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Navigating the Emotional Landscape: An Exploratory Study of Emotional Intelligence Factors on Brazilian Undergrad Students

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Abstract

The purpose of this research is to investigate the relationships between the five dimensions of Goleman's Emotional Intelligence (EI) on business undergrad students, using a scale to tap the construct. The methodology is divided into 3 stages: confirmatory analysis to validate the questionnaire, the core of the research which is the exploratory analysis of emotional intelligence factors on Brazilian undergrad students, and closing with a proposal of classification model to identify the EI profile of individuals according to the EI sub-factors found in the previous stage of the research. A convenience sample of 129 cases from a population of 250 was collected from the population of business undergrad students at a university located in São Paulo State, Brazil. The research identified that each of the five EI factors proposed by Goleman was empirically segmented into significative sub-factors without losing the original roots. Moreover, the building of a classification model according to the EI sub-factors can be used to evaluate the student's profile from time to time, during their school journey. Besides recognizing the significance of EI in business education, it

provides a reference point for more in-depth analyses of EI factors. With the proper knowledge of the students' emotional traits, the teachers can better understand their behavior profile and thus, will be able to get the most of them in the classes.

Keywords: emotional intelligence, Goleman, EI factors, Factor Analysis, K-Means Cluster Analysis

1. Introduction

Emotional intelligence (EI) is a social ability that allows a person to control his/ her own emotions and understand the emotions of others, which is essential for any professional ever, from general staff to those in management positions (Salovey and Mayer, 1990). In this sense, EI can be understood as a set of interrelated abilities that people possess to function in society, combining intrapersonal and interpersonal abilities (Law et al., 2004).

The world of business is no longer solely a domain ruled by cold, hard logic and quantitative analysis. In today's dynamic and interconnected landscape, emotions play a significant role in decision-making, team dynamics, and overall success. World Economic Forum (2023) identified needs to be addressed by education systems. This report highlights that employers have identified, as essential, various skills such as creativity, critical thinking, and problem-solving, and are placing increasing emphasis on interpersonal and social-emotional skills, as well as attitudes and values.

Mayer et al., (2008) state that the concept of EI has undergone a remarkable transformation in recent decades, and it has gained undeniable scientific credibility through extensive research. The Ability Model (Salovey and Mayer, 1990) defined EI as a set of learned abilities in perceiving, appraising, understanding, and using emotions effectively. Subsequent models, like the Trait Model (Bar-On, 1997) and the Mixed Model (Goleman, 1995), incorporated personality traits and social skills. This evolution underscores the multifaceted nature of EI, encompassing cognitive abilities, personality dispositions, and behavioral competencies.

So, why does EI matter for business undergrads? The answer lies in its demonstrably positive impact on various aspects of their lives:

- Academic Performance: Martins et al., (2017) and Van der Zee (2018) demonstrated a positive correlation between EI and academic achievement. A meta-analysis by Lopes et al., (2011) found that EI moderately affected various academic performance indicators. This connection can be explained by the role of EI in:

- Self-awareness: Students recognize their strengths and weaknesses, allowing them to tailor study strategies and seek help when needed. (Smith et al., 2008).

- Self-regulation: Strong emotional regulation skills enable students to manage stress and focus on academics. (Martins et al., 2010).

- Motivation: Bar-On's study (2006) showed that individuals with high EI demonstrate higher levels of intrinsic motivation and perseverance, challenging their academic success.

- Career Readiness: Employers increasingly recognize the importance of EI in the workplace. A 2018 study by The Conference Board (2019) found that 91% of HR leaders see EI as an important factor in hiring decisions. This is because high EI individuals exhibit:

- Strong leadership qualities: They inspire and motivate others, build trust, and effectively navigate conflict. (Bar-On, 2000).

- Effective communication skills: They actively listen, express themselves clearly, and

adapt their communication to diverse audiences (Goleman, 2012).

- Conflict resolution abilities: They find common ground and reach mutually beneficial solutions. (Mayer et al., 2008).

- Personal Well-being: Navigating the competitive and demanding world of business can be emotionally challenging. Strong EI equips students with the tools to:

- Manage stress: They maintain emotional balance even during demanding periods. (Martins et al., 2017).

- Build resilience: They bounce back from setbacks and maintain a positive outlook. (Bar-On, 2006).

- Maintain well-being: They develop healthy relationships and achieve a sense of satisfaction and fulfillment. (Goleman, 2011).

Furthermore, understanding the factors of EI is crucial to appreciating its impact on business students. Some of these factors are displayed in Goleman's model (1995). These factors work in syntony to create an effective emotional toolbox that enables students to navigate complex situations, build meaningful connections, and achieve success in various spheres of life.

This paper delves into the importance and impact of EI factors on Brazilian undergraduate business students. It explores the evolving understanding of EI and its multifaceted nature. Our study investigates the relationships between the five dimensions of Goleman's EI (1995) on business undergrad students, using a scale to tap the construct. An exploratory factor analysis was performed to examine the scale's factor structure.

2. Literature Review

2.1 Correlated Studies

Existing research on EI has been largely drawn from physiological research developments, educational-based research, and developments in the therapy field (e.g. Goleman, 1996; Steiner, 1997). Research on educational context has been more frequent since 2000 onwards, however less on business students. Three of these studies in this context are displayed below.

