to the

development of these required skills (Breen, 2014). Passive learning approaches, mainly based on content verbalization, have proved to be an inefficient teaching strategy.

In this sense, Leonard e Lang (2010) argue that the revitalization of the teaching-learning process allows students to be the main agent of their knowledge building, instead of a data and information receiver. It is necessary for students to develop their critical capacity, conceptualization, and autonomy by performing high-level mental tasks such as analysis, synthesis, and evaluation (Pedler, 2011).

One of the teaching methods that has been gaining ground in management education is action learning (Beni et al., 2017; Breen, 2014; Paton et al., 2014). Action learning requires that students do meaningful learning activities and reflect on what and how they are performing. It contributes to skills development through direct contact with the study object, reflection on the practice and its consequences, sharing of experiences and teamwork (Krakauer et al., 2017). Strategies that promote active learning can be defined as activities that engage the students in doing something, and at the same time, leads them to think about what they are doing (Leonard, 2015).

In this sense, learning by action has as premises and principles: (i) to establish a relation between action and learning; (ii) the idea that learning is more effective when it is an active rather than passive process; (iii) establishes an effective relationship between practice and theory; (iv) emphasizes the experimental nature of learning and problem solving; (v) sees change as an iterative process (Leonard, 2015). Edmonstone (2015) highlights the benefits of action learning at the individual level: Greater understanding, as a basis for building relationships; Better ability to make sense of ambiguous data and situations and solve complex problems; Ability to understand and initiate organizational changes; An improved focus on what makes the difference in a given situation; Individuals more focused on action and proactivity in delivering results; Greater self-awareness of personal impact on others, contributing to an improved ability to work in teams.

There are two key aspects of the action-learning approach: (i) the learner's control over their own learning; and (ii) inductive learning (Bell & Kozlowski, 2008). The first aspect concerns the students' owning control over their learning. The students assume primary responsibility for important decisions that will influence their learning, for example, choosing learning activities that they want to perform, monitoring and evaluating their own progress (Lima et al., 2012; Ram & Trehan, 2010; Urias & De Azeredo, 2017). In contrast, passive learning approaches focus on the control of learners, where the teacher takes primary responsibility for learning decisions (Bell & Kozlowski, 2008). The second aspect of action

learning promotes an inductive learning process for students . Students explore and experience a task to infer rules, principles, and strategies for effective performance. In contrast, passive approaches of learning assume that people acquire knowledge from some outside source (Paton et al., 2014).

Regarding the process of active learning, Leonard (2015) presents seven phases in which it is decomposed. Each phase, presented in Table 1, has a specific objective that must be fulfilled in the process of solving the problem and the typical obstacles that must be overcome by the team and should be considered critical aspects for students' learning. The author emphasizes that when students encounter an obstacle during the learning process, the facilitator may create questions that encourage the team to reflect on it (Leonard, 2015).

TABLE 1 - Stages, objectives, and obstacles of the action learning process.

| Stage | Typical Obstacles |
|---|---|
| **Identification of problems** | Inappropriate identified issues. |
| **Selecting a problem** | Apathy, resistance to withdrawal from a problem. |
| **Problem analysis and definition** | Premature and incomplete analysis of the problem; To face the problem as an objective without identifying or understanding the causes. |
| **Generating ideas** | Excessive judgment; Premature closure of the process of generating ideas; Unequal participation of the team. |
| **Evaluation of ideas** | Lack of an effective process to consolidate, organize and evaluate ideas; Unequal influence of team members; Failed to specify criteria for inclusion or exclusion of ideas. |
| **Implementation of the best ideas** | Vague planning, without the definition of criteria to follow actions, responsibilities, criteria of success and schedule. |
| **Evaluation of results** | Lack of an evaluation plan for the results generated by the team; Lack of comprehensive analysis of the whole process. |

Source: Adapted from Leonard (2015)

Finally, it is emphasized that technological advances help the activities outside and within the class, providing another tool to encourage learning (Beni et al., 2017; Breen, 2014). Currently, students can share files and create channels for content discussion, and it is possible to establish, together with teachers, virtual communities focused on learning (Olsson et al., 2010).

## 2.2 Singularity and Limited Rationality

In the light of constructivism, this article considers the singularity in decision aiding process, recognizing the values and preferences of the decision maker and the specific resources/competences of a given context at the decision making moment (Lacerda et al., 2012). The aspects measured in a given context represent the objectives that operationalize the

values perceived by the decision makers as necessary and sufficient for their management in that specific moment (Roy, 1993). From this concept, it can be deduced that it is the decision-makers' choices, based on their values and preferences, that determine the organization's business architecture, which in turn is what will make it difficult to imitate and, therefore, differentiated from others (Teece et al., 1997).

As well as identifying the characteristics and changes inherent to the context, the recognition of the singularity becomes necessary in the management of startups. Singularity allows the definitions of the components used to compose the business model to be recognized by the entrepreneur as representative of their values and preferences, thereby creating alignment and coherence with their business perceptions. Complex contexts require the consideration of the entrepreneur individual values, instead of methodologies that use generic values and preferences or are determined through statistical methods (Ensslin et al., 2010). In this way, the constructivist approach also assists in the construction of the entrepreneur knowledge, since the business model is built on its specific context and allows it to visualize the impact of the actions, and the difficulties become opportunities for learning expanding throughout the process (Ensslin et al., 2010; Marafon et al., 2015; Roy, 1993).

Choosing the constructivist approach means that the entrepreneur plays a fundamental role during the process of creation and management of the new business, since the entrepreneur is the person who has the responsibility for the decision making of the business (Marafon et al., 2015; Tasca et al., 2010). Thus, these situations require new approaches to deal with the desires of specific decision makers and use their unique resources to achieve strategic objectives and create sustainable competitive advantages (Teece, 2012).

In these uncertain, dynamic and fast-changing environments, entrepreneurs in many situations are unable to identify the various variables and alternatives that should be considered in their analysis (Montibeller et al., 2008). That is, in the decision-making process, often the entrepreneur does not possess all the necessary information, characterizing a state of limited rationality. Thus, it is necessary for the entrepreneurs to recognize that they do not have knowledge of all the variables that will influence their business and therefore the premises of the business must consider the dynamic characteristics of the context. Change and uncertainty must be treated as essential phenomena and learning must be continuous (Teece, 2012) .

## 3 RESEARCH DESIGN

A case study and a participant observation were used as a research strategy, with a descriptive objective and a qualitative approach. The cases selected for this study are three

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startups participating in a university project called *Solution up*. The *Solution up* project started in 2015, at the Federal University of Santa Catarina (UFSC), in the Business course department. After some modifications, in 2017 the project started with a multidisciplinary team of students from different UFSC's courses. Table 2 presents the main information of the companies studied in this paper.

