

Challenges and Opportunities in Assessing Youth Leadership

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Abstract. *Leadership is vital in any field or societal context, and understanding the core attributes of effective leaders is essential for leadership development. In the educational context, fostering leadership skills in youth helps them better understand their values, navigate decision-making, and improve communication. Current literature provides various frameworks for quantifying leadership development; however, applying these frameworks to teenagers with the support of technology remains underexplored. Here, we review and analyze existing methodologies for measuring leadership and examine how these approaches can be adapted to an educational setting for teenagers using technological tools. Our analysis reveals that computational approaches offer promising avenues for quantifiable leadership growth and consistent feedback in educational contexts. This text also incorporates insights from interviews conducted with young individuals as well as professionals in the field, providing a comprehensive perspective on the practical applicability and potential impact of these methodologies.*

Resumo. *A liderança é vital em qualquer campo ou contexto social, e compreender os atributos essenciais de líderes eficazes é fundamental para o desenvolvimento da liderança. No contexto educacional, o cultivo de habilidades de liderança em jovens os ajuda a entender melhor seus valores, a navegar em processos de tomada de decisão e a melhorar a comunicação. A literatura atual oferece várias estruturas para quantificar o desenvolvimento da liderança; no entanto, a aplicação dessas estruturas em adolescentes com o apoio da tecnologia ainda é pouco explorada. Neste estudo, revisamos e analisamos metodologias existentes para medir a liderança e examinamos como essas abordagens podem ser adaptadas a um ambiente educacional para adolescentes utilizando ferramentas tecnológicas. Nossa análise revela que abordagens computacionais oferecem caminhos promissores para o crescimento mensurável da liderança e feedback consistente em contextos educacionais. Este texto também incorpora insights de entrevistas realizadas com jovens, bem como profissionais da área, fornecendo uma perspectiva abrangente sobre a aplicabilidade prática e o impacto potencial dessas metodologias.*

1. Introduction

In this section it will be explored what exists about leadership in the literature, underscoring the definition of leadership and the importance of leadership in youth development. It explores leadership as a dynamic process shaped by context, highlighting key types such as transformational, servant, transactional, and situational leadership. The section

also discusses the challenges of assessing leadership, presenting tools like the Multifactor Leadership Questionnaire (MLQ-5X) and Authentic Leadership Questionnaire (ALQ), while discussing the limitations such as the reliance on self-reported data. Additionally, it examines the role of technology, including machine learning, virtual reality, and natural language processing, in providing more precise and objective methods for leadership evaluation and development.

1.1. Leadership and its Relevance for Youth

Leadership has been studied for a lot of time for its complexity and impact in our history. Studies from different areas of knowledge propose different definitions, such as the influence process aimed at goal achievement Evolution of leadership theory [Benmira and Agboola 2021] or the process of attributing causation to individual social actors [Pfeffer 1977]. There is a general consensus that leadership involves the ability to inspire and guide individuals or groups toward achieving shared goals, which this definition serves as the foundation for this study.

Although there are a lot of studies that try to understand more about leadership in different contexts and applications, there are a small number of studies that approach leadership in the youth context. However, this theme has great potential given that youth today will be the leaders of tomorrow and a better understanding of how youth deal with leadership can help academia deeper dive into this theme. The term 'youth' in this study is defined according to the United Nations definition that is individuals aged 15 to 24. [United Nations nd]

In addition to skills related to leadership such as decision-making and communication, the development of soft skills has become essential in shaping young leaders. The use of educational activities based on computing, like programming and unplugged computing practices [Alves and Bona 2024], has shown potential to foster these skills from an early stage in education. These activities encourage young individuals to practice their logical reasoning, work collaboratively, and adapt to dynamic challenges, contributing to the development of leadership skills.

1.2. Leadership in context

As it was discussed in the last topic, leadership is not a fixed or universal concept, it is a dynamic process that evolves the relationship of people in a certain context. This context may influence how leadership is perceived by people in this context. For instance, in a corporate setting, leadership might involve aligning a team to achieve business goals. In a classroom, the professor often takes on the leadership role, while in the military, it is typically defined by hierarchical authority. In religious contexts, leadership may align with those most connected to the spiritual mission.