Rozell et al., (2001) conducted a study using a sample of 295 undergraduate business majors exploring the measurement an emotional intelligence to examine the factor structure of the scale. The primary purpose of their study was to empirically assess the efficacy of using emotional intelligence as a predictor of the academic performance of undergraduate business students. They started with the Goleman (1995) EQ test of a 137-item scale and ended up with 5 factors and a 51-item scale as a result of principal components factor analysis. According to them, each of the five components of emotional intelligence can greatly impact on the way an individual perceives and reacts to all types of organizational events. For example, self-regulation has a strong link to behavior choice because it encompasses self-control, adaptability, and self-monitoring within a situational context. In addition, components such as empathy and motivation can shape the way individuals perceive events and indirectly affect a responsive behavior choice.

Rahin and Psenicka (2002) investigated the relationships of Goleman's five dimensions of EI, using a sample of MBA students in seven countries, from supervisors to subordinates' strategies of handling conflict: problem-solving and bargaining. Their findings suggest that self-awareness is positively associated with self-regulation, empathy, and social skills; self-regulation is positively associated with empathy and social skills; empathy and social skills are positively associated with motivation; which in turn, is positively associated with problem-solving strategy and negatively associated with bargaining strategy.

Zawdzki et al., (2023) aimed to answer to what extent these future leaders are uniformly equipped with essential emotional intelligence competencies, using a sample of 120 business students of various programs in Poland. Their TEI (trait emotional intelligence) distribution is significantly different regarding the type of program of study. Students of "social fields" (Management, Communication, and Psychology in Business) show higher TEI than students of "analytical fields" (Economics, Finance and Accounting, Logistics).

2.2 An overview of Emotional Intelligence models and factors

According to Neubauer and Freudenthaler (2005), we face several conceptual approaches to modeling EI, which are roughly classified either to the ability or the trait/mixed model domain. The importance of distinguishing- in two fundamentally different types of models is apparent. These two types of models have been assigned different labels, for example, ability versus mixed EI models. Whereas models of the first type refer to EI strictly as an ability construct, models of the second type allow for a much broader combination of diverse (partially older and well-established) personality traits under the umbrella term.

As the concept of EI has evolved, diverse models have emerged, each emphasizing different aspects and factors. They are separated below between classic and current models:

2.2.1 Classic Models

- Ability Model

Salovey and Mayer (1990) define EI as a set of learned abilities: perceiving, appraising, understanding, and using emotions effectively:

- Perceiving emotions: Accurately recognizing emotions in oneself and others (facial expressions, tone of voice).
- Appraising emotions: Understanding the meaning and causes of emotions.
- Understanding emotions: Knowing how emotions change and relate to each other over time.
- Using emotions: Managing emotions to achieve goals and guide behavior.

They proposed the first published, formal concept of EI as a guiding framework for the integration of an exciting but scattered body of research on individual differences in the capacity to process, and adapt to, emotional information (Neubauer and Freudenthaler, 2005). Finally, Mayer and Salovey (1993) contend that EI should not be considered as a collection of

socially desired personality traits and talents, but rather as an intelligence that enhances the processing of certain types of information.

- Trait Model (Bar-On, 1997)

This author views EI as a broad construct encompassing personality traits, abilities, and self-perceptions related to emotions. It has five main factors:

- Intrapersonal: Self-awareness, emotional self-regulation, self-motivation.
- Interpersonal: Empathy, relationship management, social responsibility.
- Adaptability: Stress management, reality testing, flexibility.
- General Mood: Optimism, happiness, well-being.
- Stress Management: Stress tolerance and impulsive control.

Bar-on's model required a new assessment tool. To assess his 1997 mixed model of EI, he developed the Emotional Quotient Inventory (EQ-i) which consists of 133 items.

- Mixed Model (Goleman, 1995)

The term mixed describes the fact that EI is viewed as a collection of (partially already well-known) abilities and non-ability traits.

Goleman's model integrates elements of both ability and trait models, viewing EI as a combination of learned skills and innate dispositions. It Identifies five main domains:

- Self-awareness: This involves recognizing one's own emotions (Salovey and Mayer, 1990), strengths, and weaknesses, and personal values and goals (Bar-On, 2000).
- Self-regulation: The ability to manage emotions constructively and delay gratification, stress management, and being flexible (Bar-On, 2000).
- Motivation: The drive to achieve goals and persevere through challenges (Deci and Ryan, 2000).
- Empathy: Understanding and responding to the emotions of others.
- Social skills: Building and maintaining healthy relationships (Mayer et al., 2008), effectively communicating, and resolving conflict.

Goleman (1997) states that emotional intelligence is about knowing what you are feeling and handling those feelings without having them swamp you; being able to motivate yourself to get jobs done, and sensing what others are feeling, and handling relationships effectively.

2.2.2 Current Models

Mayer and Salovey's (1997) revised ability model of emotional intelligence. This is an updated version of the Ability Model, emphasizing cognitive processes involved in emotional intelligence. It maintains the four-branch structure but delves deeper into the cognitive mechanisms within each branch. The authors define EI as a collection of emotional abilities

that can be divided into four classes. These four classes of emotion-related abilities are arranged from more basic to higher-level skills, as follows:

- Class I- Relates to Perception, Appraisal, and Expression of Emotion. It involves the receiving and recognizing of emotional information. These components range from the ability to identify emotions in one's self to the ability to discriminate between emotions.
- Class II- Relates to Emotional Facilitation of Thinking. It describes the use of emotions to enhance reasoning and proposes various emotional events that assist in intellectual processing.
- Class III- Relates to Understanding and Analyzing Emotions. It involves the cognitive processing of emotions and comprises four representative abilities involving abstract understanding and reasoning about emotions.
- Class IV- Relates to Reflection, Regulation of Emotions). It refers to the ability to manage emotions in oneself, and in others, to enhance emotional and intellectual growth.