TABLE 2 – Summary of the cases

| Company | Problem | Methodologies | Students | Participants |
|---|---|---|---|---|
| Aquarela | Lack of a process to select market opportunities and improve the sales pitch | Multicriteria decision support method integrated with Lean Startup method | 18 | 12 |
| Pensys | Lack of clear criteria for choosing priorities | Multicriteria decision support method integrated with Lean Startup method | 37 | 15 |
| LITMA | Absence of an R&D measurement model | Multicriteria Decision Support Methodod - R&D Evaluation Model | 89 | 16 |

Source: developed by the authors

The procedures adopted for the execution of the *Solution up* project were based on the steps defined by Marquardt (2005), which offers principles and practices that served as direction for empirical application. The phases are presented in Table 3. This project has some working premises that are used in this research: (i) multidisciplinarity; (ii) experiential learning (constructivism); (iii) collaboration; (iv) working with real cases; (v) teacher as the facilitator; (vi) promotion of research; (vii) promotion of creativity and innovation; (viii) integration of the university with society (Lacerda et al., 2017).

TABLE 3 – Phases of the study

| Phases | Description |
|---|---|
| Work Team Formation | Prospection of entrepreneurs who has interest in sharing organizational problems and selection of students who will be part of the project. |
| Contact with The Problem | The entrepreneurs make a brief presentation about their company. The students ask questions to the entrepreneurs. The teacher-facilitator questions the students on which areas of knowledge in Business would be useful to help structure the problem. |
| Activities Planning | The students are organized into commissions, according to knowledge fields. The commissions discuss the next steps, among them: Technical visits to the organization; Bibliographic reference on the topics; Financial or operational plans; Elaboration of documents models or processes; Elaboration of presentations of the recommendations to the external actors. |
| Reflection | The teacher-facilitator promotes reflections about what the students have learned. The discussion is documented into a cognitive map, categorized as theoretical and practical reflections, risks, lack of time issues, unanswered questions, and polarized opinions among students. |
| Debates and Arguments | The teacher-facilitator guides the students to elaborate the recommendations for the entrepreneurs. Weekly meetings are held so that students present to others their questions. Students are encouraged to look for related materials such as news, videos, similar cases, articles. |
| Propositions | The recommendations are presented to the entrepreneurs. Through constructive debate, mediated by the teacher-facilitator, objections are accepted or transposed through theoretical and/or creative argumentation. At this point, if necessary, the cycle returns to the debates and reflections phase until the stabilization of the recommendations. |
| Case closing | The case closes when the project workload ends; when students understand that there are no more learning opportunities; when the teacher-facilitator understands that the problem is not business related; or, when the external actor understands that the problem has been addressed. |

Source: developed by the authors, adapted from Marquardt (2005)

For this research, 15 semi-structured interviews were carried out with project participants, 25 meeting records were analyzed, 3 final reports were prepared and delivered by the students to the companies and at the end of the project the students wrote a report of the lessons learned by themselves. After the transcription of the documents and the coding process using the software Atlas.ti®, the relevant variables that will guide this narrative were observed.

## 4 RESULTS

In the following section it will be described the cases of Aquarela, Pensys, and LITMA companies, presenting the main relevant aspects about the development of the project considering the Limited rationality and Singularity aspects of them.

### 4.1 Caso 1: Aquarela

*4.1.1 Limited rationality*

In the case of Aquarela, the data limitations were related to the lack of information for the students to understand the functioning of the company and its product (fragments 26:1, 36:1, 36:2 and 36:7). This caused difficulty for the students to formulate the problem label and required that they proactively searched for information. To define the problem label, on-site visits and interviews with the managers were carried out to know more about the company needs (fragments 27:3, 29:2 and 35:1). With this understanding about the company, the students researched the techniques and management tools that could help the company (fragment 36:5).

At this point, the class presents a new difficulty related to the knowledge limitation about the management techniques identified in the process. We highlight the 25:3 fragment where the facilitator reports that the group had very superficial knowledge regarding some management tools, such as terms and jargons, but did not understand how it could be applied to the reality of the company. In some situations, the facilitator did not agree with the path and procedures performed by the students, but it was a constant exercise to make the students themselves experience their learning by doing.

In this sense, the facilitator needed to act more incisively to make the team understand that this was not simply a tool that could be replicated to the reality of the company because it was fashionable, but rather it was necessary to understand why and in what context that technique would be useful. Students were encouraged to form commissions, with the purpose of conducting research on the themes raised as possible recommendations, and to make a presentation to the other colleagues to share the information (fragment 36:5). The fragments and codes are presented in Figure 1.

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FIGURE 1 – Fragments of Aquarela's case related to Limited rationality

| Fragment | Code |
|---|---|
| **35:1** *Make a technical visit to the organization to question the points that were not discussed at the meeting and to understand a little more about the products and the company.* | Limitation of data, Company Search |
| **26:1** *It was discussed whether the group should choose the company with which it will work at this first meeting or after a brief interview with the representative of each company for more data.* | Limitation of data |
| **26:2** *Due to the short term of the project, it was decided that the company would be chosen at the first meeting, even though there was little information about the companies and their real problems.* | Limitation of data |
| **36:1** *During problem labeling, students conducted interviews with one of the entrepreneurs, asking comprehensive questions to understand the company, the industry in which they operate, their products, and especially what led them to seek help in the project.* | Limitation of data |
| **29:3** *Questions: Do they know what the segment is?* | Limitation of data |
| *Do they know what the sales process is?* | |
| *Do they have a mature product?* | |
| *Do they know how to do product validation?* | |
| **36:7** *After a series of debates and arguments, the guiding questions were defined as: "Do they know what the segment is? Do they know what the sales process is? Do they have a mature product? Do they know how to do product validation?"* | Limitation of data |
| **25:3** *The students were aware only of the terms and jargon of "fashionable" tools but did not know where that fit into science, that was the role of the facilitator.* | Limitation of knowledge |
| **27:6** *How can management (managers) help a company "not understand" what that company does?* | Limitation of knowledge |
| **36:5** *For each of the candidate techniques a group was formed for the purpose of studying it and presenting it to other colleagues in order to level the knowledge among the students.* | Limitation of knowledge, Learning |
| **36:2** *Some students questioned some technical issues and if the company should have only one product. In order to solve such questions, the doubts were enumerated and taken to the company by a committee of the students assigned to carry out a technical visit and a documentary analysis.* | Company Search, Field Search |
| **29:2** *Presentation of the report of the meeting with the company.* | Company Search, Field Search |
| **27:3** *Daiani will be responsible for making technical visits, collecting documentation, checking the information passed by the entrepreneur so that the team does not work on "premises".* | Field Search |

Source: developed by the authors

Figure 02 shows the network of fragments and codes identified related to the lens of limited rationality in the case of Aquarela.