In the studies, there are a lot of types of leadership and most of these types emerge naturally in response to context. So there is some of the types we have:

Transformational Leadership: Focused on inspiring and motivating others in a team, this type of leader creates more strong emotional connections with their teams. [Arnold 2017]

Servant Leadership: This type gave more attention to the needs of others

above all, emphasizing empathy, active listening, and the well-being of team members. [van Dierendonck 2011]

Transactional Leadership: This type is centered on structure, rewards, and performance. This type of leader provides clear expectations and focuses on achieving measurable goals. [Efianda and Iswahyuni 2021]

Situational Leadership: This is one of the most adaptable of all types, this type recognizes that no single style works in every context. [Johansen 1990]

Context is essential in leadership, this shapes not only how leaders act in the situation but also how they are perceived by others. For example, in a corporate environment, leaders prioritize efficiency and measurable results in the team, while in an educational context, the focus often is more related to personal growth.

Cultural norms significantly shape leadership. In hierarchical contexts, like the military one, authority is the base for leadership. For a better understanding of leadership, it is essential to examine the relationship between context, individual traits, and society. Leadership is something really connected with how people create connections with others.

1.3. Assessing Leadership

Assessing leadership is complex due to its strong relation with human nature. It is something that comes from human relationships and varies according to context, as it was discussed in the last topic. So through a lot of time researchers, companies, selective processes, etc.. have tried to find a way to measure it and quantify its nature. Below, are some of the tools and methodologies found during this research, highlighting their focus and limitations.

Social Network Analysis (SNA): It is the analysis of relational data arising from social systems, using computationally intensive methods. [Butts 2008]

Multifactor Leadership Questionnaire (MLQ-5X): The MLQ-5X is a three-factor instrument measuring transformational-supportive, inspirational goal-oriented, and passive-avoidant leadership styles in organizations. However, it is a little prone to biases because it is based on self-reported data. [Bajcar and Babiak 2022]

Transformational Leadership Inventory (DTLI): It assesses transformational leadership traits, usually used by coaches of sports, such as how the leader inspires others. While effective in evaluating team motivation, it may overlook broader aspects of leadership. [Vella et al. 2012]

Exploratory and Confirmatory Factor Analysis (EFA and CFA): These two are used to examine the structure of psychological assessment instruments, inclusive leadership measurement tools and frameworks. However, they do not directly evaluate leadership behaviors or practical applications. [Byrne 2005]

Authentic Leadership Questionnaire (ALQ): It is a multidimensional model of authentic leadership, assessing leader self-awareness, relational transparency, internalized moral perspective, and balanced processing. However, its dependence on self-reported data can introduce bias. [Walumbwa et al. 2008]

Leadership Behavior Description Questionnaire (LBDQ): It is a tool for measuring leader behavior, with both individual and group directed scores relating to produc-

tivity and satisfaction measures. [Reitz 1979]

Leadership Practices Inventory (LPI): It is 360-degree leadership assessment tool that helps individuals and organizations measure their leadership competencies and apply the Five Practices of Exemplary Leadership. While practical, its effectiveness relies on the accuracy of the feedback provided. [Kouzes and Posner 2003]

Many assessments are based on self-reports, which may be subjective and prone to bias. [Crawford and Kelder 2018] However, capturing every nuance of leadership continues to be a challenge. Again is important to remember that context is crucial in leadership assessment. Combining these methods may offer a broader perspective by balancing individual traits, get by self-report or peer-report, with contextual factors.

1.4. Technology in the Context of Leadership

In today's rapidly evolving technological landscape, integrating technology into leadership assessment and development has become essential, offering new opportunities for improvement. Technology can help to make leadership assessments more precise and objective and help in the development of leadership in the people.

Technology provides real-time insights into leadership behaviors, decision-making, and interactions. [Gençer and Samur 2016] Tools like LMS platforms and simulations track engagement and offer measurable data on leadership and communication. Similarly, natural language processing (NLP) techniques analyze written or spoken language to identify traits such as the ability to inspire, foster consensus, and motivate the team. [Boyce et al. 2008] Platforms like Kialo Edu, an online discussion platform that enables users to engage in structured, tree-like debates by breaking down arguments into pros and cons, further support leadership development by facilitating structured debates, encouraging critical thinking, and allowing educators to assess argumentative skills and decision-making abilities in real-world discussions. With more data, there is also the possibility to explore the field of synthetic data, which, based on existing data, can help gather more information and develop simulations.

Machine learning plays a key role in leadership assessment by using algorithms to identify patterns and predict leadership potential based on past behaviors and personality traits. [Barthakur et al. 2022] Unsupervised techniques, such as clustering, reveal hidden patterns in leadership behaviors without prior assumptions. These tools are particularly valuable when applied to youth, as they help uncover early leadership traits and areas for improvement. [Bhatia et al. 2021]

Other technologies, such as virtual reality (VR) and semantic analysis tools, can reduce subjectivity in leadership assessments by creating immersive and practical leadership scenarios. For instance, VR simulations place individuals in complex, high-stakes situations that test their decision-making and problem-solving abilities. Semantic analysis evaluates the content and structure of communication, providing objective feedback on key leadership qualities. [Parra et al. 2022] These technologies together contribute to comprehensive leadership assessment and better feedback.