Bar-On's Six-Factor Ability Model (2018) builds upon the Trait Model, adding more specific abilities within each factor. This includes six factors:

- Intrapersonal: Self-awareness, emotional self-regulation, assertiveness, decision-making.
- Interpersonal: Empathy, relationship management, social responsibility, communication.
- Stress Management: Adaptability, stress tolerance, impulse control.
- General Mood: Positive outlook, well-being, optimism.
- Motivation: Achievement orientation, personal mastery, self-actualization.
- Self-Perception**:** Self-regard, reality testing, self-esteem.

Table 1. Strengths and Weaknesses of EI Models

EI Model	Strengths	Weaknesses
Ability Model	Scientifically rigorous, focuses on learnable skills	Underemphasizes the role of personality and emotions as inherent traits
Trait Model	Comprehensive, considers personal well-being alongside social skills	May be too broad, making it difficult to operationalize and measure
Mixed Model	Popular and influential, resonates with laypeople's understanding of EI	Lacks strong scientific evidence, focusing on skills may diminish the role of traits
Mayer et al.'s Four-Branch Ability Model	Offers a more nuanced understanding of emotional processing	Still face challenges in operationalizing and measuring the cognitive processes
Bar-On's Six-Factor Ability Model	Provides a more granular view of EI abilities	Less widely researched than other models

Source: the authors

While classic models laid the foundation, contemporary models refine and expand our understanding. Each model has its strengths and weaknesses as seen in Table 1, and the choice of model depends on specific research questions and contexts. Regardless of the model, understanding the factors involved in EI remains crucial for personal and professional development.

3. Methodology

This research used the same questionnaire composed of 59 questions developed by a group of Psychologist researchers (Siqueira et al., 1999).

Table 2. Percent of total variance explained after Varimax rotation and Eigenvalues over 2.0

	Empathy	Sociability	Self-motivation	Self-control	Self-awareness	Total
% Total variance explained	12.2	5.3	4.9	3.8	3.3	29.5

Source: the authors

This instrument was developed and empirically applied, and the result of a sample with 972 cases in 1999, confirmed the significant presence of the five main factors described by Goleman (1995) with a total variance explained of 29.5% with Eigenvalue over 2.0 as a cut-off, presented in Table 2.

The results of the other two articles (Gomes et al., 2010; Lopes, 2020), using the same instrument, encouraged its application in the academic field of Business courses.

The methodology is divided into three stages:

- Confirmatory Analysis seeks to identify the adherence of the phenomenon to the original five factors of EI.
- Exploratory Analysis seeks to identify the existence of potential sub-factors that justify the belief in the complexity of human behavior in the face of the EI model and their characterization within the researched population.
- Classification modeling is intended to identify the EI profile of individuals according to the EI sub-factors found in the previous stage.

The convenience sample of 129 cases was collected in 2019 from the population of business undergrad students (250) at a university located in São Paulo State, Brazil. They were from both genders and at different stages of the course (semesters). The Level of Confidence was assumed as 95%.

The statistical technique selected for the first two stages was Factor Analysis (FA) and Principal Component Analysis (PCA). They help to identify the most important variables to explain the variability of the data set, reduce its complexity, facilitate its analysis and interpretation, and allow the identification of patterns and underlying relationships between

the variables.

A smaller number of Latent Factors extracted represents many variables that come from the survey's questions and by the Score Matrix that FA processing provides, each one written as a Linear Regression function, where the factor value reflects the EI behavior of that factor and was applied in the K-Means process.

The last stage, K-Means Cluster Analysis of multiple EI Latent Factors provides a multidimensional classification of respondents by their answers.

Some additional technical aspects of statistical analysis are described when they are considered in the description of the data analysis. Sample data was processed in SPSS version 19.

4. Data Analysis and Discussion

Sampling adequacy for Factor Analysis ensures reliable and valid results. Hair et al. (2005) and Fávero et al., (2009) recommend for Kaiser-Meyer-Olkin (KMO) index, which measures the adequacy of the sample for factor analysis is unacceptable when below 0.5, and the Bartlett Sphericity Test, which verifies whether the covariance matrix of the variables is an Identity Matrix. If the hypothesis test rejects H0, when the Significance (Sig) is smaller than 5%, indicates the existence of Latent Factors with consistent variances among them explaining the particular behavior of each one.

Table 3. KMO Index and Bartlett's SphericityTest

Kaiser-Meyer-Olkin Index		.675
Bartlett's Sphericity Test	Approx. Chi-Square	4954.113
	df	1711
	Sig.	.000

Source: the authors

Table 3 indicates the validation of empirical results where the KMO index equals 0.675 is considered acceptable, and H0 was rejected at 95% of the Level of Confidence. As in an exploratory study, it is a very encouraging performance.

4.1 Confirmatory Analysis

The confirmatory analysis was a Factor Analysis with orthogonal rotation performed by fixing the quantity of five factors to be extracted from the sample and comparing them with the classification that the authors of the research questionnaire (Siqueira et al., 1999) presented in their results.

Table 4. Empathy, the first factor extracted, when setting the number of factors extracted to 5.