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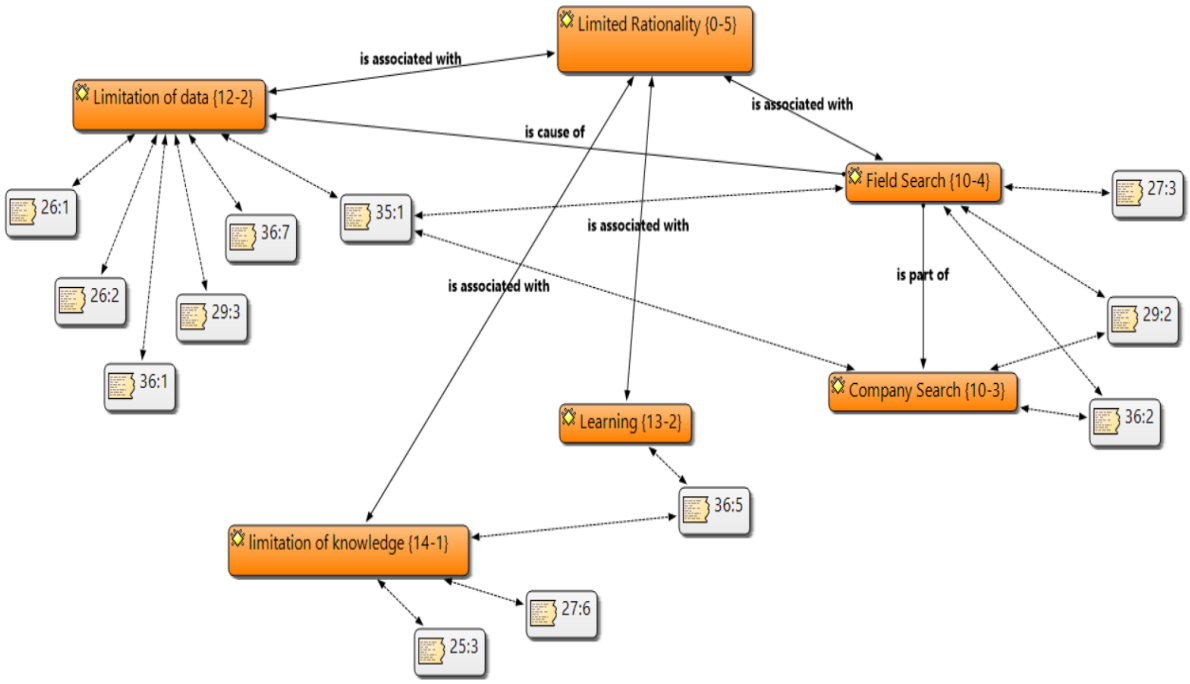
FIGURE 2 – Network of fragments and codes: limited rationality of the Aquarela case.




Source: developed by the authors

*4.1.2 Singularity*

An iterative process began between propositions and validations with the entrepreneurs, from the identification of the knowledge fields that the group would use to generate the recommendations to the company (fragments 32:3, 32:1 and 27:3). In this process of validation, the group sought to legitimize the recommended decision model, in the light of the values and preferences of the startup managers, respecting the singularities of their contexts.

One of the main points of difficulty, in this case, occurred due to the time constraint. The pressure of constraints to solve the problem can affect whether an approach is adopted (fragment 36:9). In this case, since the primary focus was on methodology rather than on the decision model, there was little time left to reflect on the criteria. However, decision-makers did not recognize their values and preferences in these universal criteria, and so they made a point of changing, proposing new criteria (33:2, 32:4 and 32:3).

It is important to recognize that the literature was useful for building an understanding and an initial proposition, and in the process of creating indicators and criteria (fragment 33:4). One can accept, that literature as a universal element has accelerated the construction of understanding, but it will hardly be accepted in each specific context. The fragments and codes are presented in Figure 3.

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FIGURE 3 – Fragments of Aquarela's case related to Singularity

| Fragment | Code |
|---|---|
| **36:2** *Some students questioned some technical issues and if the company should have only one product. In order to solve such questions, the doubts were enumerated and taken to the company by a committee of the students assigned to carry out a technical visit and a documentary analysis.* | Company Search, Search |
| **36:10** *After the final deliveries of the project, the facilitator asked the entrepreneurs for feedback on the work done and was informed by the manager that "no consultancy had presented something similar" since the consultants have a generic methodology.* | Adaptability |
| **36:9** *However, the time constraint of the project led the students to adopt the criteria of the model as north and determine the remaining meetings to legitimize them with the entrepreneurs, who would have the final say about them and propose measurement scales clearer.* | Validation |
| **29:2** *Presentation of the report of the meeting with the company.* | Company Search |
| **27:2** 1. *What do they want? What do they need? What is or what are your real problems? Why bet everything on Vortex and not on other products?Where does the data for the Vortex come from? Do they have a platform that generates your other products?Is it a risk or an opportunity to bet everything on a single product? What is the cost of the company?What is the company's sales emergency?INVESTIGATE!!!* | Company Search, D maker values preferences |
| **22:6** *What struck me the most was the labeling of the problem, which though it seems simple, seemed to me to have split a generic search for research focused on one of the sectors of the company. This change demanded a change of conduct in the progress of the project, which was mainly theoretical, came to have a more practical character.* | Singularity |
| **32:2** *Joni pointer suggestion: "possibility of recurrence"* | Decision maker valu preferences |
| **35:1** *Make a technical visit to the organization to question the points that were not discussed at the meeting and to understand a little more about the products and the company.* | Company Search |
| **27:3** *Daiani will be responsible for making technical visits, collecting documentation, checking the information passed by the manager so that the team does not work on "premises".* | Field Search, Valida |
| **33:4** *Validation criterion by criterion and necessary changes, according to discussion, understandings, and agreement.* | Validation, Decisior values and preferenc |
| **32:3** *Joni will "introduce" to Marcos and Leonel to give feedback to us.* | Validation |
| **32:1** *Presentation of the methodology used for the company:Explanation of segment prioritization process.Explanation of criteria and indicators to prioritize segments. Explanation of the premises for investigation.* | Validation |
| **36:8** *Students emphasized that entrepreneurs believed that market research would make the business process slow and costly. Thus, value propositions are premises, that is, truths assumed by entrepreneurs to support managerial actions.* | Decision maker valu preferences |
| **30:1** *Student will be responsible for contacting the entrepreneurs to ask which of these segments they can work on, and what the pains and gains they think for this segment.* | Validation |
| **33:5** *These indicators represent the moment of the company, from here one time may be another reality.* | Adaptability |