Beyond behavior-focused technologies, measuring the real-world impact of leadership is essential. Metrics such as productivity increases, quality improvements, cost reductions, and client satisfaction offer concrete indicators of leadership effectiveness.

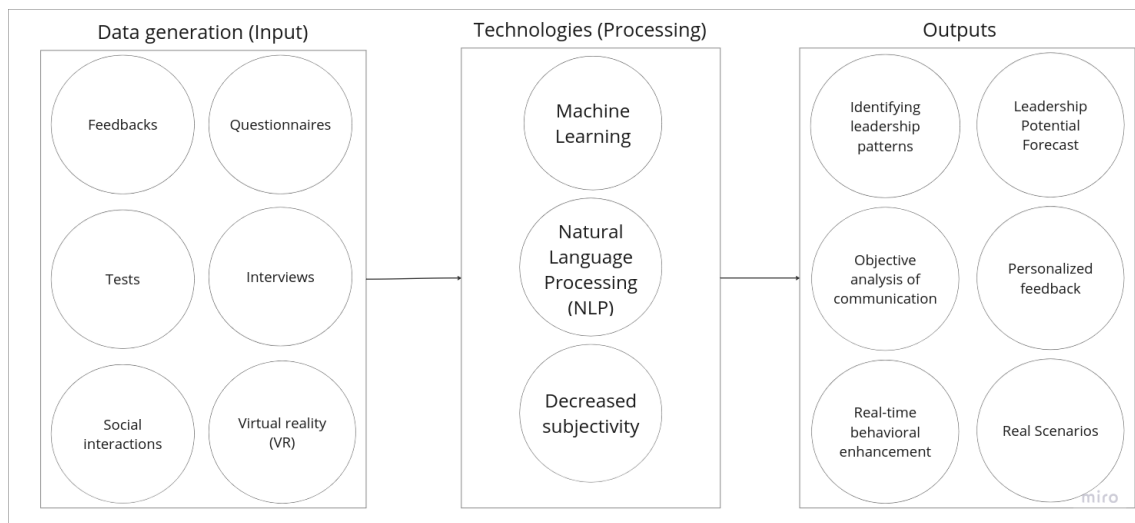


Figura 1. Illustration the process starting from data generation, through technological processing, and ending with actionable leadership outputs.

These measurements help bridge the gap between theoretical leadership traits and their practical outcomes.

However, we can not completely rely on our decisions related to leadership on the technology, it should be used as a tool for development and insights rather than as a judgmental or exclusionary mechanism.

2. Methodology

This research uses semi-structured interviews conducted with teenagers to understand their perceptions and definitions of leadership, as well as personal experiences where they exercised leadership skills. Additionally, an interview with a professional in the field of leadership development provides practical and updated insights about the development and assessment of leadership in the youth.

2.1. Interview with teenagers

This part of the methodology was made with interviews with youth to understand their perceptions of leadership, their personal experiences, and the behaviors they associate with leaders. It interviewed 5 youths from 15-18 years old, from a Private School in Lorena, São Paulo, Brazil. For more rich and detailed responses, open-ended questions were designed to allow participants to freely express their opinions. In cases where young people needed some help in answering or developing their thoughts, complementary examples were presented to facilitate the conversation.

Questions Used:

1. Do you consider yourself someone who easily interacts with new people and enjoys being around others, or do you tend to be more shy and prefer to be alone or with fewer people?
2. What comes to mind when you hear the word 'leader'? Describe it in a few words.
3. What does leadership mean to you?

4. Can you give me an example of a time when you felt like a leader? What happened and how did you act?
5. Think of someone you consider an exceptional leader. It could be someone famous or someone you know personally. What makes this person a good leader?
6. What characteristics make this person a leader?
7. Based on these characteristics, do you think they can be developed or improved?
8. How do you think a leader should act in social situations, such as on social media or in groups of friends?
9. Have you had experiences being a leader, whether at school, in sports, or in other activities? If so, what were these experiences like?

In cases where teenagers may demonstrate difficulty in answering some questions, examples of leaders were suggested as a stimulus for reflection, including:

- Coach of a Soccer Club
- Boca Rosa
- Steve Jobs
- Silvio Santos
- School principal
- Someone in the family

Examples were chosen to reflect diverse leadership styles, from public figures to family references, helping participants relate to the concept.