Survey Question related to extracted EI factor	5 EI Factor	5 Factors of EI Explanation	Explanatory Capacity of the Factor
Q09 - I can tell a person's intentions by the way he/ she acts.	Empathy	Empathy is the ability to perceive the feelings of others, through reading and understanding non-verbal communication behaviors, such as facial expressions, tone of voice, and body posture. Positive connotation: ease of identifying the feelings, desires, intentions, problems, motives, and interests of others, through reading and understanding non-verbal communication behaviors, such as facial expressions, tone of voice, and body posture. Negative connotation: difficulty in identifying the feelings, desires, intentions, problems, motives, and interests of others, through reading and understanding non-verbal communication behaviors, such as facial expressions, tone of voice, and body posture.	11.24%
Q06 - I identify a person's intentions as soon as he/ she starts talking.	Empathy		
Q08 - I easily find out what a friend is feeling.	Empathy		
Q03 - I recognize a person's feelings through the way he/ she speaks.	Empathy		
Q04 - I recognize when a person is in trouble.	Empathy		
Q07 - I recognize how a friend feels through their nonverbal gestures.	Empathy		
Q05 - I understand what a person wants even if he/ she doesn't say it.	Empathy		
Q10 - I identify when someone I know is in trouble.	Empathy		
Q11 - I recognize when a person is well or not by their tone of voice.	Empathy		
Q01 - I easily identify people's feelings.	Empathy		
Q12 - I know when a friend needs my help.	Empathy		
Q02 - I know when someone is in trouble even if he/ she doesn't talk.	Empathy		
Q14 - I identify the interests of the people I live with.	Empathy		
Q13 - I can name the feelings of the person closest to me.	Empathy		

Source: the authors

Tables 4 to 8 present the questions corresponding to the factor extracted by Factor Analysis, the correspondent 5 EI Factor assumed by the questionnaire with the corresponding explanation. Closing the table, the percentage of Explanatory Capacity of the factor extracted from the present sample.

To guarantee the significance of Loading Factors, Hair et al., (2005) recommend that for a research sample of 130 cases, only Loading Factors above 0.45 would be significant. The Exploratory Analysis had only two cases out of 129 (Q02 = 0.36; Q38 = 0.44) and all other Loading Factors were above 0.47. We consider that the practice is being met. In the

Confirmatory Analysis, the quantity of Loading Factors below 0.45 was higher, but enough to confirm the consistency of the existence of the expected five Latent Factors.

The orthogonal VARIMAX rotation was used because it is the one that normally maximizes the variance of Loading Factors in each factor, simplifying the interpretation of the contribution of each factor to explain the whole phenomena (Hair et al., 2005).

Table 5. Self-Motivation, the second factor extracted, when setting the number of factors extracted to 5.

Survey Question related to extracted EI factor	5 EI Factor	5 Factors of EI Reviews	Explanatory Capacity of the Factor
Q31 - I act with optimism about my projects.	Self-motivation	Self-motivation is the ability to set goals for yourself, persist, and be enthusiastic about personal goals. It is the ability to resist any obstacles that prevent the achievement of personal goals, involving, the individual who retains it at a high level, a high degree of hope and optimism. Positive connotation: ease of developing plans for one's own life, to create, believe, plan, persist, and maintain situations conducive to achieving future goals. Stay hopeful at different stages of life. Negative connotation: difficulty in developing life projects, being pessimistic and hopeless.	8.23%
Q29 - I face any obstacle to get what I want in life.	Self-motivation		
Q35 - I doubt the achievement of my future goals.	Self-motivation		
Q28 - I persist in my goals even in the face of strong obstacles.	Self-motivation		
Q30 - I focus my attention on the plans I have selected for my life.	Self-motivation		
Q36 - I am enthusiastic about my life.	Self-motivation		
Q32 - I guide my actions in the present by the plans I have made for the future.	Self-motivation		
Q38 - I stop carrying out important projects in my life.	Self-motivation		
Q33 - I enthusiastically prepare a personal project.	Self-motivation		
Q34 - I plan situations to achieve my goals.	Self-motivation		
Q55 - I avoid reflecting on what I'm feeling.	Self-awareness		
Q56 - I avoid analyzing what I'm feeling.	Self-awareness		
Q37 - I achieve the goals I set for my life.	Self-motivation		
Q25 - I prefer to work alone.	Sociability		
Q15 - I have many friends.	Sociability		

Source: the authors.

Table 6. Sociability, the third factor extracted, when setting the number of factors extracted to 5.

Survey Question related to extracted EI factor	5 EI Code	5 EI Factor	5 Factors of EI Reviews	Explanatory Capacity of the Factor
Q18 - I relate well with anyone.	3-F2	Sociability	Sociability is the ability to initiate, deepen, and maintain social relationships. Positive connotation: ease of starting and maintaining friendships, being accepted by people, valuing social relationships, adapting to new situations, leading, coordinating, and guiding the actions of other people. Negative connotation: difficulty initiating and maintaining friendships, being little accepted by people, avoiding social gatherings, not adapting to new situations, as well as having difficulties in leading and coordinating groups or actions of other people.	10.89%
Q27 - I feel comfortable among people I recently met.	3-F2	Sociability		
Q23 - I make people feel comfortable around me.	3-F2	Sociability		
Q26 - I can liven up any environment.	3-F2	Sociability		
Q22 - I talk animatedly with a stranger.	3-F2	Sociability		
Q19 - I treat someone I just met as if we were old friends.	3-F2	Sociability		
Q16 - I increase the number of people in my circle of friends.	3-F2	Sociability		
Q39 - I direct my feelings to act wisely.	3-F3	Self-motivation		
Q20 - I make people feel good around me.	2-F2	Sociability		
Q21 - I prefer to remain silent rather than talk to strangers.	2-F2	Sociability		
Q24 - I run into someone I know most places I go.	2-F2	Sociability		

Source: the authors.

Table 7. Self-Awareness, the fourth factor extracted, when setting the number of factors extracted to 5.

