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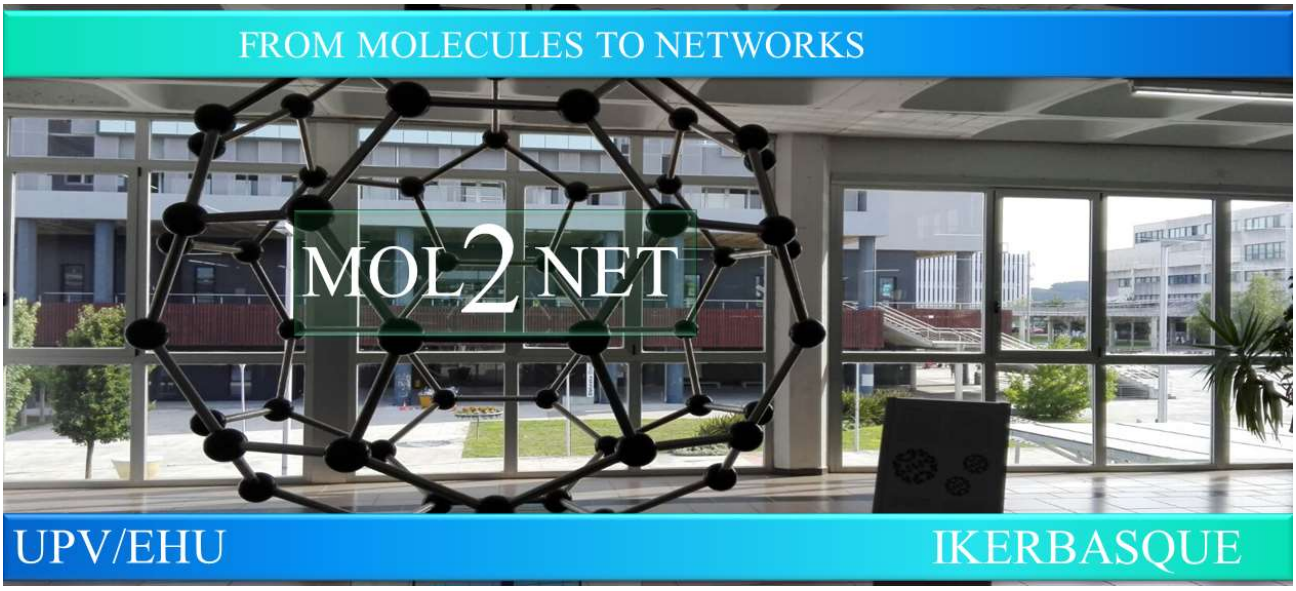

Multicriteria Methodology Based on Hierarchical Process Analysis (AHP) for the Selection and Evaluation of Companies in an Entrepreneurial Project Accelerator

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Graphical Abstract	**Abstract.**
• In Colombia, approximately 32% of new businesses die due to lack of mechanisms for planning and control. • Through business acceleration processes it is possible to promote these young companies to states of greater stability, however, it is necessary to determine which ones have greater growth potential. • The application of the multi-criteria analysis method provides a reliable solution to the objective decision-making process for the selection of companies with the best strengthening opportunities.	The objective of this article is to offer an objective methodological tool that helps to identify the most relevant criteria in the process of selection and evaluation of projects in business acceleration, supported using Super Decisions software. The Hierarchical Analysis of Processes (AHP), defined by Tomas Saaty, was used as a methodology, taking as a framework of analysis an accelerator in operation at the time of the research. The results indicate that the AHP is reliable for selecting and evaluating initiatives and provides flexibility for defining the importance of the criteria according to expert judgment.

Introduction

In the dynamics of current entrepreneurship, various projects are continually presented to public or private support organizations, to obtain financing or advice for their development (Arízaga et al, 2017). However, the limitations of human and economic/financial resources of this type of entities, makes it necessary to carry out a prior evaluation of all the proposals that are registered, to select those that have the greatest probability of success.

The acceleration of technology-based business projects (*Startups*) is an area currently on the rise, which recently presents an important development in the field of entrepreneurship, generating a growing production of articles in the academic literature (Tasic et al, 2015), that have aroused the interest of the scientific community in order to provide a better understanding of the processes, structures and paradigms that best fit this trend in the field of entrepreneurship (Wenzel and Koch, 2018).

Being a growing area, the accelerators have tried to adapt to the new dynamics, but, according to observations by experts in the area, they still have weaknesses in the theoretical and methodological models for selecting and evaluating alternatives, which is why making efforts to create mechanisms that aim to overcome these shortcomings (Bondarenko et al, 2019; Nikoloudis et al, 2017). This represents an enormous challenge for those responsible for deciding in which of these companies the available resources should be invested, considering that, sometimes, the latter are not as extensive as desirable. In this order of ideas, the subjectivity to define the relevant criteria for the decision has been the subject of debate in academic publications, given that support points are mostly presented in qualitative methods, which can lead to involuntary errors or unexpected results.

