

## LEADERSHIP 4.0 COMPETENCIES TO ENHANCE DIGITAL TRANSFORMATION IN ORGANIZATIONS

COMPETÊNCIAS DA LIDERANÇA 4.0 PARA IMPULSIONAR A TRANSFORMAÇÃO DIGITAL NAS ORGANIZAÇÕES

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### Abstract

The Fourth Industrial Revolution (4IR) accelerates digital transformation in knowledge-based organizations. Developing strategies to rethink business models and organizational processes, with a strong focus on enhancing customer experience through digital technologies, is now a top priority in the business world. However, the lack of leadership skills that prioritize cognitive and interpersonal abilities over traditional managerial skills poses a significant barrier to achieving sustainable transformation. This article maps Leadership 4.0 competencies and diagnoses human-related weaknesses in the work environment of two teams at a large software company, providing recommendations to address these deficiencies and strengthen team-specific skills.

**Keywords:** Leadership. Competencies. Skills. Digital Transformation.

### Resumo

A Quarta Revolução Industrial (4RI) acelera a transformação digital em organizações da economia do conhecimento. Desenvolver estratégias para repensar modelos de negócios e processos organizacionais, com foco na experiência do cliente por meio de tecnologias digitais, é uma prioridade no mundo dos negócios. A falta de competências de liderança, que priorizam habilidades cognitivas e interpessoais sobre as gerenciais, é uma barreira à transformação sustentável. Este artigo mapeia competências da Liderança 4.0 e diagnostica fraquezas humanas no ambiente de trabalho de duas equipes de uma grande empresa de software, oferecendo recomendações para mitigar essas deficiências e fortalecer habilidades específicas das equipes.

**Palavras-chave:** Liderança. Competências. Habilidades. Transformação Digital.

## Introduction

According to Schwab (2017), the exponential advance of innovations based on combining technologies such as artificial intelligence, robotics, Internet of Things (IoT), nanotechnology, and biotechnology, among others, characterizes the Fourth Industrial Revolution (4IR). 4IR is forcing: companies to reexamine the way they do business and require new higher-level skills for workers; governments to establish new ways of doing politics and delivering public services; and people to rethink how to develop careers, cultivate skills, and nurture relationships, while concerns about privacy, consumption patterns, and time devoted to work and leisure emerge.

However, technology is only half of the 4IR equation (McKinsey, 2022). To thrive in the 4IR, companies must ensure that their workers are properly equipped through upskilling and reskilling and then hire new people when necessary. Upskilling means that employees learn new skills to help them in their current positions as the skills they need evolve. Reskilling is the real challenge: workers are retrained with new skills that will enable them to fill different positions within their companies. According to Luchtenberg (2022), with 4IR technologies in the hands of a workforce empowered with the skills needed to use them, an organization's digital transformation journey can move from aspiration to reality.

Digital transformation has become an important enabler for sustainable growth and innovation (Cathey, 2023). It can stimulate new business models, services, and revenue streams that can help companies boost bottom-line results. It can encourage greater operational efficiencies and productivity by streamlining complex processes, automating manual tasks, and removing redundancies. Furthermore, it allows organizations to improve customer experience, which is critical to increasing consumer loyalty and repeat revenues.

Digital transformation, or digitalization, occurs through technological, organizational, and human drivers (OECD, 2019; Oliveira & Souza, 2022). Technological drivers involve tools, digital technologies, and ICT infrastructure. Organizational drivers include adopting strategies, agile practices, and innovative approaches to (re)design business processes. Human drivers include knowledge, soft and hard skills required by stakeholders.

The Future of Jobs Report 2020 (WEF, 2020) points out that businesses are set to accelerate the digitalization of work processes, learning, and expansion of remote work, as well as the automation of tasks within an organization. However, the ability of global companies to harness the growth potential of new technological adoption is hindered by skills shortages. Still as found by the Future of Jobs Report 2020, *skills gaps among organization's leadership* are a perceived barrier to the adoption of new technologies to accelerate the digitalization of work processes, and *leadership and social influence* will be one of the most demanded skills for the coming years. The coming decade will require purposeful leadership to arrive at a future of work that fulfills human potential and creates broadly shared prosperity.

Leadership is a competency associated with different skills such as social influence, persuasion and negotiation, decision-making, judgment, negotiation, delegation, and taking responsibility (DQ Institute, n.d.). According to the Education 2030 learning framework (OECD 2018), developing competencies involves mobilizing knowledge, skills, and attitudes and values to address complex demands.

In light of the specific skills demanded by 21st-century work and the challenges posed by the 4IR, this study is guided by the following research question: What are the Leadership 4.0 competencies necessary for leading a digital transformation journey in knowledge-based organizations? To address this research question, the study presents the findings of a mapping of the competencies required by leaders in the context of 4IR, as identified in the specialized literature. The contribution of this study lies in specifying

and grouping the Leadership 4.0 competencies into a Reference Model, which can be utilized for various purposes, including diagnosing Leadership 4.0 competencies gaps in an organization aspiring to embark on a digital transformation journey.

## Reference Model of the Leadership 4.0 Competencies

Digital Transformation, or digitization, empowers and simultaneously necessitates leaders to continually adapt their strategies, business models, products, services, processes, technology, and organizational structure under conditions of volatility, uncertainty, complexity, and ambiguity (Kohnke, 2017). Digitization places demand on leaders, requiring heightened flexibility, risk management, and agility in decision-making. It is inherent to the 4IR, where innovation is driven by diverse combinations of digital technologies (Schwab, 2017).