Survey Questions related to extracted EI factor	5 EI Code	5 EI Factor	5 Factors of EI Reviews	Explanatory Capacity of the Factor
Q51 - I talk to myself about my feelings.	4-F5	Self-awareness	Self-awareness allows the individual to perceive, observe, distinguish, and name their feelings, and to recognize and accept themselves in their most diverse emotional states. Positive connotation: ease of dealing with one's feelings in terms of identification, naming, evaluation, recognition, and attention to these feelings. Negative connotation: difficulty dealing with one's feelings in terms of identifying, naming, evaluating, recognizing, and paying attention to these feelings.	7.46%
Q59 - I recognize my mixed feelings.	4-F5	Self-awareness		
Q52 - I evaluate my feelings to understand what I am feeling.	4-F5	Self-awareness		
Q53 - I worry about how I'm feeling.	4-F5	Self-awareness		
Q58 - I can name the feelings that marked my life.	4-F5	Self-awareness		
Q50 - I recognize my feelings very easily.	4-F5	Self-awareness		
Q54 - I recognize feelings of joy and sadness in myself.	4-F5	Self-awareness		
Q57 - I identify all my feelings.	4-F5	Self-awareness		
Q17 - I prefer to have few friends.	4-F2	Sociability		
Q49 - I control the feelings that disturb me.	4-F4	Self-control		

Source: the authors.

Table 8. Self-control, the fifth factor extracted, when setting the number of factors extracted to 5.

Survey Questions related to extracted EI factor	5 EI Code	5 EI Factor	5 Factors of EI Reviews	Explanatory Capacity of the Factor
Q41 - I try to react cautiously when faced with provocations.	5-F4	Self-control	Self-control is the ability to manage feelings and develop personal skills to achieve previously set goals. A high level of self-control leads the individual to reinterpret the situation that has occurred and give it a more positive meaning, in addition to making it possible to postpone a momentary impulse in favor of a future goal. Positive connotation: ease of managing one's feelings, impulses, thoughts, and behaviors. Negative connotation: difficulty managing one's feelings, impulses, thoughts, and behaviors.	7.85%
Q45 - I return in kind an insult I received.	5-F4	Self-control		
Q42 - I react immediately to aggression.	5-F4	Self-control		
Q48 - I make decisions based on my impulses.	5-F4	Self-control		
Q43 - I have a response to an insult on the tip of my tongue.	5-F4	Self-control		
Q40 - I try to think before responding to something that displeases me.	5-F4	Self-control		
Q46 - I say what comes to my mind.	5-F4	Self-control		
Q47 - I break my impulses in a conflict situation.	5-F4	Self-control		
Q44 - I count to ten before responding to a challenge.	5-F4	Self-control		

Source: the authors.

The Confirmatory Analysis, with a total explanatory capacity of 45.7%, allows us to identify the adherence of the sample data to the original five factors of EI structure, when applied to business undergrad students. Comparative analysis of the performance of Confirmatory and Exploratory analysis will reinforce these conclusions.

Some variables were extracted in another Factor than the expected by Siqueira et al., (1999) questionnaire when they came to another factor out of that author's classification. The hypothesis to explain these results is out of the present scope.

4.2 Exploratory Analysis

In this stage, we established the Eigenvalue criteria above 1.0 in deciding the number of factors to extract.

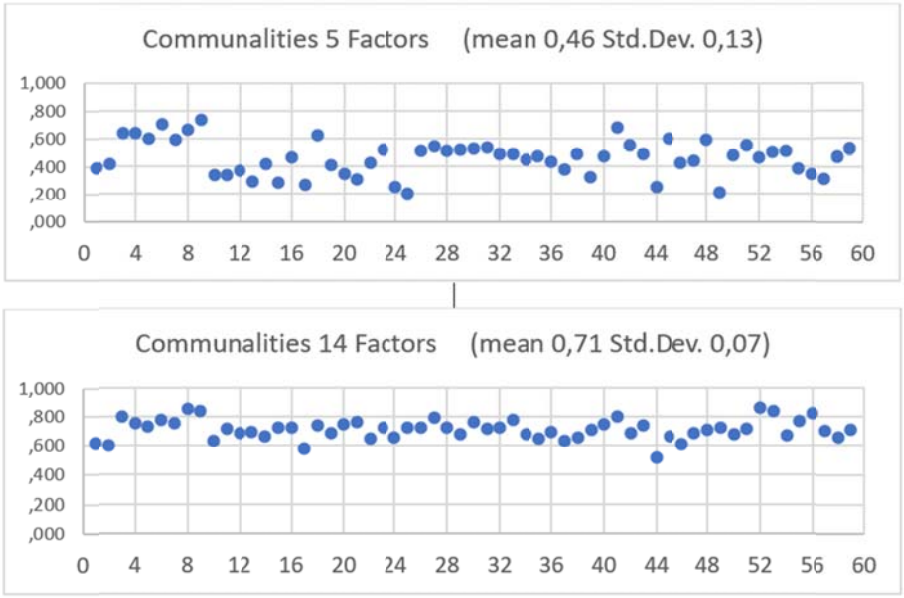
In Factor Analysis, the Latent Root, also known as Eigenvalue, is an indicator for determining the importance of each extracted factor in explaining data variability. A larger Latent Roots value indicates that the factor explains more variability than a single original variable and the greater the importance of the factor in explaining the structure of the data,

the latent roots smaller than 1 can be considered irrelevant and can be discarded from the analysis. This is the basis for the Exploratory Analysis of Factor Analysis when all significant factors will be extracted and subsequently interpreted, as already presented in the model with 5 factors from the step above (Hair et al., 2005; Fávero et al., 2009).

In addition to the interpretability of the extracted factors, the analysis of Communalities complements the decision criteria of which factors to retain (Hair et al., 2005).