By virtue of this, it can be said that in the decision-making process there are multiple aspects that must be considered to select the best options (Kochenderfer, 2015). This being the case, it is essential to clearly define the most important criteria that contribute to determining the most convenient alternative. However, given the wide range of implicit variables and the complexity of the selection procedure, theorists have designed scientific methodologies that provide reliable and objective results, among which multi-criteria methods can be highlighted (Govindan et al, 2015).

The theoretical review indicates that there are various multicriteria decision making methodologies (MCDM) for decision support, among which it is worth mentioning: those based on fuzzy logic (*Fuzzy logic*) (Nallusamy et al, 2016; Van et al, 2016); those of classification, such as *PROMETHEE, ELECTRE, GRIP* (Roy and Słowiński, 2013); and the one developed by Saaty (1990; 2008) known as *Analytic Hierarchy Process* (AHP), widely used in different areas of knowledge.

For this reason, the article that is presented seeks to offer an objective methodological tool that helps to identify the most significant criteria in the process of selecting and evaluating projects, whether they are technology-based (Startup) or not, depending on the gap found in literature covering both segments. The previous approach is based on the findings of Luo and Ying (2018), who state that only 3% of the proposals presented to the accelerators are accepted, excluding 97% of the initiatives, causing that, in many cases probably viable, the necessary support for its implementation is not available.

Super Decisions software is used,which is based on the AHP method built by Saaty (1990; 2008). It is worth noting that, with respect to other existing tools, the aforementioned program provides the necessary analytical structure to carry out the decision-making process, without the user having to know in depth the calculation and technical elements of the AHP model; on the other hand, by having a free and open access license, it can be replicated by other accelerators that have similar difficulties to those raised in this study, making the proposed solution scalable to other contexts.

Although MCDM methodologies have been implemented in acceleration processes, specifically in the selection and evaluation of projects, it is not evident that this type of methodology has been applied in accelerators that oversee heterogeneous initiatives, that is, with grassroots enterprises. technological (Startup) and traditional, this element being one of the main contributions to knowledge.

Materials and Methods

The theoretical foundation of this article is based on the methodology designed by Saaty (1990; 2008), which is aimed at supporting the decision-making process. The AHP method has been recognized as one of the most useful instruments to use when it is necessary to determine the most viable option among many alternatives (Emrouznejad and Marra, 2017)

The article is approached from a quantitative approach, expressed by Barnham (2015) as a set of methods that allow showing the reality or phenomenon of interest based on numerical and statistical indicators, that is, from a measurable and verifiable perspective. In this sense, the aim is to apply the AHP model to the evaluation process of the initiatives presented in the accelerator under study, to verify if this procedure offers greater clarity about the key criteria and the projects that should be accepted.

Consequently, initially a characterization of the projects registered and accelerated in an operating accelerator is carried out (the commercial name is kept confidential in respect of the data use law in force in Colombia) that participated in the process (6 reference calls) , taking into account their age in the market, sales levels, number of employees and sector; whose purpose is to present a general perspective of the management of the accelerator in recent years. The statement was based on a statistical analysis carried out in the SPSS software, version 24, where the data of the projects assigned and effectively accelerated during 2017, 2018 and 2019-I were tabulated; Likewise, the number of projects registered and attended in general during the same period was studied.

With respect to the AHP method, the selected projects were compared, likewise, it is proposed to address three types of decision levels in the methodology, namely: a) ready to start

the acceleration process; b) those that partially meet the requirements; and c) those that cannot be accelerated, but that, with support, would probably be incorporated in other calls.

It is important to point out that the objective of the AHP method is to offer the best solution based on the criteria predefined by the experts and the weights that they assign to each one. The latter is relevant to define in order to understand the interpretation of the procedure output.

Proposed methodology

For Grajales, Serrano & Hahn (2013), a multicriteria decision support methodology refers to a series of rules, axioms, procedures, guidelines, standards, which are designed to support decision makers during the stages of the process, with a view to guaranteeing an objective, efficient and effective process. In this sense, in this research the IBM data science methodology was followed (Rollins, 2015); in such a way that, within this framework, reference is made to the characteristics of the selected data, their compilation, their cleaning, the analysis of the variables and their interpretation; in relation to which, below, the CRISP DM methodology is presented:

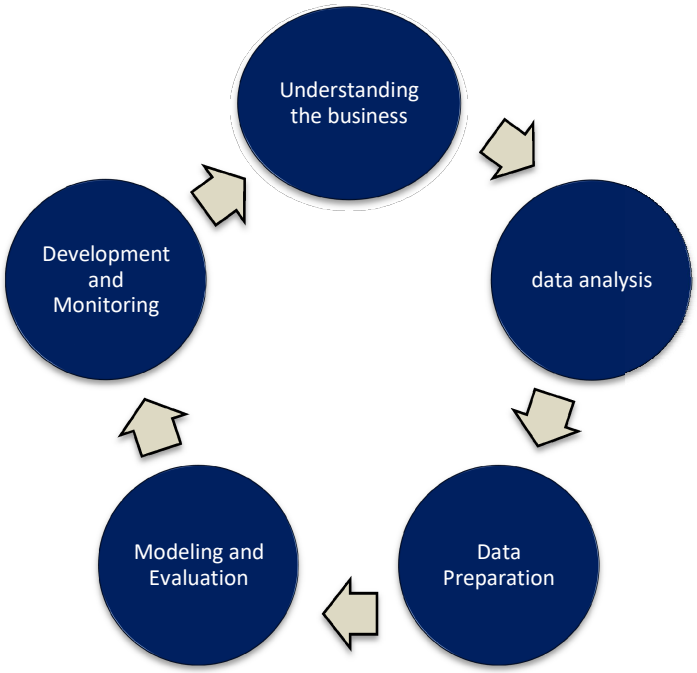

Fig.1.CRISP DM Methodology

This is how the IBM methodology is organized in ten stages that represent an iterative process (Rollins, 2015); In this regard, data science frequently tends to follow a general process that includes data collection, cleaning, analysis, and modeling, allowing its visualization and reporting (Phethean et al, 2016). In this sense, in data science, the figures obtained are processed differently from traditional databases, so it is necessary to apply a methodology to extract the necessary information or knowledge from them. In fact, the use of a methodology allows engineers to develop tests and thus lead to more efficient models (Murphree, 2016).

Consequently, the proposed proposal presents a decision support methodology, confirmed by three phases: phase I: decision and conceptual structure, phase II: registration of information on alternatives, phase III: evaluation and selection of alternatives. Figure 1 illustrates the scheme of the proposed methodology with its respective phases, which are described later.

It is important to state that, although the structure of a methodology is presented, it is flexible in terms of adjustments in: criteria, sub-criteria and scales, an aspect that guarantees the extrapolation of the methodology and its flexibility to be implemented in scenarios where It is necessary to apply adjustments to these factors, depending on the economic, cultural, social, political, and other conditions considered by the decision makers.

Based on the above, the *Super Decisions software* by Thomas L. Saaty (1926 - 2017) was used for the application of the methodology, with the decision implementation structure shown in figure 2.

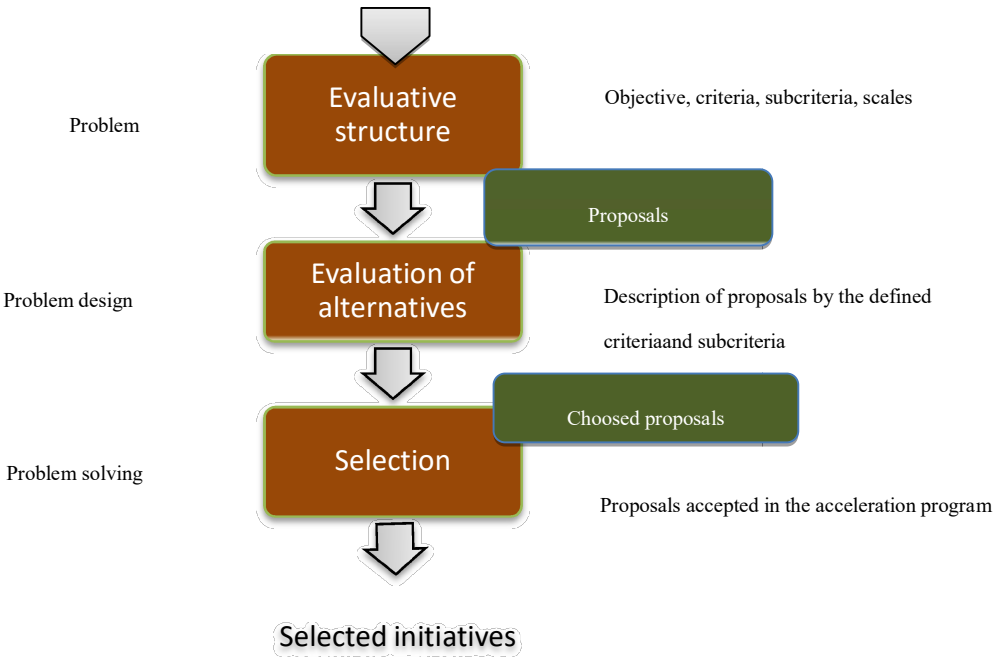

Fig.2. Graphic structure of the proposed methodology

Figure 2 presents in its initial part the evaluation and selection of initiatives (evaluation structure) as a problem of multi-criteria definition, before which the decision-making team must establish an objective, define the criteria, sub-criteria,scales, and initiatives to be evaluated. Within the framework of this proposal, these aspects will be defined in Phase I: Definition and conceptual structure.

Next, for the purposes of this research, the evaluation of the initiatives is contemplated as a multi-criteria evaluation problem; Based on this, it should be considered, within a group of initiatives and a series of defined criteria and sub-criteria, the establishment of scores (alternative evaluation), objectively, for each alternative presented.