Source: developed by the authors

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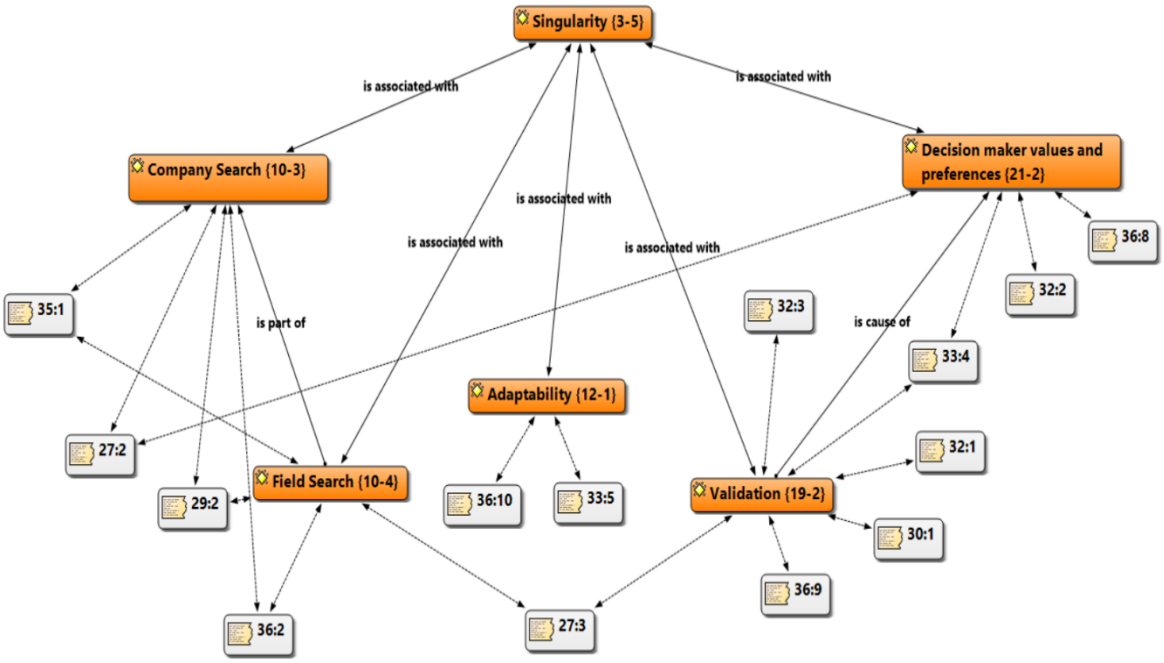
Figure 04 shows the network of fragments and codes identified related to the singularity of the Aquarela case.

FIGURE 4 – Network of fragments and: singularity of the Aquarela case.




Source: developed by the authors

## 4.2 Case 2: Pensys

### *4.2. 1 Limited rationality*

The first activity developed in the project concerns the definition of the problem label to be solved by the students. For this definition, it is necessary that they find ways to extract from the entrepreneur's relevant information about the company's situation. In this sense, conducting on-site surveys and interviews enables this information collection (fragments 11:1, 11:2 and 11:4). This search for information is related to the limitation of data that the team has on the company, and for this limitation to be overcome, the students asked questions that could extract important information for decision making (fragment 11:7).

Thus, several factors explained by the startup managers were placed on an Ishikawa diagram. However, the preconceived format of criteria of this technique left the group reflective, since there were criteria that did not fit the reality of the company. Thus, the students were asked by the teacher-facilitator about the reason for the creation of the diagram. The group discussed and reached a consensus that it would serve to analyze the causes that could lead to

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good project choices, the teacher-facilitator then urged them to use this statement to create their own criteria from interviews with managers. In this sense, it is possible to observe that the facilitator's position at this moment does not refer to the classical role of the teacher in teaching activity, but rather to ask constructive questions so that the students can reflect on the paths they were following up.

From the definition of the problem label, it is possible to observe that the limitation found by the students refers to the lack of knowledge necessary for proposing recommendations to the company (fragment 23:3). To do this, the facilitator encourages students to ask questions, debates, and research to foster team learning (fragments 23:8, 24:4 and 19:1). The fragments and codes are presented in Figure 5.

FIGURE 5 – The network of fragments of the codes identified related to the limited rationality of the Pensys case.

| Fragment | Code |
|---|---|
| **11:1** *Purpose of the Meeting: To know more deeply the organization and the manager; to identify strategic points for identifying the organization's problem.* | Limitation of Interview |
| **11:7** - *Why do they occupy so much time with technical questions and little with management issues?* | Limitation of dat |
| *Why do not you want to be a great company in terms of employees?* | |
| **11:2** *Camila, Brenda, and Marina will make a technical visit to ACATE (For next Thursday)* | Field Search |
| **11:4** *In the presentation about the company, followed by the interview elaborated by the team, we had the possibility to know more about the partners and the organization.* | Limitation of Interview |
| **23:3** *Once the guiding goal of the project was determined, the students were encouraged to reflect on areas of knowledge and techniques that would be useful to begin structuring the recommendations.* | limitation knowledge, Lear |
| **18:2** *The management model was legitimized by Pensys managers, who will be able to incorporate such knowledge into their daily practices, as well as the model will generate reflection and learning about the need to focus on business success.* | Learning |
| **18:5** *The greatest contribution of the Project Learning in Action is in the proposed method and not in the tool, that is, it will be the learning flow that will assist the managers in the decision making process when choosing the projects.* | Learning |
| **19:1** *Most commented points: learning in action, learning in practice tools that were previously only known in books, integration between classes, strong and hardworking group.* | Learning |
| **24:4** *The lesson that we all have knowledge and experience* | Learning |
| *which can contribute in some way, even if the people on the other side seem to be better able than you. And that's exactly what happened on the project. Each student brought his knowledge, and with the freedom we had, given by the teacher and also by the entrepreneurs, everyone could help find the solution.* | |