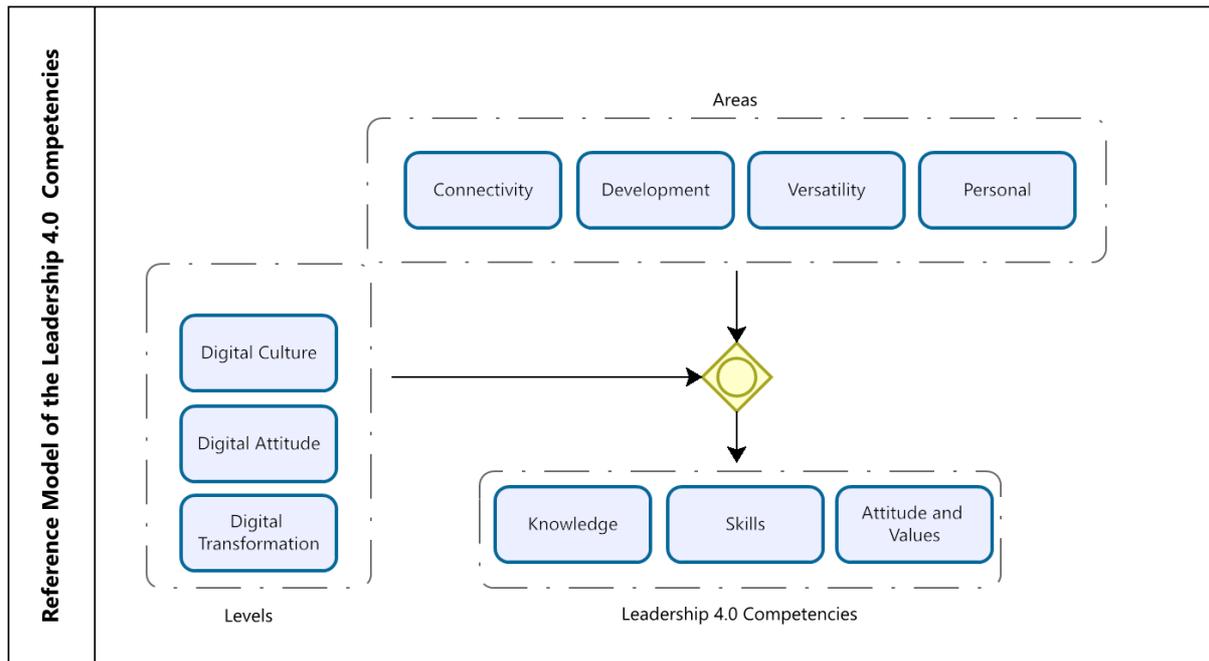
Competency gaps in leadership within organizations present significant challenges to the implementation of digital transformation (Bughin et al., 2018). The pivotal aspect of a digital transformation initiative is its alignment with leadership, serving as the indispensable foundation for organizational change (Kohnke, 2017). Consequently, leadership stands as a fundamental factor for the successful digital transformation of organizations.

According to DeRue and Ashford (2010), leadership can be defined by five essential elements: Leaders and Followers, where followers exert influence by providing input to leaders, and effective followers contribute to a constructive dialogue; Influence, a process by which leaders communicate ideas, gain acceptance, and motivate followers to support and implement changes; Organizational Objectives, emphasizing effective leaders' role in fostering a shared vision and guiding followers to align with organizational goals; People, highlighting the centrality of leading, working with, and guiding individuals with a shared vision; and Change, emphasizing that setting objectives and influencing are inherently linked to organizational adaptation to rapidly changing global environments.

As observed by Oberer and Erkollar (2018), a significant challenge for 4IR extends beyond finding or implementing the right technology; it also involves addressing a lack of digital culture and skills within organizations. Knowledge-based companies must cultivate a robust digital culture, with clear leadership driving transformative change. The imperative is to develop a Leadership 4.0 culture within organizations. Leadership 4.0 places less emphasis on traditional managerial skills, such as budget, scope, and deadline management, and is more closely associated with cognitive, interpersonal, emotional, and digital capabilities (Schwab, 2017; Bughin et al., 2018). The primary objective of this study was to comprehend and structure the Leadership 4.0 competencies. To achieve this, a Reference Model of the Leadership 4.0 competencies (Figure 1) was developed.

### Figure 1

Reference Model of the Leadership 4.0 Competencies



Source: Prepared by the authors.

The design of the Reference Model of Leadership 4.0 Competencies is inspired by and theoretically founded on some works. Guzmán et al. (2020) present leadership skills and characteristics in the context of Industry 4.0 based on a literature review. The Digital Intelligence framework (DQ Institute, 2019) groups digital skills through matrix relationships between competency areas and levels. The Education 2030 Learning Framework (OECD, 2018) defines competency based on knowledge, skills, and attitudes and values. The Future of Jobs reports (WEF 2018, 2020, 2023) highlight the key cognitive, social, and technical skills demanded by 21st-century work in response to the challenges posed by the Fourth Industrial Revolution (4IR).

Guzmán et al. (2020) categorized conventional leadership skills into four groups: Cognitive skill, which encompass speaking, active listening, writing, reading comprehension, active learning, and critical thinking; Business skill, involving operation analysis, management of personnel resources, management of financial resources, and management of material resources; Interpersonal skill, which encompass social perceptiveness, coordination, negotiation, and persuasion; and Strategic skill, involving visioning, systems perception, system evaluation, identification of downstream consequences, identification of key causes, problem identification, and solution appraisal.