Finally, the selection of the best evaluated initiatives is proposed as a multi-criteria selection problem (selection), given that the most pertinent ones must be chosen against a

proposed group. In this sense, it is proposed to select, according to the results obtained, the level of order of preferences and the budgetary resource that the accelerator has to invest. Consequently, the commented phases are detailed below.

Phase I: definition and conceptual structure

The proposed methodology is based on the evaluation of the alternatives to develop a logical and effective selection process; In this way, the criteria and sub-criteria were defined, at levels associated with the degree of complexity identified, defining preference levels for both aspects. Similarly, the methodology contemplates alternatives that must be evaluated against the criteria or sub-criteria that are defined in the proposal.

Next, the criteria, sub-criteria and evaluation scales to be used in the applied methodology were considered, which were considered according to the following logical actions: a) review of the literature; b) validation by decision makers in acceleration processes, action developed through unstructured interviews with the people in charge of this process; and c) a data analysis process through which the behavior of the evaluators and criteria was determined in a real evaluation process in an accelerator under study.

In accordance with the above, the following criteria (C) were defined:

- **C1: Profile and experience of the entrepreneurial team:**Describes whether the profile and experience of the entrepreneurial team demonstrates the capacity for the business to be sustainable over time; especially if they have work experience in areas that respond to the needs of the enterprise. Additionally, it must be validated if the team is flexible, that is, it does not resist change and is willing to let itself be guided.

- **C2: Knowledge of the market:**Evaluates to what extent entrepreneurs understand the market in which they are developing their business.
- **C3: Description of the initiative:**Description of how the initiative is formulated and its elements as a sustainable business over time.
- **C4: Pitch:**It is evaluated at the moment that the entrepreneurs make the pitch of their venture to the group of juries.

Thus, for criteria C1 and C3, subcriteria (S) were determined, which were defined as follows:

- For criterion C1, the following:
    - S1C1 - Time Commitment and Disposition
    - S2C1 - Teambuilding
    - S3C1 - Experience in entrepreneurship
    - S4C1 - Previous experience in the business
- For criterion C3, the following sub-criteria were considered:
    - S1C3 - CostStructure
    - S2C3 - Minimum Viable Product-PMV and growth potential
    - S3C3 - Valueproposition
    - S4C3 - Business Sustainability
    - S5C3 - Sales

For these defined subcriteria, scales were determined; for criteria C2 and C4 it was not necessary to establish subcriteria, given that, due to their conceptual nature, it was more relevant to directly establish evaluation scales, as will be seen later.

Within the evaluative structure, the levels of preference or importance between criteria were established: criterion C1 Vs criterion C2, criterion C1 Vs criterion C3, criterion C2 Vs criterion C3. In the same way, between the subcriteria of each of these criteria, the levels of importance were defined (subcriterion (Sn) of the criterion (Cn) Vs subcriterion (Sn) of the criterion (Cn). Finally, the scales for each subcriterion were established. by defined criteria, the results are shown in Table 2.

Table 2

Items for entrepreneurs and teams of entrepreneurs applying to the accelerator under study

Criterion	subcriterion	Importance	subcriterion	Qualitative definition
C1 - Profile and experience of the entrepreneurial team	S1C1 -Time Commitment and Disposition	6	S2C1 -Team Building	S2C1 - Team building is of considerable importance vs. S1C1 - Time commitment and disposition
	S1C1 -Time Commitment and Disposition	7	S3C1 -Experience in entrepreneurship	S3C1 - Experience in entrepreneurship is very important compared to S1C1 - Commitment of time and disposition
	S1C1 -Time Commitment and Disposition	7	S4C1 -Previous experience in the business	S4C1 - Previous experience in the business is very important compared to S1C1 - Commitment of time and disposition
	S2C1 -Team Building	two	S3C1 -Experience in entrepreneurship	S2C1 - Team building is more important, but (low) compared to S3C1 -

Criterion	subcriterion	Importance	subcriterion	Qualitative definition
				Experience in entrepreneurship
	S2C1 -Team Building	two	S4C1 -Previous experience in the business	S2C1 - Team building is more important, but (low) vs. S4C1 - Previous business experience
	S3C1 - Experience in entrepreneurship	1	S4C1 -Previous experience in the business	S3C1 - Experience in entrepreneurship is equally important compared to S4C1 - Previous experience in the business
C3 - Description of the initiative	S1C3 - Cost Structure	5	S2C3 – Minimum viable product-PMV and growth potential	S2C3 - Minimum Viable Product-MVP and growth potential is important vs. S1C3 - Cost Structure
	S1C3 - Cost structure	6	S3C3 - Value proposal	S3C3 - Value proposition is of considerable importance compared to S1C3 – Cost Structure
	S1C3 - Cost structure	3	S4C3 - business sustainability	S4C3 - Business sustainability is moderately important compared to S1C3 - Cost structure
	S1C3 - Cost structure	9	S5C3 - Sales	S5C3 - Sales is extremely important vs. S1C3 - Cost structure
	S2C3 - Minimum viable product-MVP and growth potential	3	S3C3 - Value proposal	S3C3 - Value proposition S2C3 - Minimum Viable Product-PMV and growth potential
	S2C3 - Minimum Viable Product-PMV and growth potential	3	S4C3 - business sustainability	S2C3 - Minimum viable product-MVP and growth potential is moderately important compared to S4C3 - Business sustainability