Source: developed by the authors

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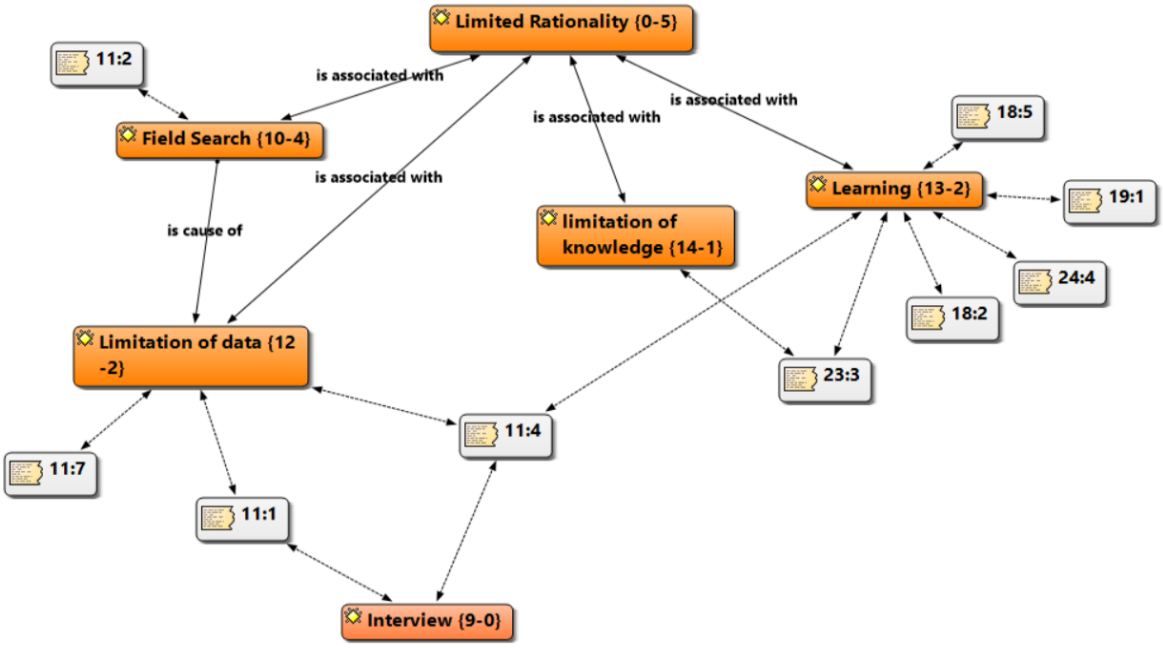
Figure 06 shows the network of fragments and codes identified related to the limited rationality of the Pensys case.

FIGURE 6 – Network of fragments and codes identified: rationality of the Pensys case.




Source: developed by the authors

*4.2.2 Singularity*

When the recommendations phase started, students were faced with important questions to formulate their propositions. The first one refers to the adaptability of the recommendations to the reality and necessity of the company (fragment 23:4). Thus, from this assumption, the team began to elaborate its propositions based on the needs expressed by the entrepreneurs from their values and preferences (fragments 23:6, 15:1, 13:1, 11:7). At this point of the project, there were a demand for greater contact between the team and the entrepreneurs (fragments 15:2, 18:3).

The group's next challenge were to legitimize the structuring of ideas, since the elements were drawn from the interview with only one of the four startup entrepreneurs. This concern arises from the following statement by the entrepreneur: "One of our challenges is to harmonize the interest of the members, to have the chemistry between the different areas of technology of the company". The facilitator teacher at that time posed the challenge to the students to try to achieve a harmonious solution. In this way, individual meetings were held with each of the four partners to discuss the diagram. The group decided to avoid excluding the criterion if it was

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interesting for at least one shareholder.

To solve the deadlocks, the students decided that each criteria had a different importance, which would be established to ensure that the greatest number of shareholders' interests were met by the decision model. In this sense, the continuous contact between the team and the company is also important for the continuous validation of the results during the project. In this case, at each stage of development of the student's recommendation there were a moment of validation with the entrepreneurs (fragments 23:9 and 23:10). These moments of validation proved to be important for the alignment between the expectations of the entrepreneurs regarding the delivery of the project. The fragments and codes are presented in Figure 7.

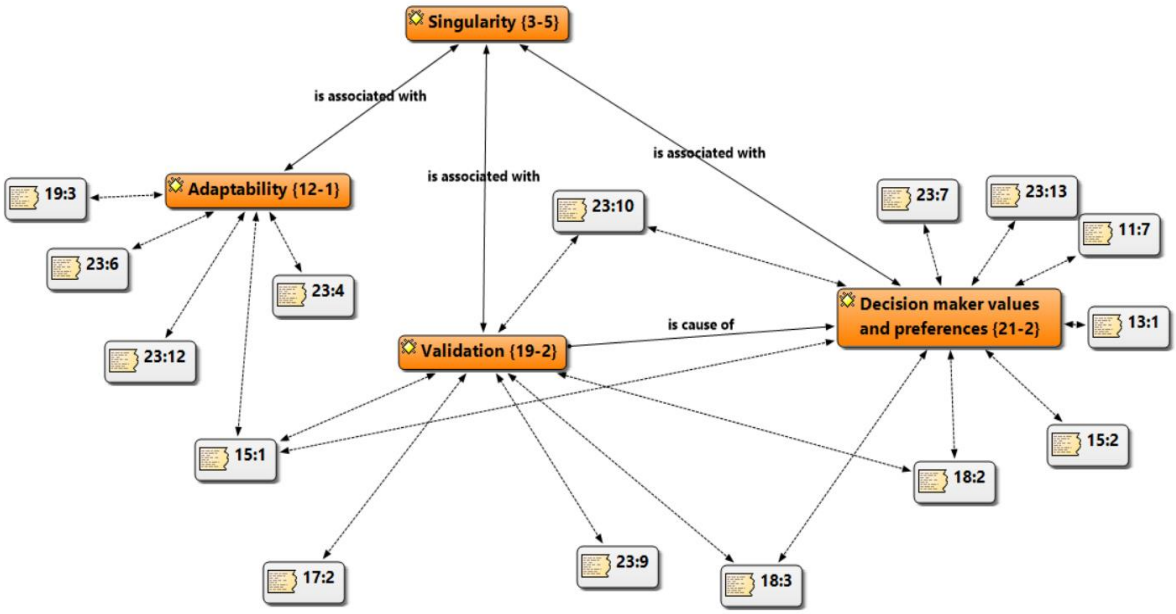
FIGURE 7 – Fragments of Pensys case related to Singularity