The interviews gave valuable insights into how youth can perceive and experience leadership in their realities. Participants described leadership as guiding a team, company, or idea, often associating it with 'guiding others' and 'knowing what to do'. This aligns with transformational leadership theories.

Examples of leadership often came from school contexts, such as organizing group projects or leading teams in a sport, showing that they can identify leadership experiences. Some participants found it difficult to articulate personal leadership experiences, highlighting the value of tools that provide practical scenarios to uncover leadership traits.

Admired leaders included figures like Steve Jobs and Tite, the coach of Corinthians Soccer Club. Participants highlighted traits such as effective communication, strategic thinking, and leadership presence, agreeing that these skills can be developed through practice. It was really interesting how some participants emphasized the role of leaders in social and digital spaces as setting a positive example.

These findings highlight the multifaceted nature of youth leadership and reinforce the importance of combining subjective perceptions with objective, technology-based assessments to nurture leadership potential effectively.

2.2. Interview with Leadership specialist

An in-depth interview was conducted with a leadership professor and his insights provided a professional perspective on leadership development, assessment, and pedagogy, particularly for young individuals, based on his experience teaching themes related to leadership for teenagers.

1. How do you perceive the differences in leadership styles in different environments, such as academia, business, and entrepreneurship?

2. Is the leader's situation already something natural and intrinsic?
3. What is your opinion on the effectiveness of tests and assessments in measuring leadership and soft skills, in general, and young people?
4. Does self-perception greatly influence the results of safety tests?
5. What are the main differences between leadership development in young people compared to adults?
6. Do you have any experience in applying or carrying out leadership tests and their coherence with actual performance?
7. What are the limitations that self-perception can impose on the development of leadership skills?
8. How would you describe the ideal cycle of teaching and leadership development for young people? And what do we see at Inteli?
9. What is the difference between teaching leadership in corporate, and academic environments and in teaching focused on young people?
10. In your experience, do young people respond better to collaborative or more authoritarian leadership styles?
11. Can the limitation of self-perception in young people hinder the development of their leadership skills? Can you explain how?

During the interview, he emphasized that leadership styles can vary significantly depending on the environment, with context shaping both the expectations and behaviors of leaders, as it was discussed in the introduction. Usually, academic settings prioritize collaboration and the development of socioemotional competencies, while corporate environments are more focused on the hierarchical structures and results of the company. In a more entrepreneurial context, adaptability and innovation are part of a supposed good leader. This observation aligns with the literature, which suggests that leadership is highly situational, a concept central to this study.

When discussing whether leadership is intrinsic or contextual, he noted that while some traits may be inherent, context plays a critical role in shaping leadership behaviors. Leadership often emerges in response to specific environmental needs, such as being assigned to lead a group. However, the ability to influence and adapt to surroundings is a universal trait across different leadership styles.

Regarding the effectiveness of leadership tests, he said he acknowledged their value in self-assessment and benchmarking but also pointed out their limitations, particularly the significant influence of self-perception on the results. This can lead to distorted results, particularly among young individuals who often face challenges in managing their emotions. To address this, he recommended complementing traditional tests with peer feedback and practical observations.

The comparison between youth and adults highlighted key differences in leadership development. Based on his experiences, he stressed that leadership training for young people should emphasize experimentation and opportunities to learn from mistakes. He emphasized the importance of patience when working with young people, as their emotional and cognitive maturity is still developing, requiring adaptive approaches. Conversely, adults are often expected to respond quickly to the demands of their environments, reflecting a different developmental focus.

He also addressed the ethical and pedagogical challenges of leadership education, emphasizing that it must preserve individual autonomy and respect personal interests. He described the ideal leadership development cycle as one that integrates theory, practice, and a constant focus on the individual, the context, and societal demands. He cited Inteli(Instituto de Tecnologia e Liderança)'s Project-Based Learning (PBL) [De Barros et al. 2023] model as an effective example, where students practice leadership in a safe and collaborative environment.

In terms of leadership styles, he pointed out that young people generally respond better to collaborative approaches, though he emphasized the importance of situational leadership. In high-pressure situations, such as crises, directive leadership may be necessary, while more open environments favor collaboration.

Finally, it was discussed the limitations of self-perception in leadership development, noting that young individuals may exhibit leadership behaviors even if they do not see themselves as leaders. He argued that external recognition and opportunities to assume leadership roles are critical to overcoming this barrier. By fostering such environments, young people can gradually build their confidence and leadership skills.