Guzmán et al. (2020) also synthesized the Leadership 4.0 characteristics (or profiles): Responsive leadership entails effectively adapting to various situations; Swarm leadership involves navigating complex adaptive systems, where decisions, innovations, and directions emerge from the system itself; Learning and innovation leadership focuses on fostering the absorption of new knowledge and the collaborative generation of new ideas; Open leadership involves effectively communicating and exchanging constructive feedback; Agile leadership involves considering various scenarios, exploring different options, and embracing diverse ideas; Participative leadership involves decentralizing and sharing decision-making responsibilities; Network leadership involves supporting both internal and external connections; Trust leadership focuses on establishing an organizational culture grounded in trust; Digital leadership refers to make the right thing into the strategic success of digitalization of the company and in its business ecosystem; and Collaborative leadership encourages workers to experiment and contribute new ideas.

Finally, Guzmán et al. (2020) highlight the relationship between the characteristics of Leadership 4.0 and conventional leadership skills. The authors conclude that business skills are less in demand for the Fourth Industrial Revolution (4IR). Instead, leadership styles suited for 4IR are more collaborative, participative, and decentralized, encouraging people to make decisions and experiment to create an agile and responsive network culture.

This work uses Leadership 4.0 profiles and cognitive, interpersonal and strategic skills surveyed by Guzmán et al. (2020) to specify Leadership 4.0 competencies in terms of the knowledge, skills, and attitude and values.

The organization of the Reference Model of Leadership 4.0 Competencies into competency areas and levels is inspired by the Digital Intelligence framework (DQ Institute, 2019). Digital Intelligence (DQ) comprises a comprehensive set of technical, cognitive, meta-cognitive, and socio-emotional competencies grounded in universal moral values, enabling individuals to navigate challenges and seize opportunities in digital life. DQ has three competency levels (digital citizenship, digital creativity and digital competitiveness), eight competency areas (digital identity, digital use, digital safety, digital security, digital emotional intelligence, digital communication, digital literacy and digital rights) and twenty four competencies, each related to the intersection of one competency area and one maturity level. The DQ competencies involve the articulation of knowledge, skills, and attitudes and values to support digital life, where digital interactions are pervasive in personal, educational, and professional contexts.

The Reference Model of Leadership 4.0 Competencies defines twelve Leadership 4.0 competencies, organized through a matrix relationship between four competency areas (connectivity, development, versatility, and personal) and three competency levels (digital culture, digital attitude, and digital transformation), detailed in the following sections. Leadership 4.0 competencies are also articulated through knowledge, skills, and attitudes and values. According to the Education 2030 learning framework (OECD, 2018), competency development involves mobilizing disciplinary, epistemic, and procedural knowledge, a wide range of skills — cognitive, social, emotional, practical, and physical — to apply knowledge in unknown and evolving circumstances, and attitudes and values guiding how knowledge and skills are used at personal, local, social, and global levels to tackle challenges and seize opportunities.

Leadership 4.0 Competencies mobilize essential skills for workers and jobs required for knowledge-based economy. The last three Future of Jobs reports (WEF 2018, 2020, 2023) highlights *Leadership and social influence* and *Empathy and active listening*, related to *Working with people*, as core skills required by workers.

## Areas of the Leadership 4.0 Competencies

The Areas of the Leadership 4.0 Competencies are intricately linked to the key traits of digital leaders and followers. The following areas constitute the columns in the Reference Model, forming the vertical grouping of Leadership 4.0 competencies:

- **Connectivity:** Relates to the connection and cohesion between the leader and followers, fostering agile, decentralized, and collaborative decision-making with shared responsibility. Connectivity entails the distribution of decision-making within a team, where the leader establishes the necessary space and opportunities for decentralized decision-making.
- **Versatility:** Reflects the ability to swiftly act and react to changes and challenges, keeping pace with continuous shifts in project and operational constraints regarding scope, time, and cost. Versatility measures how digital leaders and followers respond rapidly to changes and challenges in an increasingly volatile and immediate environment. It involves leading groups or organizations toward

constructive transformation, setting direction, and aligning people with the strategies necessary to achieve the organization's vision.

- **Development:** Establishes strong interpersonal relationships between the leader and stakeholders, especially followers. It involves leading by example, inspiring behavioral changes, and fostering skills optimization within the team. Bilateral trust serves as the foundation for the mutual support that the leader requires. Once a trust-based relationship is established, the leader can naturally inspire and develop skills in individuals to catalyze the digital transformation movement.
- **Personal:** Relates to the behavioral and emotional skills and other human factors of the digital leader. The acquisition and enhancement of leadership skills are influenced by the uniqueness of personalities, values derived from cultural context, and the leaders' personal experience (Guzmán et al., 2020).

## Levels of the Leadership 4.0 Competencies

The Levels denote progress in achieving Leadership 4.0 competencies, reflecting the required maturity in a digital transformation journey. The following Levels form the rows in the Reference model, constituting the horizontal grouping of Leadership 4.0 competencies:

- **Digital Culture:** Signifying the ability to employ both hard and soft skills to cultivate a coherent and ethical mindset, embodying the fundamental behaviors of a digital leader.
- **Digital Attitude:** Reflecting the ability to implement Leadership 4.0 methods based on acquired knowledge, positively influencing work performance and team well-being to achieve superior results.
- **Digital Transformation:** Envisaging a digital leader capable of promoting digital transformation in the work environment, inspiring innovation and fostering healthy team integration leading to personal satisfaction.