Criterion	subcriterion	Importance	subcriterion	Qualitative definition
	S2C3 - Minimum Viable Product- PMV and growth potential	3	S5C3 - Sales	S5C3 - Sales is moderately important vs. S2C3 - Minimum Viable Product - PMV and growth potential
	S3C3 -Value proposition	5	S4C3 - business sustainability	S3C3 - Value proposition is important compared to S4C3 - Business sustainability
	S3C3 - Value proposal	1	S5C3 - Sales	S5C3 - Sales is equally important vs. S3C3 - Value proposition
	S4C3 - business sustainability	3	S5C3 - Sales	S5C3 - Sales is moderately important compared to S4C3 - Business sustainability

Phase II: evaluation of alternatives

Considering the methodology as a systematic process, phase II seeks for the decision maker to proceed to the evaluation of the initiatives, establishing a weighting for each defined criterion and sub-criterion, considering this aspect as a multi-criteria evaluation problem, to which a solution is provided. through this methodology.

In this phase, the decision maker must consider the characteristics of the company, the validated information that it provides and, based on this, must establish, for each criterion and sub-criterion, the weighting scale that corresponds to it. It is important to note that the methodology seeks, unlike other forms of evaluation, for the decision maker to establish quantitative logical definitions for each of the criteria and sub-criteria, an aspect that is achieved by establishing the scales mentioned in the previous phase and illustrated in the case study, where the use of this scheme is described in detail.

At a practical level, the process of evaluating alternatives of this methodology is designed so that, during the Pitch and after verifying the documents that certify the information, the decision maker defines for each criterion and sub-criterion the value that corresponds to the company. ; process that merits dialogue between the exponent and the decision maker, to the extent that, in most cases, it is necessary for the decision maker to clarify a specific topic or request an extension of the established information, therefore it is not possible that it can only be based on data recorded in the registration process. Additionally, the Pitch allows validating qualitative aspects concerning the exhibitor's soft skills, such as the communication or explanation of the initiative; crucial aspects when exposing your initiative to angel investors.

In this sense, this phase addresses the definition and conceptual structure of the evaluation process as a multi-criteria evaluation problem, since, from the definition of the criteria, sub-criteria, the levels of preference, importance and scales must be considered in an organized manner., objective and logical. This is a necessary and important decision aspect to guarantee that the evaluation process of the alternatives (initiatives) can be carried out correctly, so that the result of the evaluation process is correct, regarding the criteria to be considered. evaluate.

This class of multi-criteria evaluation methods aims to capture the determination of a decision maker against a series of criteria previously determined by a decision maker. Among the most used methods for classifying and establishing project hierarchies is the Analytic Hierarchy Process (AHP), on which this model was based to analyze the methodology with data from an accelerator.

In the case of this methodology, the use of the *Super Decisions program is recommended* within the framework of the AHP model, for the development of the evaluation process. In this

sense, the methodology has been proposed according to what was described in phase I. The evaluation process of the initiatives is contemplated in two scenarios, in accordance with this methodology: the first scenario establishes that the decision makers evaluate each company according to the data, information and evidence obtained from the registration process developed by the applicants. In this case, decision makers can develop an objective evaluation process according to what is evidenced.

Likewise, this process must be carried out at the same time among all the evaluators and in the same space (virtual or face-to-face, or combined), with the objective that they can debate against any particularity that is not very clear in the analysis; although in any case it is not expected that all of them reach the same conclusion due to the effects of interpretation in some criteria or sub-criteria; however, the level of dispersion of the scores is expected to be as low as possible, with the defined scales.

That valuation developed in this scenario must be preserved while the second scenario is started, which is executed during the Pitch process, considering changes in the initial valuations, if deemed convenient and establishing the scores of those criteria or sub-criteria that correspond in that moment. In this space it is possible to develop adjustments, since the entrepreneurs will be able to detail some aspects of the initiative and answer questions from the decision makers, whenever they consider it.

The evaluation process ends once the score has been generated for each criterion and/or sub-criterion, and immediately, the hierarchical order of the initiatives to be selected is listed; In this sense, the selection process proposed in this methodology is described in Phase III: Selection of alternatives.

Phase III: selection of alternatives

Multi-criteria decision problems culminate once the decision maker has a record of the most effective solutions, represented in a hierarchical manner. Although the decision maker has the set of the most effective solutions, another new decision problem is presented, focused on deciding among these proposed solutions, which are the most acceptable considering the multiple criteria or the objective defined in the problem. of decision, however, the decision maker will select one or a set of alternatives that promise effective solutions, thus configuring a multi-criteria selection problem.