The Communality of each variable represents the amount of variance explained by the factor solution of each variable. The closer to 1, the greater the correlation with the other variables, since the behavior of the factor reflects the behavior of the variables, meaning the extracted components represent the variables well.

Graph 1: Communalities Confirmatory Analysis (5-Factors) and Exploratory Analysis (14-Factors), survey 59 questions



Source: the authors.

Graph 1 shows the Communality value of each question, respectively for the 5-factor model of the Confirmatory Analysis and the 14 factors of the Exploratory Analysis. Note the greater homogeneity of Communalities in the 14-factor model when compared with the 5-factor model. Note in the graphs of Graph 1 that the 5-factor model has greater variability in the communal values (0.19 to 0.73) of the 59 questions compared to the 14-factor model (0.51 to 0.86). Higher Mean value and lower Standard Deviation reflect the better performance of the 14-factor model compared to the 5-factor model.

Table 9. Empathy, the first and fourth factors extracted.

Factor	Questions	5 EI Factor	14 Factors of EI Reviews	Explanatory Capacity of 14 Factors	Explanatory Capacity of 5 Factors
1-F1	Q03, Q04, Q05, Q06, Q07, Q08, Q09	Empathy	1. Empathy-Mind-Reading Tendency: this group can understand and share the feelings of others by observing their cues. This was the 1st factor extracted.	9.36%	11.24%
4-F1	Q01, Q02, Q10, Q11, Q12, Q13, Q14	Empathy	4. Empathy-Intuitive: this factor reflects strong intuition that allows the pick-up of unspoken cues and produces judgments about people's feelings. It was the 4th factor extracted.	6.13%	

Source: the authors

Tables 9 to 14 present the processing of Factor Analysis and extraction of factors that resulted in 14 significant factors according to the criteria of Eigenvalue above 1.0. They were rearranged to keep together the factors that share the same group of variables recommended by Siqueira et al., (1999). Then, it is possible to identify that each of the 5 basic factors was logically divided into subfactors, without losing their original root (the groups of basic variables). Based on the context of each variable of the correspondent factor, the authors developed an explanation of a possible behavioral meaning.

The total explanatory capacity of the 14-factor model was 71.18%, superior performance to the 5-factor model in the Confirmatory Analysis (45.66%).

The factor extraction indicates that the explanatory capacity of each factor decreases as the factors are extracted and this is represented in the first-factor number and the suffix Fn represents the EI 5-factor number considered in the Confirmatory Analysis.

Comparing Empathy presented in Table 4 (5 factors) and correspondent Table 9 (14 factors), Factor F1 from the sample was fully consistent with the same factor results from Siqueira et al., (1999) because all variables expected to represent Empathy were the same as in the present study.

Table 10. Self-motivation, the second and thirteenth factors extracted.

Factor	Questions	5 EI Factor	14 Factors of EI Reviews	Explanatory Capacity of 14 Factors	Explanatory Capacity of 5 Factors
2-F3	Q28, Q29, Q30, Q31, Q32, Q33, Q34, Q37	Self-motivation	2. Self-motivation-Future-oriented mindset: It is the EI factor characterized by greater Self-motivation with a vision of the future, that is, with a coherent and firm strategic, tactical, and operational vision, willingness to face expected and unforeseen difficulties, to maintain the plan drawn up. Demonstrates determination and focus for the feeling of reward when achieving set goals. It was the 2nd factor extracted.	8.66%	8.23%
13-F3	Q24, Q35, Q36	Self-motivation	13. Self-motivation-Enthusiastic: It is the EI factor that reflects the existence of a strategic, tactical, and operational plan and reflects the enthusiasm and determination in execution, counting on personal networking throughout the execution of these plans. It was the 13th factor extracted.	3.10%	

Source: the authors

Table 11. Self-control, third and seventh factor extracted.

Factor	Questions	5 EI Factor	14 Factors of EI Reviews	Explanatory Capacity of 14 Factors	Explanatory Capacity of 5 Factors
3-F4	Q38, Q42, Q43, Q45, Q46, Q48	Self-control	3. Self-control-Reactive aggression: It is the EI factor characterized by automatic immediate reactions, whether due to urgent decisions or even untimely actions, without concern for the intensity of the side effects of the reaction, that is, the reaction before reflection and evaluation of the consequences. It was the 3rd factor extracted.	6.46%	7.85%
7-F4	Q40, Q41, Q44, Q47	Self-Control	7. Self-Control-Reflection: It is the EI factor characterized by the immediate containment of reactions to the most intense events, perhaps evaluating the possible consequences of this reaction and aiming to minimize the impacts due to these immediate reactions. It was the 7th factor extracted.	4.86%	

Source: the authors

Table 12. Sociability, fifth, tenth, twelfth, and fourteenth factors extracted.

Factor	Questions	5 EI Factor	14 Factors of EI Reviews	Explanatory Capacity of 14 Factors	Explanatory Capacity of 5 Factors
5-F2	Q18, Q19, Q22, Q26, Q27	Sociability	5. Sociability-Higher extroversion & Sociability: It is the EI factor that reflects a high degree of extroversion and sociability. It was the 5th factor extracted.	6.09%	
10-F2	Q15, Q16	Sociability	10. Sociability-Extraversion: It is the EI factor that reflects that extroverts gain energy from social interaction by being around others. It was the 10th factor extracted.	3.77%	
12-F2	Q20, Q21	Sociability	12. Sociability-Active extroversion: It is the EI factor that demonstrates extroversion and active sociability, that is, it indicates the initiative to develop contact. with people. It was the 12th factor extracted.	3.26%	10.89%
14-F2	Q17, Q25	Sociability	14. Sociability-Introversion: It is the EI factor that reflects introversion and the desire for individuality in contact with people. It was the 14th factor extracted.	2.69%	

Source: the authors

Table 13. Self-awareness, sixth, eighth, and ninth factor extracted.