## Leadership 4.0 Competencies

Table 1 shows the Leadership 4.0 Competencies Matrix, offering a brief description of the twelve Leadership 4.0 competencies across four competency areas and three competency levels.

**Table 1**

*Leadership 4.0 Competencies Matrix*

LEVEL	AREA			
	Connectivity	Versatility	Development	Personal
<b>Digital Culture</b>	<b>Openness</b> involves creating a supportive environment for giving and receiving feedback, whether positive or negative.	<b>Agility</b> entails acting and reacting swiftly, taking risks, considering various scenarios, experimenting with ideas, and learning from failures.	<b>Trust</b> involves establishing professional relationships with stakeholders, particularly followers, built on mutual trust.	<b>Empathy</b> involves understanding and considering the perspectives and feelings of others in professional relationships.

<b>Digital Attitude</b>	<b>Articulation</b> involves leveraging and connecting internal and external competencies within a networked environment, maximizing interactions between people.	<b>Adaptability</b> involves responding to unplanned work situations and quickly adjusting to adversities.	<b>Innovation</b> involves understanding, preparing, and cultivating the necessary competencies for innovation in people.	<b>Communication</b> involves effectively engaging with diverse audiences through various channels, as well as facilitating and creating space for fluid communication.
<b>Digital Transformation</b>	<b>Decentralization</b> involves participatory and shared leadership, where individuals actively participate in decision-making processes.	<b>Self-organization</b> involves stimulating or participating in an adaptive system where collective effort organically collaborates around a task or challenge.	<b>Collaboration</b> involves fostering collaborative work that leverages individual competencies.	<b>Resilience</b> involves maintaining a positive, proactive, and learning-oriented attitude in the face of failures and obstacles.

Source: Prepared by the authors.

Based on the literature review findings, Leadership 4.0 competencies are specified into knowledge, skills, and attitudes and values. Table 2 outlines the competencies at the Digital Culture level. Table 3 then specifies the competencies at the Digital Attitude level, and finally, Table 4 details the competencies at the Digital Transformation level.

**Table 2**

*Leadership 4.0 Competencies at the Digital Culture Level*

**Leadership 4.0 Competencies for Digital Culture**

	<b>Openness</b>	<b>Agility</b>	<b>Trust</b>	<b>Empathy</b>
<b>Knowledge</b>	Concepts and principles of feedback; and Continuous feedback cycles.	Agile concepts, practices, principles, and values, such as continuous delivery of value in short timeframes, accommodating changes, sustainable work, visual and self-organized management, simplicity, and reflections on teamwork.	Social intelligence developed through work relationships.	Understanding empathy as the art of imagining oneself in someone else's place, comprehending their feelings and perspectives, and using that insight to guide one's actions; Accurate interpretation of emotional and behavioral cues from others; and Body language.
<b>Skills</b>	Promote feedback cycles and define their scope within the team's development workflow; Utilize gathered	Manage changes effectively; Employ a humanistic approach to problem resolution; Utilize the collective	Integrity to adhere to ethical principles.	Cognition, to observe and be empathetic to the emotions of others; and Communication, to respond appropriately

	information and lessons learned for future planning; Cultivate productive dialogues; and Foster openness that respects individual differences without compromising the health of the organizational environment."	capacity of autonomous teams as a fundamental mechanism for problem-solving; Embrace the unpredictability of situations and emphasize adaptability to changes; Respond to emerging outcomes from self-organized teams; and Remove obstacles that hinder the team from achieving its objectives.		to people's body language.
<b>Attitudes and Values</b>	Promote open communication; Provide and receive feedback; Be open to criticism; Align organizational goals with workforce demands; and Encourage the expression of ideas and opinions about the workplace and even about the behavior of leaders and colleagues.	Define the strategy; Consider different scenarios; Maintain various alternatives; Identify weaknesses; Experiment with ideas; Learn from failures; and Encourage feedback, adaptation, and collaboration.	Demonstrate a sense of justice and transparency; Promote an open and direct process in addressing conflicts and issues; Show concern for supporting and empowering subordinates; and Provide opportunities for the team to participate in decision-making.	Listen to and treat each person in a unique way; Share feelings and motivations with others; Encourage the team to engage in empathy exercises and define their own empathy creed; Build emotional bonds with team members, fostering a sense of interconnectedness within the group; and Strengthen the team's identity by developing more positive intergroup attitudes.
<b>Theoretical foundation</b>	Goleman (2021); Decuyper & Schaufeli, (2020).	Rigby, Sutherland, & Takeuchi, (2021); Denning (2022).	Goleman (2021); Legood, van der Werff, Lee & Den Hartog (2020).	Brown (2022); Goleman, (2020); Rogers (2021).

Source: Prepared by the authors.

**Table 3**

*Leadership 4.0 Competencies at the Digital Attitude Level*

Leadership 4.0 Competencies for Digital Attitude				
	Articulation	Adaptability	Innovation	Communication
<b>Knowledge</b>	Work structure and existing professional and interpersonal relationships; and Structuring the professional network	Methods to enhance behavioral performance, such as multi-source feedback, behavioral modeling, personas, and executive coaching; and	Mindset, practices, methods, and tools of innovation; and Practical and experimental approaches.	Mastery of different means and channels of communication; and Semiotic, verbal, and non-verbal resources.

to understand who is involved and how it can be leveraged through effective communication, negotiation, influence, conflict resolution, and relationship strengthening.