| Fragment | Code |
|---|---|
| **19:3** *Photograph of a company moment, scenarios are volatile.* | Adaptability |
| **23:6** *There was a consensus that the startup should look at their own competencies and interests, rather than privileging what is being demanded by the market.* | Adaptability |
| **23:12** *Despite the simplicity of this definition, the group agreed that the main contribution is in the evaluation process, not in the generation of a definitive model. This prerogative was accepted by shareholders who were afraid of adopting a static model that would not meet the dynamic conditions typical of a startup.* | Adaptability |
| **15:1** *The project is aligned with the company's strategic planning.* | Decision maker and prefer Validation, Adaptab |
| **23:4** *The group then organized itself to form commissions to study candidate techniques according to the guiding question: What factors would lead to this startup to the best project?* | Adaptability |
| **17:2** *How to sensitize the other members to change? Join the decision for implementation with all members and be accepted by them.* | Validation |
| **23:9** *The next challenge of the group was to legitimize this structuring of ideas since the elements were extracted from the interview with only one of the four shareholders of the startup* | Validation |
| **18: 3** *In this stage, three products, the Wind Turbine, the DNA Sequencer, and the Veterinary X-ray were analyzed, being chosen according to the validation of the managers in relation to each of the criteria presented at the meeting.* | Decision maker and prefer Validation |
| **18: 2** *The management model was legitimized by Pensys managers,* *who may incorporate such knowledge into their practices every day, as well as the model, will generate reflection and learning about the need to focus on business success.* | Decision maker and prefer Validation |
| **23:10** *At each meeting with one of the entrepreneurs, he wondered about which criterion he understood as the most important and, collectively, measuring scales were constructed to order the company's projects.* | Decision maker and prefer Validation |
| **15: 2** *Identify whether there is a personal affinity of the members with the project - degree of personal affinity with the Project.* | Decision maker and preferences |
| **13: 1** *Reported that he does not like market research, says that the focus of product development should be on what people want.* | Decision maker and preferences |
| **11: 7** *- Why do they occupy so much time with technical questions and little with management issues? - Why do not you want to be a great company in terms of employees?* | Decision maker and preferences |
| **23:13** *The facilitating teacher then urged them to use this statement to create their own criteria from interviews with managers.* | Decision maker and preferences |
| **23: 7** *"... when a customer has already demanded a specific solution, the degree of innovation is low ... what we need to be aware of is in the users' needs and not in what they ask for ... " "... we have to see some motivation points from the project development team itself to accelerate progress ..." "... we want to make products with our face, to work with the love of technology"* | Decision maker and preferences |

Source: developed by the authors

Figure 08 shows the network of fragments and codes identified related to the singularity of the Pensys case.

FIGURE 8 – Network of fragments and codes identified: singularity of the Pensys case.




Source: developed by the authors

## 4.3 Case 3: Litma

### *4.3.1 Limited rationality*

From the fragments identified in the field and evidenced in figure 07, it is possible to observe that related to the limited rationality are the codes of limitation of knowledge and limitation of data.

There was a knowledge limitation related to the difficulty of some students in participating in meetings, because even with the project already in advanced stages, there were still students who did not know the purpose of the activities (fragments 2:8 and 22:1). This difficulty impacted on the progress of the project, but mainly on the student's learning, since they developed the activities mechanistically and lacked critical thinking for understanding what was happening. In this sense, in many cases, the students had difficulty mediating the meetings with the company. By losing control of the meeting, students conveyed insecurity, giving the false impression that they did not know what they were doing, as well as being influenced by the thoughts and intentions of the manager. Thus, there was a need for a leader to carry out this mediation, making the necessary interventions.

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The intervention of the facilitator teacher was of fundamental importance. The role of the facilitator does not refer to the classic role of the teacher in teaching activity, but rather to ask constructive questions so that the students can reflect on what can be done to overcome such difficulty. In this way, the way the facilitator approached the students was mostly through questions to elicit reflection (fragment 2:12) and to propose subsequent actions that would allow students to confront their ideas with questions, obtain information in the external world to form their own judgment of value (fragments 22:2 and 11:1). The fragments and codes are presented in Figure 9.

FIGURE 9 – Fragments of Litma case related to Limited rationality

| Fragment | Code |
|---|---|
| **2:12** *How far can we act to really influence the management of LITMA? Does the process area have the premise of maintaining openness to innovation? What is the limit of our propositions?* | limitation of know |
| **4:6** *The level of uncertainty is high and complicates time in the box.* | limitation of know |
| **20:5** *The first difficulty of the project was in relation to the definition of the problem label. It was a few hours of discussion after the interview with the company, and yet the group did not seem to be convinced or even understood what the problem would be solved and the solution proposed.* | limitation of know |
| **20:4** *In many situations it was difficult to understand what the managers wanted, the redefinition of the problem label only happened because the facilitator was able to identify that the first label identified did not match the expectations of the managers.* | limitation of know |
| **9:4** *If possible all members should attend at least a technical visit.* | Field Search |
| **5:1** *How to validate the criteria with LITMA? Visit the LITMA to validate the criteria and indicators.* | Field Search |
| **22:1** *I believe it was the maturation of the members in general, at first I (and many others believe me too) felt dislocated and unfit to contribute to the debates.* | Learning, limitati knowledge |
| **22:2** *Being proactive, the best way to learn is to seek challenges, so going after them I think was a watershed in the way I lead my life.* | Learning |
| **2:**8 *Routing: Learn to master the meeting. There was a lack of courage and there was a fear of making mistakes. Learn from the error*. | Learning |
| **10:4** *The Solution Up group did not have access to the data that define the current situation of the company, therefore we could not help in the determination of the scales, being this function in charge of the entrepreneurs*. | Limitation of data |
| **11:**1 *Purpose of the Meeting: To know more deeply the organization and the manager; to identify strategic points for identifying the organization's problem*. | Limitation of data |
| **9:1** *In the first moment of the project, one hardly has an idea of the real problem of the company, but of the most superficial one.* | Limitation of data |

Source: developed by the authors

Figure 10 shows the network of fragments and codes identified related to the limited rationality of the Litma case.

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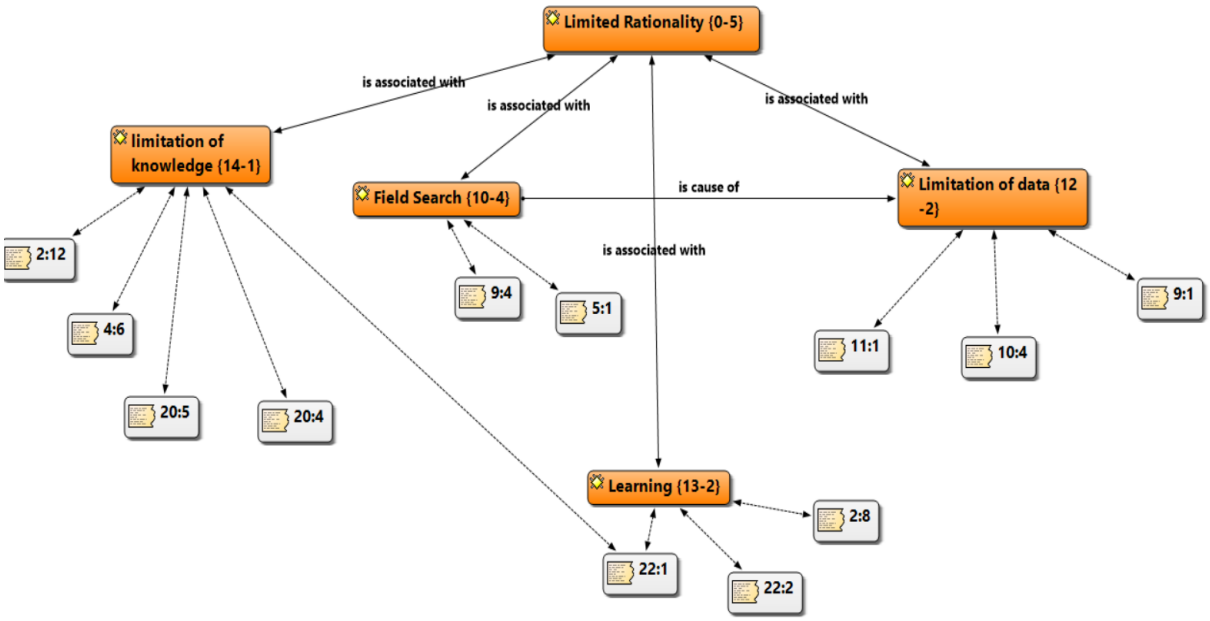
FIGURE 10 – Network of fragments and codes: limited rationality of the Litma case.