Factor	Questions	5 EI Factor	14 Factors of EI Reviews	Explanatory Capacity of 14 Factors	Explanatory Capacity of 5 Factors
6-F5	Q50, Q54, Q57, Q58, Q59	Self-awareness	6. Self-awareness- Recognize own feelings: This EI factor characterizes the ability to recognize present and past feelings, whether joy or sadness. It was the 6th factor extracted.	5.15%	7.46%
8-F5	Q51, Q52, Q53	Self-awareness	8. Self-awareness-Auto-reflection: this EI factor indicates great concern and action in self-evaluating feelings. It was the 8th factor extracted.	4.34%	
9-F5	Q55, Q56	Self-awareness	9. Self-awareness-Aversion of self-awareness: this EI factor indicates a great aversion to self-assessment of feelings. It was the 9th factor extracted.	3.84%	

Source: the authors

Table 14. Mixed, eleventh factor extracted.

Factor	Questions	5 EI Factor	14 Factors of EI Reviews	Explanatory Capacity of 14 Factors	Explanatory Capacity of 5 Factors
11-*	Q49 (Self-control), Q39 (Self-motivation), Q23 (Sociability)	Self-control Self-motivation Sociability	11. Prosocial Behavior: This EI factor describes actions intended to benefit others. By controlling their emotions and acting wisely, the person is creating a more positive and comfortable environment for those around them. It was the eleventh factor extracted.	3.47%	No clear match

Source: the authors

Table 14 presents the eleventh factor extracted and is not associated with one 5 EI-Factor because they are associated with different 5 EI-Factor models, then, the authors decided not to associate it to any 5 EI-Factor, giving it the name 11-*.

Table 15. Cronbach's Alpha of each latent factor extracted and consistency

Factor	Cronbach's Alpha	Consistency of Alpha	Number of Items in the Factor
1-F1	0.93	High	7
2-F3	0.88	High	8
3-F4	0.80	High	6
4-F1	0.81	High	7
5-F2	0.81	High	5
6-F5	0.77	High	4
7-F4	0.79	High	4
8-F5	0.83	High	3
9-F5	0.86	High	2
10-F2	0.71	High	2
11-*	0.65	Moderate	3
12-F2	0.45	Low	2
13-F3	0.42	Low	3
14-F2	0.49	Low	2

Source: the authors

Table 15 presents the performance of the exploratory model to verify whether each of the 14 factors is being measured consistently. The number of items of each factor is the same number of variables FA produced the 14 factors. Cronbach's Alpha confirmed the consistency of the contribution of each variable of its factor.

It is not surprising that the last three factors extracted have lower performance since they were the factors with the lowest Explanatory Capacity of Factor Analysis.

4.3 Classification

This last stage is intended to identify the EI profile of individuals according to the EI sub-factors found in the second stage. After validating the quality of the EI Latent Factor given by Cronbach's Alpha, it is possible to classify the respondents' profiles by their answers.

The technique chosen was K-Means Clustering, an unsupervised Machine Learning algorithm used to group events in a predefined quantity of clusters and consider the Euclidean Distance of the case to the closest centroid. The result is a classification of the cases, minimizing the distance of each one to the centroid (Hair et al, 2005).

Each sample variable, on a scale of 0-10, is transformed to its Standardized Value and multiplied by the correspondent Factor Score given by FA calculation, in a Regression Linear Equation for each factor. Those are data input to K-Means which provides two results: i) the coordinate of the centroid of each Latent Factor in each group, (see Table 16), and ii) the ANOVA Test which measures the Level of Significance of that classification. In the present case, 4 groups maximized the number of significant variables in ANOVA. Tables 16 to 18 present the steps to stratify the quantitative values given by FA Regression Models into four groups, named by authors as Lower, Mid-lower, Mid-upper, and Upper.

Table 16. Cut-off criteria to stratify Latent Factors in four groups

Values of EI Latent Factor range cut-off limits of groups based on Quartil (25%)					
Factor	Minimum	Q1	Q2	Q3	Maximum
1. Empathy-Higher level	-3.180	-0.153	0.217	0.543	1.497
2. Self-Motivation-Future vision	-3.649	-0.579	0.073	0.721	2.356
3. Self-Control-Fast shot	-2.242	-0.712	-0.070	0.38	2.627
4. Empathy-Lower level	-3.081	-0.590	0.123	0.696	1.863
5. Sociability-Higher extroversion & sociability	-2.709	-0.562	-0.041	0.651	2.487
6. Self-Awareness-Feelings	-2.515	-0.626	-0.056	0.733	2.422
7. Self-Control-Reflection	-3.592	-0.615	0.138	0.713	1.870
8. Self-Awareness-Auto-reflection	-3.867	-0.490	0.244	0.657	1.626
9. Self-Awareness-Aversion	-3.028	-0.736	-0.112	0.601	3.392
10. Sociability-Highest degree	-2.818	-0.533	0.040	0.656	2.426
11. Unclear classification	-3.802	-0.563	0.077	0.615	2.158
12. Sociability-Active extroversion	-2.774	-0.591	-0.102	0.566	2.767
13. Self-Motivation-Enthusiastic	-6.210	-0.555	0.094	0.542	2.416
14. Sociability-Introversion	-3.383	-0.627	-0.060	0.692	2.475

Source: the authors

Table 17. Cut-off criteria to stratify Latent Factors in four groups

Quartile criteria of qualitative group evaluation by intensity			
Group 1	Group 2	Group 3	Group 4
From Minimum to Q1 (25%)	From Q1 to Q2 (25%)	From Q2 to Q3 (25%)	From Q3 to Maximum (25%)
Lower	Mid-lower	Mid-upper	Upper

Source: the authors

Table 16 provides the Descriptive Values of the Regression Model of each EI Latent Factor from sample data, and they will be used to stratify that quantitative value in just four groups by defining the cut-off limits as per Table 17.