Adaptable leadership, to comprehend that a leader can and should adapt to the needs of the situation and vary in structure and persona.

**Skills**

Communicate and raise awareness about how to handle a problem and what is necessary to achieve the objectives; Disseminate information accurately, timely, and clearly, which requires active listening to extract and absorb information from others; Negotiation, knowing the opportune moment to push or retreat, share information, exchange resources, and trade short-term results for a long-term goal; and Conflict management through win-win solutions, win-learn, and mutual agreement, considering different perspectives.

Diagnose adverse situations and activate the appropriate mode of behavior according to the context; Balance and lead competing values and opposing types of behavior in a manner suitable for the situation, such as control versus empower; Respond quickly but appropriately to sudden events that threaten and harm workflow, people, and property; and Make appropriate changes in strategies and tactics to adapt to threats or opportunities.

Guide and inspire subordinates to give their best and be guided by the vision of the future; Partner with subordinates, supporting them in taking risks and in carrying out activities that lead to change and innovation; and Foster flexible and incremental reward systems, valuing small contributions, milestones, and incremental changes ("small victories").

Use semiotic resources according to the specificities of the goals, situations, and recipients of the messages; Diagnose, mitigate, and resolve communication failures; and Employ a positive interaction style and provide a supportive work environment.

**Attitudes and Values**

Establish trustworthy relationships, use information ethically, and keep confidences; and Appropriately share resources (information, services, access, and power) in a scheme of exchange and reciprocity to create and maintain one's reputation, alliances, and position.

Recognize and encourage relevant competencies of subordinates, facilitating the rise of independence and adaptability within the team; Alternate the leadership pattern to be more or less centralized according to the group's needs; and Demonstrate appropriate behavioral flexibility according to tasks and subordinates.

Reduce or eliminate internal barriers to innovation and the generation of new ideas, such as fear of risks and failure, and knowledge centralization; Support and trust the team's work; Value individual contributions; Promote creative individuals and neutralize negative ones; Set balanced goals and challenges; and Develop physical and psychological spaces and processes that encourage

Embrace transparency in internal communication based on honest, relevant, and useful information to maintain or enhance relationships with subordinates; and Gather feedback from the team.

			interaction, easy exchange of ideas, and mutual support.	
<b>Theoretical foundation</b>	Northouse (2022); Goleman (2021).	Boyar et al., (2023); Schulze & Pinkow, (2020).	Damanpour (2020); Soto Setzke, Riasanow, Böhm, & Krcmar, (2021).	Yue, Men & Ferguson (2019); Darics (2020).

Source: Prepared by the authors.

**Table 4**

*Leadership 4.0 Competencies at the Digital Transformation Level*

Leadership 4.0 Competencies for Digital Transformation				
	Decentralization	Self-organization	Collaboration	Resilience
<b>Knowledge</b>	Leadership development practices; Techniques for selection and identification of leadership profiles; and Shared leadership concepts.	Guidance practices to provide a management structure, avoiding rigid and fixed instructions that hinder self-organization and team management; and Adopt agile management practices to keep the team integrated and motivated, resolve conflicts, and remove impediments to the team's self-organization.	Management practices aimed at creating a conducive and favorable environment for collaboration.	Reactive and proactive measures for problem resolution, learned from lived experiences and lessons learned.
<b>Skills</b>	Identify among team members those with leadership potential and delegate management tasks when appropriate; and Encourage spontaneous, shared decision-making without the need for strict supervision.	Emotional intelligence; Recognize and respect the team's workflow dynamics; Maintain team integration; Promote a healthy work environment; and Construct and effectively convey the future vision to guide the team's self-organized work.	Assess the team's maturity level and implement the appropriate management style to foster collaborative work and good relationships among team members; and Lead by example, exhibiting behaviors that support the team.	Resist and respond positively in adverse situations or changes, both internal and external, without letting it affect the cohesion and performance of the team; and Turn adversities into opportunities for individual and collective development and growth.

<b>Attitudes and Values</b>	Delegate decision-making to the team member who has the necessary competence to address specific problems faced by the team; and Foster trust and confidence for decision-making within the team.	Act as a facilitator, managing with a focus on results and removing obstacles that hinder the smooth operation of self-organized teams; and Understand the individual characteristics and preferences of team members to identify what makes each one tick outside the workplace and what motivates them.	Actively collaborate with the team, advising, providing feedback, supporting, encouraging, and removing impediments; Respect individual competencies; Encourage and nurture team empowerment and risk-taking; and Foster a culture of trust within the team, where individual competencies contribute to the overall strength of the team.	Influence the team to be more confident in handling failures, taking risks, and undertaking innovative and creative actions.
<b>Theoretical foundation</b>	Hoch & Dulebohn (2022); Pearce & Conger (2022); Zenger & Folkman (2023).	Denning (2022); Goleman (2020); Brown (2022).	Edmondson (2023).	Lombardi, Cunha & Giustiniano (2021); Gichuhi (2021).

Source: Prepared by the authors.

## Case Study

The Leadership 4.0 Competencies outlined in this work can be used to identify skill gaps in both team leaders and their followers. By diagnosing these leadership competencies gaps, organizations can plan actions to address weaknesses, preparing teams more effectively for a digital transformation journey.

The case study aimed to diagnose and capture the team's perceptions of the work environment. Each team member, including the leader, completed a brief and objective questionnaire, providing their perspective on each Leadership 4.0 competency in the context of their work environment. The anonymous feedback was then analyzed to identify any shortcomings highlighted by the team.