The identification of initiatives suitable for acceleration processes is not a simple process, since it implies modeling the preferences of the decision maker through a process of comparison between criteria and sub-criteria, scales at the level of importance between these. Additionally, it implies a confrontation between alternatives to determine against the criteria which would be the best.

In this phase, the aim is to support the decision maker in the selection of the best initiatives with the best profile to be accelerated, or on the contrary, to be discarded, for which the present methodology intends that an organization be obtained because of the evaluation process. hierarchical according to the score obtained, and according to the budget that the accelerator has, the process time or another variable that it considers, it will be able to select the initiatives in descending order; having clarity that the present methodology considers as best, the first in the generated list.

Results and Discussion

Analysis of the application of the methodology in a case study

Next, the results of the analysis of the data presented by a real accelerator, during the years 2017 and 2018, are presented. Among these, the characteristics of the promoted projects are studied, to subsequently expose the application of the AHP methodology in the evaluation of the initiatives.

Accelerator Company Context

The accelerator company is an organization dedicated to providing services and carrying out business acceleration processes for startups in Colombia. It develops processes aligned to the Lean StarUp and Model Canvas Business in such a way that consulting, and support processes are provided for local entrepreneurs. These carry out their process based on a comprehensive accompaniment by experts, to achieve the development of soft skills in which three actors participate:

a) Mentors

b) Teams of entrepreneurs and businessmen

c) Thematic advisers

Due to the above, the target population of said accelerator is directed towards the following subjects:

- Teams of entrepreneurs and businessmen: they are teams with an established business idea, which must necessarily have a differentiating factor with respect to the same or similar businesses in the market, where members are aware of their potential customer segment, their cost structure, and a monetization approach.

- Entrepreneurs: those who have a formal or informal production unit, developed processes, products, or services, as well as the potential to innovate. Similarly, these entrepreneurs must have verifiable income, have products or services with potential for growth and sustainability, in addition to a defined cost structure.

In this sense, the criteria that characterize each of the two groups are detailed in Table 3.

Table 3 Items for entrepreneurs and teams of entrepreneurs applying to the accelerator under study

Businessmen	Entrepreneurial teams
Each team will select a leader who will be the initial contact person during the pre-selection and selection process.	Each team will select a leader who will be the initial contact person during the pre-selection and selection process.
Companies may or may not be registered with the Chamber of Commerce	At least one of the team members must have experience in developing the business idea.
Team members must all be of legal age.	Team members must all be of legal age.
The weekly face-to-face availability for the development of the mentoring process of each team must be a minimum of three hours a week.	The weekly face-to-face availability for the development of the mentoring process of each team must be a minimum of three hours a week.
The business idea must be viable and legal. The business must be viable, lawful and stand out in the market.	The business idea must contain one or more differentiating or innovative elements compared to those already existing in the market.
Fill out the accelerator registration form	Fill out the accelerator registration form
At least two team members must have experience in the business.	Have defined what will be the cost structure to start the business.
The business must contain several differentiating elements in relation to direct and potential competitors.	Clearly define how you intend to monetize or generate income.
Define what the value proposition of the business is (the reason why the customer pays).	Specify the segment in which they intend to operate.
Have at least one product or service with growth potential in the market.	
Demonstrate sales in the last six months.	
Have a defined cost and expense structure.	

Thus, the selection process used by the accelerator is fulfilled in relation to the phases described in figure 3.

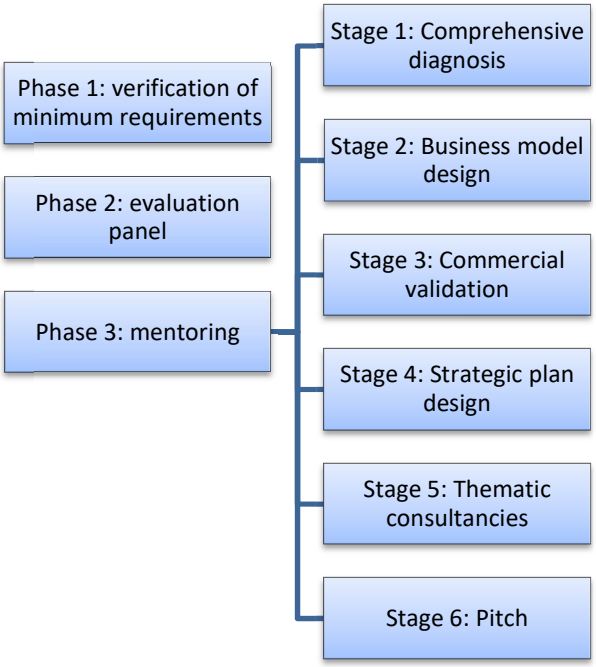

Fig. 3. Customer selection process in the accelerator company

Now, in the accelerator studied, the projects attended in the period between 2017-2019 (1st semester) are taken as a reference. The foregoing demonstrates the need to carry out an objective selection process that maximizes the results of the applicant companies. In relation to what has been described, the way in which the proposed multi-criteria methodology can be applied to the selection process in the accelerator under study is presented below.