Source: developed by the authors

*4.3.2 Singularity*

The first outstanding code of the network of fragments is the values and preferences of the entrepreneur. In this sense, values are cultural and behavioral aspects that a given entrepreneur has, because of his/her path-dependence (Lacerda, 2017). Values are principles used for an evaluation, to evaluate the current situation or the consequences of the action or omission. Thus, the values are the goals, and the external and internal context provides the available resources that, once combined by the decision maker, become alternatives to the achievement of objectives (Keeney, 1996). Preferences are the attractiveness that a given decision-maker has in relation to his/her observation of the world, available resources, and unique objectives to the assessed context (Lacerda, 2017).

The 2:1 fragment highlights this issue from the speech of a member of the student team, where he thinks it is important to "take a step back to identify the product that Gustavo wants to work with and where he wants to go with it." Supporting this fact, we also highlight the fragments 10:6, 10:5, 7:5, 7:1 and 5:1 that present the team's precaution in always validating and developing the proposal according to the values and preferences of the managers of the company. In this sense, the adaptability code also represents the concern of the team from the singularity of the case. The 3:2 fragment highlights the fact of "researching the technique and adapting it to LITMA".

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Finally, it is possible to identify the relationship between the on-site search and search codes on the company. The fragments related to these codes (1:16, 1:17, 9:4 and 5:1) present the importance of the systematic collection of information about the company and the validation of the results obtained with the project progress. The fragments and codes are presented in Figure 11.

FIGURE 11 – Fragments of Litma case related to Singularity

| Fragment | Code |
|---|---|
| **2:1** *A student raises the question that it would be better to take a step back to identify the product that Gustavo wants to work with and where he wants to go with it.* | Decision maker values preferences |
| **10:6** *The assignment of the scales was done together with the entrepreneurs, since only they could determine for each of the indicators the limits between compromising, normality and excellence.* | Decision maker values preferences |
| **10:5** *Entrepreneurs defined the scales from the current situation of each indicator, taking into account the improvement that would represent the excellence and the worsening that would represent the compromising situation.* | Decision maker values preferences |
| **7:5** *Entrepreneur excluded some indicators and added new weights.* | Decision maker values preferences, Validation |
| **7:1** *Entrepreneur took out some indicators, and validated the scales and weights of some indicators. Some indicators were left to be defined with the other partner***.** | Decision maker values preferences, Validation |
| **5:1** *How to validate the criteria with LITMA? Visit the LITMA to validate the criteria and indicators***.** | Decision maker values preferences, Validation, Search |
| **9:10** *Before creating a report and chart, define a methodology: Do not leave the main concepts aside, and always develop your project by validating this with the client.* | Validation, Company Searc |
| **10:2** *All the proposals presented here were subject to the approval of the partners of the company.* | Validation, Adaptability |
| **9:4** *If possible all members should attend at least a technical visit***.** | Field Search, Company Sea |
| **1:17** *Interview with the entrepreneur.* | Company Search |
| **1:16** *LITMA Dossier Commission***.** | Company Search |
| **10:1** *Project objectives:* *Develop and implement a Research and Development (R & D) management system for LITMA, based on 10 indicators with their respective scales and weights. With the R & D management system in place, it will be possible to accurately measure the impact of R & D industry as LITMA's propulsion engine***.** | Adaptability |
| **4:8** *Build evaluation model: Identify the criteria;Construction of performance indicators; Define the weights of each indicator;Build scales;Identification of the current LITMA situation;Recommendations.* | Adaptability |
| **3:2** *Search the technique and adapt it to LITMA.* | *Adaptability* |

Source: developed by the authors

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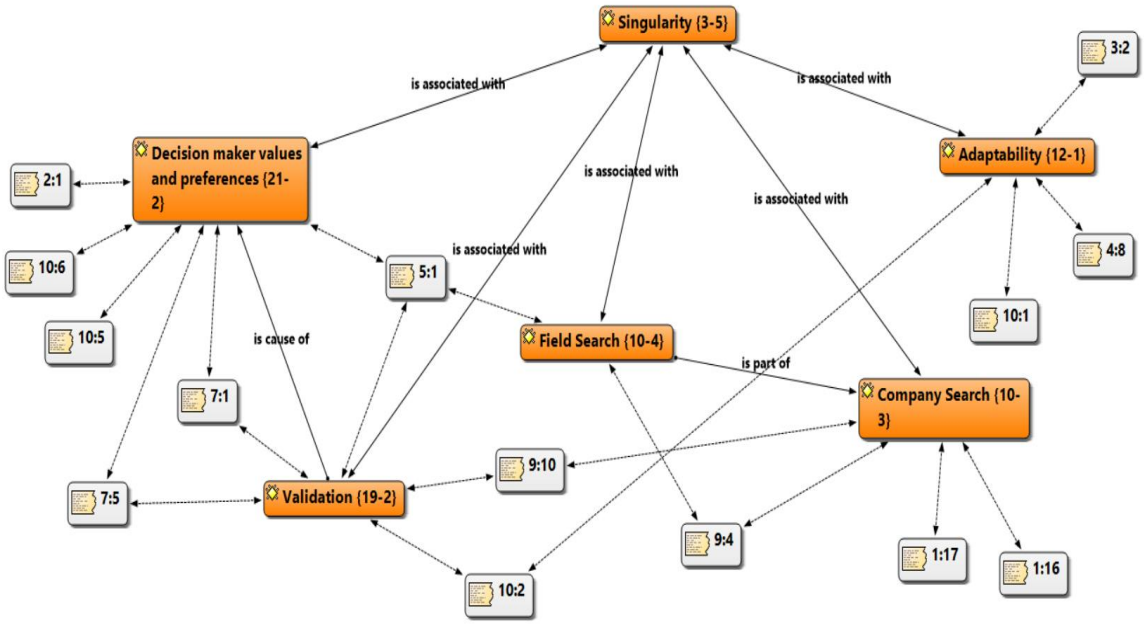
Figure 12 shows the network of fragments and codes identified related to the singularity of the Litma case.