The case study was implemented within two teams at Accenture Brasil<sup>1</sup>, the Brazilian branch of the multinational software development organization. Team I consisted of one leader and five followers, while Team II consisted of one leader and seven followers. Both teams were engaged in software development and bug-fixing, operating in a remote work setup.

Both leaders and followers completed an electronic questionnaire (Table 5) containing closed questions (Q1 to Q12) related to each Leadership 4.0 competency. Additionally, there was an open-ended question (Q13) that addressed individual perceptions about the work environment.

### Table 5

*Questions for diagnosing the team's Leadership 4.0 competencies*

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<sup>1</sup> <https://www.accenture.com/br-pt>

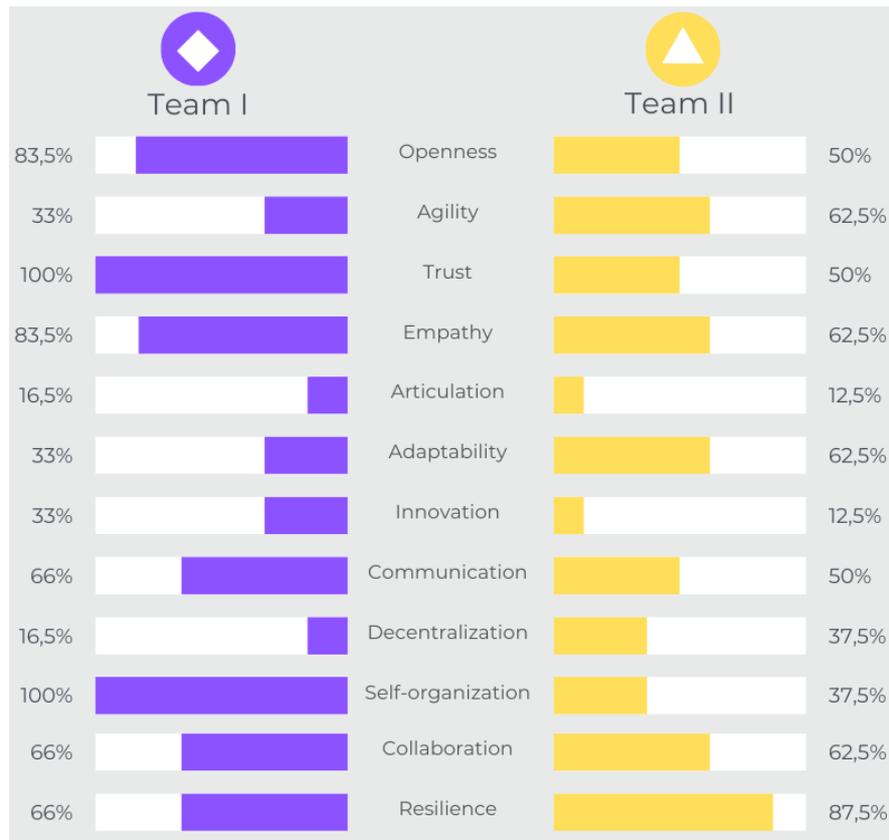
QUESTION	COMPETENCY EVALUATED
(Q1) Does the work environment facilitate two-way positive or negative feedback between the leader and team members?	Openness
(Q2) In the work environment, do you act and react quickly, take risks, consider different scenarios, experiment with ideas, and learn from failures?	Agility
(Q3) In the work environment, do you believe that the professional relationship between the leader and the team is based on mutual trust?	Trust
(Q4) In professional relationships, do you understand, empathize, and consider the perspective and feelings of others, and do you notice that the same is reciprocated?	Empathy
(Q5) In the work environment, are the connections between the competencies of team members and those external to the squad/project potentiated, maximized, and well-utilized?	Articulation
(Q6) In the work environment, are you able to adapt quickly and respond to adversities occurring in unplanned situations?	Adaptability
(Q7) Does the work environment favor, stimulate, and develop the necessary competencies for the pursuit of innovation in individuals?	Innovation
(Q8) In the work environment, is communication facilitated and occurs fluently, allowing you to communicate internally and externally through various forms and channels?	Communication
(Q9) In the day-to-day work environment, is decision-making participatory and shared between management and the team, rather than concentrated in one person?	Decentralization
(Q10) In the work environment, does the team self-organize and collectively strive to solve a complex task or an unexpected challenge?	Self-organization
(Q11) In the work environment, are challenges treated collaboratively, effectively leveraging the individual competencies of team members?	Collaboration
(Q12) In the work environment, do you consider that you maintain a positive, proactive, and learning attitude in the face of obstacles and failures?	Resilience
(Q13) In your opinion, what could be improved in the physical or psychological work environment or in professional relationships within the team or with management?	Work environment

Source: Prepared by the authors.

The answer choices for closed questions Q1 to Q12 followed a Likert scale: "Strongly disagree", "Disagree somewhat", "I don't know", "Agree somewhat", and "Strongly agree". Figure 2 displays the perceptions of the six members (leader and followers) of Team I and the eight members of Team II regarding Leadership 4.0 competencies. For each competency, the certainty index is presented as the percentage of "Strongly agree" responses to questions Q1 through Q12.

## Figure 2

*Teams I and II Perceptions on Leadership 4.0 Competencies from Questions Q1 to Q12*



Source: Prepared by the authors.

When analyzing Figure 2, a certainty index of less than 50% indicates the main weaknesses related to Leadership 4.0 competencies. Therefore, for Team I, the competencies to improve are Agility, Articulation, Adaptability, Innovation, and Decentralization. For Team II, the competencies to improve are Articulation, Innovation, Decentralization, and Self-organization.