3. Discussions

Leadership is shaped by a combination of individual traits, environmental factors, and societal expectations, which makes it a dynamic and context-specific process. This research highlights key aspects of youth leadership, particularly its development and assessment in the context of ethical challenges, the growing role of digital platforms, and the emphasis on autonomy in leadership education. Moreover, traditional assessment tools, such as self-reported questionnaires and performance evaluations, often struggle to capture the nuanced and dynamic aspects of youth leadership.

Digital platforms have introduced new forms of leadership, with influencers shaping opinions and behaviors across wide audiences. For instance, social media personalities often serve as role models for youth, showcasing traits like charisma and communication, but sometimes lacking depth in ethical considerations. During the interviews, some participants identified public figures, such as Steve Jobs and sports coach Tite, as exemplary leaders. Interestingly, the role of influencers was also indirectly highlighted, with youth associating leadership with qualities such as inspiring others and providing direction.

However, this new era of digital leaders also raises concerns about the authenticity and ethical responsibilities of these leaders. Unlike traditional leaders in educational or professional settings, the informal nature of digital leadership presents unique challenges in aligning influence with ethical and developmental goals. Their influence, while impactful, may not always align with the developmental needs or values of young individuals. For researchers and educators, understanding how digital leadership shapes youth perceptions and behaviors is essential for designing relevant and meaningful.

As observed in this study, self-perception heavily influences leadership assessments. Many young participants struggled to identify themselves as leaders, even when describing situations where they demonstrated leadership behaviors. This aligns with findings from the professional interview, where self-awareness was identified as a critical

factor in leadership development and assessment. Tools that rely solely on self-reporting are limited in their ability to account for this bias, particularly among younger individuals who are still developing their emotional and cognitive maturity.

A multifaceted approach that combines various assessment methods provides a more holistic understanding of youth leadership. For instance, Social Network Analysis (SNA) can provide insights into informal leadership within peer groups by mapping interactions and influence. Similarly, peer feedback and observational assessments help balance self-perception biases by incorporating external perspectives. However, these methods must be complemented by contextual understanding [Ahn et al. 2014], as leadership behaviors are shaped by the specific environment in which they occur.

Technology also plays a critical role in enhancing leadership assessment. There is the possibility to use Natural language processing (NLP) and semantic analysis can objectively analyze communication patterns, and provide feedback on traits related to leadership in the speech from the participant. Virtual reality (VR) simulations and machine learning tools can create immersive scenarios and predictive models that identify potential leadership traits based on the results of tests in ways traditional methods cannot. These technological advancements not only can improve the accuracy of assessments but also make them more engaging and relevant for youth.

It is acknowledged that the reduced number of interviews limits the generalization of the findings in this study. For instance, Komives [Komives et al. 2005] explored leadership identity development in college students through depth interviews, using a grounded theory approach to uncover how young individuals perceive and experience leadership. Investigating leadership is already a challenge, now in the context of adolescents it is even more challenging, particularly due to the lack of studies on the subject and given that this age group is in a critical phase of personal and social development.

Moreover, it is important to emphasize that the use of technology in leadership assessments must be used with ethical principles, ensuring that the focus remains on supporting individual growth not excluding them directly by the results. Assessments should encourage growth, adaptability, and a deeper understanding of individual strengths. Instead, they should focus on fostering growth, providing constructive feedback, and respecting the individuality and autonomy of the participants.

4. Conclusion

This study examined the complexities of assessing youth leadership, emphasizing how traditional methods can be enhanced through the integration of emerging technologies. Through interviews with young individuals and a leadership expert, we gained valuable insights into how leadership is perceived, developed, and measured in youth contexts.

The perceptions gained through this study serve as an initial step in the theme of exploring youth leadership assessment. While the sample size is limited, the findings provide important insights into how teenagers understand and perceive leadership.

This work highlights the limitations of self-reported assessments, which often overlook the nuanced and dynamic aspects of youth leadership. By integrating peer feedback, contextual analysis, and advanced tools like NLP and VR simulations, leadership assessments can become more precise and tailored to the unique challenges faced by

young individuals.

Encouraging autonomy is essential for leadership development, as it allows young individuals to explore their strengths and adapt their leadership styles to different contexts. Approaches like Project-Based Learning provide safe environments for growth and experimentation [Karagianni and Montgomery 2017], preparing youth to lead effectively in diverse situations.

Future research should include a more diverse group of participants, expand the number of interviews, and test technological tools in practical settings to evaluate their impact on youth leadership development. By addressing these areas, we can create more inclusive and impactful strategies to support the next generation of leaders.

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