FIGURE 12 – Network of fragments and codes: singularity of the Litma case.




Source: developed by the authors

## 5 DISCUSSION

The limited rationality is the absence of historical basis and criteria in the decision-making process (Marafon et al., 2015). Thus, building knowledge, both for the student and the entrepreneur, becomes an important factor during the project development process (Lacerda et al., 2014). In the cases presented, the limited rationality is related to the limitation of data and information regarding the company and the limitation of students' knowledge. The limitation of data and information of the company refers to the fact that the available information is imperfect and incomplete.

To overcome this implication of data limitation, students need to understand that because these companies are inserted in dynamic environments and rapid changes, it is not possible, in many situations, to identify the various variables and alternatives that should be considered in their analyses. However, from the data limitation associated with the knowledge limitation of the students, it was observed in the cases that initially, the students resort to the search for optimal and generic solutions to the problem from the scientific literature or similar examples.

There was also a recognition among students that the decisions they faced could hardly be solved by optimal solutions such as mathematical, economic or statistical models. On the contrary, what was observed during the three cases were situations where the participants and the facilitator teacher had to deal with diffused information and the certainty that they would not have the mechanisms, economic or financial resources to obtain the "correct" answer. When confronted with this type of situation, students with a more technical background and accustomed to solutions of mathematical optimization, sometimes found themselves in an uncomfortable situation.

In these moments of insecurity, related to limited rationality, students turned to the facilitator teacher as a source of answers. However, the facilitator teacher remained without objective answers, informing the students that the knowledge is the result of an action, by going to the field and conducting research. It is better for students to search for ways and methods so they could find answers by themselves and provoking their motivation to learn, instead of receiving all the answers from teachers and entrepreneurs.

Thus, it is important to point out that the project is characterized by the diversity of characteristics inherent to the object of study. In this scenario, students cannot always use the "roadmaps" of management manuals as a basis for decision-making, but rather for proposing recommendations to startups, they often have to create their own 'new roadmaps'. Also, in uncertain environments, many questions cannot be answered based on past company experiences. Aligned with the idea of continuous learning, it is perceived the importance of the entrepreneur as the figure responsible for directing the proposal of recommendations.

Singularity advocates that there are no optimal responses or universal responses that can be applied to solve the problem of an organization. This is due to the historical trajectory of the organization and the reaction that its manager will have in relation to the evidence and information obtained from the market and the study field. The nature of the business, the values and preferences of the managers and the informational resources were preponderant factors observed in the three cases.

In the project dynamics, by overcoming the limitation of knowledge and data, students then come to understand the singularity of the problem, which leads the group to decide more about on-site studies rather than generic bibliographic research on the problem or the search for similar solutions. This on-site monitoring brings the members of the company closer to the project team and helps make their processes more tangible for the group's understanding. Just as observed in the cases, the active participation of the company during the project is fundamental, it is from the information presented by it that the students obtain a subsidy to

identify the problem to be solved and which technique can be adapted to the context of the company.

From direct contact, problems are identified in an inductive way, and they focus mainly on the "why" of their research and not only on "what" and "how" questions. In this sense, based on the students' understanding of the singularity of the entrepreneur values and preferences and the inherent characteristics of the environment in which the companies are inserted, the research process implies an epistemological choice which eliminates traditional positivist paradigms. Choosing the constructivist approach means to affirm that the entrepreneur has a fundamental role, since he/she is the person who has the responsibility and the authority necessary for the decision making. In this way, the validations of the project assumptions occurred favoring argumentation with the entrepreneur instead of statistical or economic methods.

The participation of the entrepreneurs in the meetings enriched the discussion about the label of the project problem and made processes of decision making and validation of decisions more agile. Once the entrepreneur knows what is happening and participate on the preparation of the final product, he/she knows what to expect. Still, moments of reflexive questioning between the entrepreneurs and the team have appeared several times in both case studies, but because the project were based on objectives and particular criteria, the debate could mitigate uncertainties. Certainly, a model based on current literature for "organizations in general" would not fit the particularity of the context.

## 6 CONCLUSIONS

This article presented the initial results of a university entrepreneurship development program from an action learning approach. The article aimed to answer the following research questions: (i) What challenges does the academy face to improve critical thinking in its entrepreneurial students in an action-learning approach? and (ii) What are the reactions and alternatives that students present to the singularity and limited rationality in solving a problem? The article sought to present a parallel between the academic world and entrepreneurship, using theories related to entrepreneurship as a singularity and limited rationality.

Some results came through the three study cases. One of the difficulties presented by the students was the fear of failure, provoked by the search for an optimal and generic solution for the problem, typical of the traditional methods of learning. In this sense, it is important that students are encouraged to develop a critical sense and that knowledge is the result of an action. The singularity of the problem, along with the limitation of data and knowledge, led the group to decide more about on-site studies than generic bibliographic research on the problem or the

search for similar solutions. In this way, the challenges to be overcome emerge in an inductive way, that is, the students are in direct contact with the problem and must be proactive in proposing recommendations, stimulating critical sense, the ability to solve problems and the continuous learning. The moments of validation processes of the proposed recommendations proved to be important for the alignment between the expectations of the entrepreneurs regarding the delivery of the project.

In identifying these patterns of behavior, and based on practical evidence from the case studies, it is possible to observe that the dynamics proposed by the project stimulates the development of a practical vision of solving problems in students. The project allowed students to understand the dynamics of a startup, the challenges, and decisions in building a business model in addition to stimulating learning. Learning by action aims the student as the main agent of his knowledge development. It is necessary that the students are stimulated in a recurring way, and thus subsidize the necessary tools so that he/she can develop not only its theoretical knowledge but also its practical skills.

The article has limitations related to its research methodology. The results cannot be generalized, mainly due to the singularity of the contexts of the cases. As opportunities for future research, it is recommended to exemplify other cases of application of the proposed method, to identify other patterns of behavior, as well as a detailed synthesis of the main challenges faced by the students during the process. A transverse and longitudinal analysis of the cases is also possible, and the comparison and variations of the method applied in each case are presented.

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