Tables 6 and 7 present the responses of Team I and Team II, respectively, regarding the open-ended question Q13, which evaluates the work environment. Question Q13 was optional, and not all participants responded. The answers obtained were analyzed to identify Leadership 4.0 competencies weaknesses.

**Table 6**

*Team I Feedback on Questions Q13*

Q13 answers	Leadership 4.0 Competencies weaknesses
“The leadership has always been open to conversations. What I think is missing is integration among the teams.”	Articulation.
“Long-term demands require organization, perhaps by working with Sprints, where we have one or two weeks with clear objectives and well-defined goals. Additionally, using a platform (either from Accenture or internally from the team) to organize demands would help everyone clearly understand the tasks being executed.”	Decentralization; Self-organization.
“We have many areas for improvement. The main priority should be creating a work	Decentralization;

standard that protects the team from unreasonable demands with tight deadlines, which lead to excessive work, poor-quality deliveries, and communication failures. By having a consistent way of working, we can accurately assess whether new demands could negatively impact the work environment.”

Self-organization.

Source: Prepared by the authors.

**Table 7**

*Team II Feedback on Questions Q13*

Q13 answers	Leadership Competencies weaknesses	4.0
“Create initiatives to encourage 360-degree feedback, as many people may still be hesitant to provide it. Develop methods to monitor team satisfaction with the work and activities assigned to each person.”	Openness; Trust.	
“Increased interaction within the team would enhance communication, making it easier to ask for and offer help.”	Collaboration; Communication.	
“The high volume of demands may leave little time to invest in developing new skills and having career discussions.”	Innovation.	
“Leaders need to understand how their leadership is perceived through 360-degree feedback. They should be receptive to criticism and committed to improving.”	Openness; Trust.	

Source: Prepared by the authors.

The diagnosis, based on feedback from team members participating in the case study, identified the Leadership 4.0 competencies that need improvement. With this discovery, we can consult the specification of Leadership 4.0 competencies (Tables 2, 3, and 4)—the main contribution of this work—to identify the knowledge to be acquired, the skills to be developed, and the attitudes and values to be exercised by leaders and followers. This will strengthen the most needed Leadership 4.0 competencies, such as Agility, Articulation, Adaptability, Innovation, Decentralization, and Self-organization as diagnosed in the case study.

Agility goes beyond a set of practices—it's a philosophy that must be embedded into the organizational culture as part of an ongoing journey. According to Rigby et al. (2021), companies that embrace these principles become more adaptable and thrive in complex, ever-evolving business environments. Organizations that can quickly adjust and adopt a humanistic, collaborative approach are better positioned for success.

Denning (2022) highlights that for agile practices to succeed, the focus should be on continuous value delivery, maintaining sustainable work at a steady pace, promoting transparency and simplicity, empowering employees, prioritizing customer needs, and fostering collaborative, self-organizing teams while embracing uncertainty and exercising visionary leadership. Thus, organizations must integrate practices that encourage flexibility and adaptability in dynamic environments. Rigby et al. (2021) also suggest that companies should establish a clear strategy, consider various scenarios, and nurture a culture of experimentation where failures are seen as learning opportunities.

To strengthen Articulation and enhance collaboration between teams, it is necessary to understand the network of existing professional and interpersonal relationships. Establish mechanisms such as a community of practice to encourage the exchange of experiences and the dissemination of information

and knowledge. Additionally, value and reward attitudes such as sharing best practices.

To enhance and make better use of connections, leaders must structure their professional and interpersonal networks around effective communication, negotiation, and conflict resolution. According to Northouse (2022), clear communication and accurate information dissemination are crucial for strengthening connections through articulation, enabling leaders to guide their teams in problem-solving and achieving goals. Leadership grounded in articulation enhances professional networks by encouraging the exchange of resources and ideas among participants.

Goleman (2021) underscores the importance of leveraging connections ethically and persuasively, with trust and reciprocity as the foundation for building alliances and strengthening one's reputation. The ability to resolve conflicts through mutually beneficial solutions and negotiate long-term outcomes further solidifies professional relationships. By ethically and effectively balancing the exchange of information, services, and power, leaders ensure that their networks remain sustainable, fostering continuous innovation and growth within the organization.

To strengthen Adaptability, leaders must adjust their behavior to fit the situation, balancing competing values like control versus empowerment, and rapidly adapting strategies in the face of disruptions (Schulze and Pinkow, 2020).

Executive coaching plays a key role in developing flexible leaders. Beyond diagnosing challenging situations, leaders should identify and nurture the skills of their followers, fostering a sense of independence and adaptability within the team (Boyar et al., 2023). Demonstrating behavioral flexibility, shifting between centralized and decentralized leadership styles, and adjusting to the needs of the group are crucial behaviors for cultivating adaptability (Boyar et al., 2023).

To strengthen Innovation and develop innovation-oriented capabilities in people, it is necessary to train and mentor the team in creative problem-solving approaches. Establish physical, technological, and psychological spaces that promote a growth mindset, risk-taking, learning from failures, and experimentation. Additionally, create a system that encourages individual and collective contributions of new ideas.

To foster innovation, leaders must integrate knowledge and practices such as cultivating an innovative mindset and embracing experimental approaches. This helps create a safe environment where employees feel comfortable taking risks and proposing changes, which is key to driving organizational innovation. Damanpour (2020) argues that leaders can establish an environment that lowers internal barriers, like the fear of failure, while encouraging the generation of new ideas and the decentralization of knowledge. By adopting these strategies, leaders can guide and inspire their teams to align with the organization's vision for the future.