Characterization of accelerated companies

During the years 2017, 2018 and 2019-I, 36 projects were accelerated in the organization under study, among which 14.7% were technology-based (web*platforms,* mobile *apps*) and

85.3% were distributed in the sector traditional, the most representative being gastronomy (23.5%), services oriented to the needs of the home and industry (17.6%), among others. Next, table 4 shows the evolution of the initiatives registered every six months and those attended.

Table 4 Companies nominated vs. selected in the calls (2017 to 2019)

developed call	Postulated Alternatives	Selected Alternatives
2017-I	67	10
2017-II	53	9
2018-I	76	9
2018-II	86	8
2019-I	70	9
2019-I	133	9

According to the data presented, an average of 15.8% of the projects registered during 2017 and 2018 have been accelerated, translating into an average attention of 11.11%. On the other hand, table 5 summarizes the main characteristics of the micro and small companies that receive advice from the accelerator under study.

Table 5 Characterization of accelerated projects during the 2017-2018 period

Parameter	micro company	Small company
Antiquity	3.55 years	6.73 years
Sales 2017	$63,344,417	$845,000,000
Sales 2018	$129,896,968	$895,000,000
Jobs	4.67	8

Note: Data provided by Accelerator under study, 2018

It is observed that micro-enterprises have been operating in the market for about four years, managing to double the sales margin between 2017 and 2018. For their part, small companies

have about 7 times more income than micro-enterprises, operating with three more employees on average and at least 3.18 years difference in terms of business operations.

4.2.3. Application of the AHP method to projects of the accelerator under analysis

Following the procedure defined by Saaty (1990), a first cluster was created whose main objective was the proper selection and evaluation of the projects presented to the accelerator; then a second cluster was defined with the fulfillment of seven parameters chosen by the accelerator, within the criteria and sub-criteria established in a preliminary phase; At this stage, according to the methodology detailed in previous sections, it should be remembered that the concept of Pitch must be treated as a fixed parameter, for which reason it will not be included in the subsequent phases of evaluating the criteria. Finally, in a third step, the three projects chosen for the case study, previously described in the methodological section, were established as alternatives (A1, A2 and A3). Table 6 shows the description of the criteria indicated above.

Table 6 Alternative evaluation criteria

Criterion	Description
Previous experience	One or more team members have prior experience in the business.
market knowledge	The team has knowledge of the market, defines its target segment, and knows its competition.
Value proposal	The team has a clear, differentiating, and innovative value proposition.
Minimum Viable Product	The team has a minimum viable product or service that responds to clear market opportunities, with potential for growth in the market.
Costs and expenses	The team has defined the structure of costs and expenses of the business operation

Criterion	Description
Sales	The team shows sales in the last six months.
Sustainability	The team is clear about how to generate income to make a sustainable business.

From the above, the hierarchical network was configured, where the relationships between the parameters of the decision are established; Subsequently, the weighting assignment procedure is started according to the Saaty scale (1990), as indicated by the AHP method, obtaining the criteria matrix, which shows the weight in importance of each of these elements, summarized in table 7.

Table 7 Criteria matrix (data provided by accelerator's DM).

Criterion	normalized [to]	not normalized
C1 - Previous experience	0.117	0.553
C2 - Market knowledge	0.211	1,000
C3 - Value proposition	0.182	0.865
C4 - Minimum Viable Product	0.155	0.734
C5 - Costs and expenses	0.091	0.432
C6 - Sales	0.085	0.405
C7 - Sustainability	0.160	0.758

The non-normalized value is the product of matrix multiplication calculations using the AHP process. The normalized value indicates the conversion of non-normalized data whose sum is 1.

It is seen in this first outing of the *Super Decisions software*that, once the weighting of the criteria between peers was established, it was obtained that the most relevant are: Knowledge of the market(0.211), Value proposition (0.182) and Sustainability (0.160), as shown in the column of normalized values.

On the other hand, the Consistency Ratio (RC) is one of the assumptions that must be met in the AHP methodology, since it indicates the degree of reliability of the weighting carried out. In this case, a CR = 1.30789 was reached which, according to Saaty (1990), can be considered as correctly weighted. Once the criteria and their relevance based on the objective were defined, a third step consisted in evaluating the importance of the alternatives with respect to each of the seven criteria versus each of the three projects analyzed.

Selection process

The result of the previous procedure allows defining the relevance of the criteria, based on the initiatives presented in the accelerator, given that in the real scenario there are projects where certain criteria should be given greater importance according to the nature of the initiatives. For example, in a traditional company, the same weight should not be given to the Minimum Viable Product parameter.(C4), in comparison with a technology-based initiative, since in the latter it will be essential for customers to interact quickly with the prototypes that come onto the market while the corresponding improvements are incorporated. Having established the foregoing, finally the AHP method shows the alternatives that are most relevant for decision making, according to the criteria and weights made.