Just for illustration, the Factor 13-Self-motivation-Enthusiastic, composed of questions Q24 - I run into someone I know most places I go; Q35 - I doubt the achievement of my future goals and Q36 - I am enthusiastic about my life, (even though this was the penultimate value extracted), this means smaller explanation capacity, and a wider range of responses on the negative side (minimum value -6.210), indicating the presence of individuals with strong disagreement with those questions.

To facilitate the understanding of EI behavior in each Latent Factor and correspondent intensity, each group numbered from 1 to 4 will indicate four classes of individuals each one with 25% of the range of each scale, then, 25% from Minimum to Quartile 1 means Group 1 (lower level). Table 18 provides the identification of the correspondent Stratified Cluster ID.

Table 18. K-Means results giving Centroids coordinates of each Group for each Latent Factor, both exact value and correspondent stratified group ID

Final Cluster Groups					
EI 14-factors	ANOVA Test	Stratified Cluster ID			
	Sig	Group 1	Group 2	Group 3	Group 4
1. Empathy-Higher level	.694	2	2	2	2
2. Self-motivation-Future vision	.029	2	3	2	2
3. Self-control-Fast shot	.000	3	3	3	1
4. Empathy-Lower level	.050	2	2	3	2
5. Sociability-Higher extroversion & sociability	.095	3	2	3	3
6. Self-awareness-Feelings	.000	1	3	2	4
7. Self-control-Reflection	.021	2	3	2	3
8. Self-awareness-Auto-reflection	.000	1	3	2	2
9. Self-awareness-Aversion	.000	2	2	3	3
10. Sociability-Highest degree	.000	4	3	2	2
11. Unclear classification	.067	2	3	3	2
12. Sociability-Active extroversion	.000	3	2	3	3
13. Self-motivation-Enthusiastic	.002	3	2	3	1
14. Sociability-Introversion	.000	3	3	2	2

Source: the authors

The column ANOVA Test in Table 18 provides the measures of the Level of Significance of each Latent Factor to contribute to the discrimination of each Group considering four Groups. The number of four Groups maximizes the Latent Factors that help the discrimination, in the present case, 11 out of 14 factors were significant at a 95% Level of Confidence, and 2 were above, but not much. Empathy with Sig = 0.694 is not significant, because that factor presents small differences in the responses reflected in the coordinates ranging from Quartil 1 (-0.153) to Quartil 2 (0.21) in Table 16 compared to the Centroid of the Cluster Coordinate ranging from -0.118 to +0.118 (see Table 18).

Table 19. Euclidean distance between Final Cluster Centers (centroids)

Cluster	Group 1	Group 2	Group 3	Group 4
Group 1		2.461	2.412	3.048
Group 2	2.461		1.838	2.530
Group 3	2.412	1.838		2.371
Group 4	3.048	2.530	2.371	
Number of cases	17	42	52	17

Source: the authors

Table 19 provides the Euclidean distance between the cluster's centroids. Groups 2 and 3 are the closest (1.838) and Groups 1 and 4 are the furthest away (3.048). This shows the concentration of the respondents around Groups 2 and 3 (see Number of cases: 42+52 = 94 out of 17+42+52+17=128 cases) indicating that students have small variability in their answers, with a smaller quantity of extreme behaviors (strongly disagree, negative values, or Group 1, and Group 4, vice-versa for positive values).

5. Conclusion

Initially, the adherence of the phenomenon to the original Goleman's five factors of EI, when applied to business undergrad students, was also identified. Later on, by examining the scale's factor structure (the objective proposed), the findings made it possible to identify that each of the five EI factors was logically divided into sub-factors without losing the original roots but characterizing enough to be interpreted as a significative behavior variant in the groups of respondents. Bear in mind that depending on the students' answers to the questionnaire, we may find some different sub-factors, under the five EI factors. As said before, this can be interpreted as a behavior change in each group of respondents.

Furthermore, the article describes a step-by-step process that allows the building of a classification model of the respondents' profile as per their answers, and according to the EI sub-factors. This can be used to evaluate the student's profile from time to time, during their school journey, by comparing their EI Sub-factors and cut-off limits, and then take proper actions, if necessary. These are the two main contributions of this article.

With these tools in hand, the teachers can better understand their behavior profile and thus, will be able to get the most of them in the classes.

The obtained results complement the existing research on EI factors in some groups of business students worldwide and provide a precious reference point for, more in-depth analyses of these factors. Recognizing the significance of EI in business education necessitates a shift in approach. This paper lays the groundwork for further exploration, delving into the following questions:

- How can existing curriculum and pedagogy be adapted to foster EI development in business students?
- What are effective assessment methods for measuring and tracking EI growth?
- How can we prepare future business leaders to leverage their EI for ethical and socially responsible decision-making?

This exploration requires collaboration between academia, industry, and researchers to equip future business leaders with the emotional intelligence necessary to thrive in the business world.

The appearance of COVID-19 in 2020/2021 limited the progression of this research with the same group of students.

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