Soto Setzke et al. (2021) emphasize that leaders should support practical experimentation and celebrate small wins, implementing a flexible, incremental reward system that acknowledges minor achievements to build confidence and encourage calculated risks. By nurturing creative individuals, minimizing negative influences, and setting balanced goals, leaders can create physical and psychological spaces that promote collaboration and innovation. In this environment, individual contributions are appreciated, and mutual support becomes integral to the organization's progress.

To strengthen Decentralization and enable participative and shared decision-making by the team, it is necessary to understand and practice leadership techniques, establish evidence-based management mechanisms using available information and knowledge, and foster a culture of trust and delegation of responsibilities.

To facilitate decentralization, leaders must embrace practices of shared leadership development by identifying and delegating responsibilities to team members with leadership potential. Hoch and

Dulebohn (2022) suggest that shared leadership distributes decision-making across the team, leading to a more collaborative and efficient approach to overcoming organizational challenges. By recognizing individuals with the right skills and assigning management tasks accordingly, leaders promote spontaneous decision-making and reduce the need for constant oversight, ultimately enhancing team engagement and fostering greater autonomy.

According to Pearce and Conger (2022), trust and support in decision-making are crucial for effective decentralized leadership. By delegating decision-making authority, leaders not only build a trusting environment but also help the team develop its own leadership abilities. Zenger and Folkman (2023) highlight that exceptional leaders cultivate this trust by creating a culture that encourages decentralized decision-making and instills confidence in individuals' abilities to tackle complex challenges.

Finally, to foster Self-organization within teams, leaders must avoid rigid management structures and fixed instructions that can limit team autonomy and adaptability. Denning (2022) suggests that adopting agile management practices helps keep teams motivated and cohesive, facilitating conflict resolution and removing obstacles. Denning highlights that by fostering a culture of empowerment and collaboration, leaders can act as facilitators who support teams in their autonomous work. This approach involves understanding the team's workflow dynamics and creating an environment that respects individual differences, thereby encouraging self-organization and agility.

Emotionally intelligent leaders are better positioned to integrate their teams and cultivate a healthy work environment where employees feel valued. Goleman (2020) emphasizes the importance of recognizing and respecting the workflow dynamics within teams, while clearly communicating an inspiring vision to guide the self-organized efforts of the team and foster alignment around common goals. This approach to emotional intelligence highlights the strong connection between emotional skills and organizational effectiveness, contributing to the development of healthier and more productive work cultures. Leading with a focus on results while removing obstacles that hinder the performance of self-organizing teams is essential. Brown (2022) argues that effective leaders should foster an environment where vulnerability and courage are valued, enabling teams to feel safe to collaborate and innovate. Brown (2022) also highlights the importance of understanding the unique characteristics and preferences of each team member, including what motivates them outside of work, to create a more engaged and productive atmosphere.

### Final considerations

The rapid pace of digital transformation across various sectors of the knowledge economy and education, driven by the Fourth Industrial Revolution (4IR), demands the holistic integration of knowledge, skills, and attitudes and values, giving rise to the so-called Leadership 4.0 competencies. These competencies require greater attention to cognitive and interpersonal skills and less emphasis on traditional deadline, scope, and cost management. This study aimed to identify the key Leadership 4.0 competencies through a survey of specialized literature.

The outcome of this work is the specification of a Reference Model of Leadership 4.0 Competencies, structured through a matrix relationship between three competency levels (digital culture, digital attitude, and digital transformation) and four competency areas (connectivity, versatility, development, and personal), defined the twelve Leadership 4.0 competencies: Openness means creating a supportive environment that welcomes all feedback; Agility involves swift action, risk-taking, and learning from failures; Trust involves forming professional bonds with followers based on mutual trust; Empathy is about understanding and considering others' perspectives and feelings in professional relationships; Articulation involves leveraging internal and external competencies within a networked environment to maximize team interactions; Adaptability means responding to unplanned situations and swiftly adjusting to adversities; Innovation involves preparing and fostering team abilities to innovate;

Communication is about effectively engaging diverse audiences through various channels and creating space for fluid interaction; Decentralization means participatory and shared leadership, where individuals actively engage in decision-making processes; Self-organization stimulates collective effort to collaborate organically around tasks or challenges; Collaboration involves fostering teamwork that leverages individual competencies; and Resilience involves maintaining a positive, proactive, and learning-oriented attitude despite failures and obstacles.

This work also included a case study that diagnosed deficiencies in Leadership 4.0 competencies within two teams comprising a total of fourteen individuals, including leaders and followers, from a large software industry company. Based on feedback from these teams regarding Leadership 4.0 competencies in the workplace, the main weaknesses were identified. With these findings in hand, the complete specification of Leadership 4.0 competencies, encompassing knowledge, skills, attitudes, and values gathered from specialized literature, was consulted. Subsequently, recommendations were made for strengthening the deficient Leadership 4.0 competencies.

The Leadership 4.0 competencies mapped and specified in this study have broad applicability and can benefit various audiences: Researchers focusing on competencies needed for the Fourth Industrial Revolution (4IR); HR professionals interested in recruitment and leadership development; Organizations seeking to pinpoint barriers in their digital transformation journeys; Leaders and professionals looking to gain an edge in the workplace; and Educators aiming to cultivate competencies essential for the 21st-century workforce.

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