Evaluation process

The emphasis of this study lies in being able to determine the optimal option based on a set of pre-established criteria, in order to decide in which, project the investment of resources may be more relevant. In this sense, the procedure exposed in the previous section only indicates the preponderant initiatives, and for this reason, it is then necessary to carry out an evaluation to definitively determine which one is the best.

Consolidated below, Figure 4 presents the correlation analysis between evaluators and the criteria where there were greater and lesser disagreements by decision makers. However, it became necessary to consolidate the entire list of results to generate a global focus on all the correlation presented throughout the 6 (six) calls.

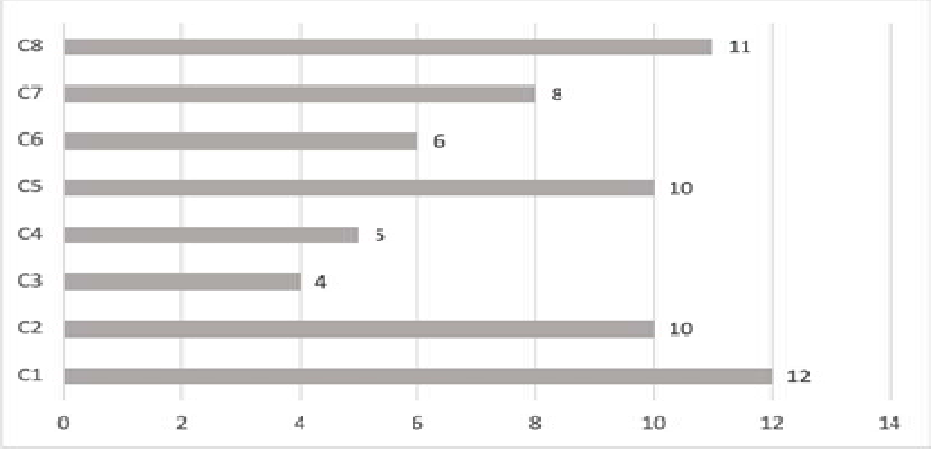

Fig. 4. Criteria with number of times r < 0.05 in the six calls

Figure 4 shows that the criteria where the evaluators presented higher correlations below 0.05 in C8 and C1 respectively. Each criterion was evaluated 18 times. In the case of C1: Team experience; 67% of rater correlations were below 0.05. The other two criteria where the discrepancies were also significant were: C5: The team has defined the cost and expense structure of the business operation and criterion C2: Market; both with 55% of times in which the correlation was less than 0.05.

In this sense, the consideration that the criteria did not contemplate evaluation scales, as was stated in one of the analyzes previously, the decision makers were able to establish evaluation judgments that in some cases for the initiatives could not be quantitatively close. Regarding criterion C8: Clear, concise, and sufficiently exposes all the relevant points of

evaluation (pitch), 61% of the times that the evaluators evaluated this criterion, the correlations were below 0.05

Conclusions.

The findings of this article expose the usefulness of the AHP method, developed by Saaty (1990), in the context of decision making. In the first place, it offers a procedure that allows defining the importance of the key criteria that intervene in the choice of a series of alternatives. In this regard, Mardani et al (2015) confirms that the AHP and, in general, multi-criteria analysis techniques, are one of the most used references to achieve significant improvements in the selection of options in complex environments.

On the other hand, Nikoloudis et al (2017) focus their attention on the establishment of criteria such as financial benefits, the entrepreneurial team, and the market/product, which is consistent with what is reported in this document. Likewise, Lee (2017) states that the critical success factors for starting a company consist of: entrepreneurial spirit, innovation, technology, personal skills such as motivation and investment in technical development. Similarly, Khong-khai and Wu (2018) indicate that the elements associated with success are human capital, entrepreneurial ability, and innovation.

The foregoing confirms that these are the components that should be evaluated in depth in any entrepreneurial project to increase the chances of success, however, in some cases, such as those of the analyzed accelerator, the criteria are more oriented towards the product/service and market items. In this order of ideas, Durmuşoğlu (2018) performs an AHP analysis to determine the factors that should be used in project evaluation processes, determining that three of the ten

projects analyzed, which had already failed, were classified by the AHP method as the latest alternatives. The foregoing allows us to validate that this procedure increases the chances of rejecting a project that has little chance of succeeding.

It can be stated that the AHP is a reliable process for decision making, in turn, the *Super Decisions software* is an effective and simple tool to structure models that support those responsible for accelerators in the selection and evaluation of alternatives. Given the complexity and diversity of variables that come into play when carrying out this type of procedure, it is important to have proven and scientific methodologies, thus reducing the risk of accepting projects that do not meet the parameters that ensure its reception in a dynamic and increasingly complicated market for micro and small businesses.

In conclusion, the application carried out in the chosen business acceleration organization, allowed to establish that the results of the use of the proposed methodology, yield selections that meet the selection criteria and the weights that were previously defined by the evaluators, approaching with enough pinpoint the initiatives with the best growth opportunities and returns on investment.

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