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Navigating leadership challenges with technology: Uncovering the potential of ChatGPT, virtual reality, human capital management systems, robotic process automation, and social media

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ABSTRACT

Objective: The article aims to examine the use of technology in leadership, and whether it can bring real advantages to leadership effectiveness.

Research Design & Methods: In this article, we provide a preliminary analysis of empirical research conducted among managers working in the USA, Japan, India, and France on technology use. The analysis was conducted on a country level.

Findings: We found that technology is an important issue, but the application of too many technological solutions is not effective for leaders. Analysis of non-technological solutions to overcome a constraint is necessary, especially in the long term.

Implications & Recommendations: The study was devoted to the use of new technologies by leaders in different countries. We examined technologies that have influenced present-day leadership and contemporary business in recent years. Without any doubt, new technologies such as ChatGPT will have an impact on the current leadership.

Contribution & Value Added: The article's added value consists of the updated and synthetic presentation of the application of different technologies in leadership activities.

Article type: literature review and research article

Keywords: digital technologies; chatGPT; virtual reality; robotic process automation; social media; human capital management systems

JEL codes: L26, L10

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INTRODUCTION

As the swift advancement of technology in recent times revolutionized how businesses and organizations are operated (Rymarczyk, 2020), many leaders in organizations assumed an entrepreneurial mindset and approach, acting like entrepreneurs to drive innovation and growth within their companies (Aránega, Montesinos, & del Val Núñez, 2023). As a result, current leaders have increasingly embraced various emerging technologies to maintain competitiveness and enhance productivity (Montenero & Cazorzi, 2022; Sieja & Wach, 2019). Generative AI such as ChatGPT refers to artificial intelligence systems that can create content or predict outcomes based on the data provided (Wach *et al.,* 2023). The importance of generative AI for leaders lies in its ability to automate complex data analysis and decision-making processes, leading to more accurate and efficient outcomes, and ultimately, better-informed

strategic decisions (Korzynski & Mazurek *et al.*, 2023). Virtual reality (VR) is a technology that allows users to immerse themselves in a computer-generated environment, enabling them to interact with the environment and its elements. For leaders, VR is important as it offers innovative ways to train employees, design products, and market services, reducing costs and enhancing customer experiences (Smutny, 2022). Blockchain is a decentralized digital ledger that enables secure, transparent, and tamper-proof recording of transactions across a distributed network (Wu & Zhang, 2022). The significance of blockchain for leaders is its potential to improve trust, reduce fraud, and streamline operations, particularly in industries like finance, supply chain management, and healthcare. Human capital management systems (HCMS) are software applications that facilitate the management of employee data and organizational processes, streamlining human resources functions. Leaders benefit from HCMS by gaining better insights into their workforce, improving employee engagement, and fostering a more efficient and productive organization (Silic, Marzi, Caputo, & Bal, 2020). Robotic process automation (RPA) involves the use of software robots to perform repetitive tasks, thus increasing efficiency and reducing human errors. The adoption of RPA is crucial for leaders as it allows them to optimize their operations, reduce costs, and enhance overall productivity (Plattfaut & Borghoff, 2022). Finally, social media encompasses various online platforms that facilitate communication, collaboration, and information sharing among users. The importance of social media for leaders is twofold. Firstly, it serves as a valuable tool for brand building, marketing, and employee engagement (Korzynski, Mazurek, & Haenlein, 2020). Secondly, it enables leaders to stay informed about industry trends, gather feedback, and maintain a strong presence in the digital space (Korzynski, Paniagua, & Mazurek, 2023).

The article aims to examine how different technologies influence leadership effectiveness. To determine factors influencing leaders' effectiveness, we considered a new leadership concept, termed bounded leadership (Kozminski, Baczynska, Skoczeń, & Korzynski, 2022). This concept assumes that leaders are constrained by different issues such as office politics, cultural norms, employee motivation, or emotional attitudes, and coping with these constraints helps leaders be more effective in fulfilling their roles (Kozminski, 2015).

Previous studies focused primarily on the individual impacts of technology and leadership activities on organizational outcomes. However, there is a lack of research examining the combined effects of technology usage and leadership activities on leadership effectiveness. The study described in this article sought to address the existing knowledge gap by investigating the interrelationship between technology usage and leadership activities (*i.e.*, coping with different constraints), and its influence on leadership effectiveness. By examining this complex interplay, the study attempted to provide valuable insights that can contribute to a better understanding of how leaders can leverage technology to enhance their decision-making, problem-solving, and overall leadership performance.

This article is structured as follows. Firstly, we will discuss the concept of leadership constraints and analyse how these constraints might be minimized thanks to technology. Secondly, we will propose hypotheses concerning the relationship between the use of technology, overcoming constraints, and leadership effectiveness. Thirdly, we will present the data collection and results. Finally, we will discuss the results, implications, and limitations of this study.

LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

Bounded Leadership Theory

Industry professionals argue that conventional management theories provide solutions that result in effective processes and foreseeable outcomes during times of stability. However, these theories often fall short when confronted with the demands of an ever-changing, complex, and uncertain environment. Similarly, leadership theories are frequently limited in scope. In contrast, the bounded leadership theory proposes a holistic and versatile perspective, transcending the focus on a leader's characteristics or responsibilities, and taking into account numerous constraints linked to actions at various levels, including individual, team, organizational, and stakeholder dimensions (Kozminski, 2015). This alternative perspective on leadership is evocative of Herbert Simon's concept of bounded rationality, which asserts that individual actions are shaped by emotions and irrationality, as their innate ability to process information

and tackle problems is restricted (Cristofaro, 2017). In recent times, this theory of bounded rationality has found application in leadership studies, as demonstrated by a Polish investigation involving top-level executives (Kozminski, 2015). The study endorsed the idea that the efficacy of leaders is impeded by a myriad of factors, including power dynamics, organizational culture, ethical challenges, emotional components, workforce motivation, procedural protocols, and information accessibility.

Coping with Constraints and Leadership Effectiveness

Leadership effectiveness is often influenced by various constraints that leaders must overcome to achieve success in their organizations (Kozminski *et al*., 2022). Understanding and addressing these constraints can significantly impact a leader's ability to guide their team and organization effectively. Cultural constraints pertain to deeply ingrained values and norms that are difficult to change, even if they prove to be counterproductive (Sørensen, 2002). By navigating these challenges and fostering a positive organizational culture that supports growth and development, leaders can enhance their effectiveness in driving organizational change and promoting innovation (Meng & Berger, 2019). Emotional constraints are typically associated with strong negative emotions that can prevent leaders from behaving rationally and making sound decisions (Llamas-Díaz, Cabello, Megías-Robles, & Fernández-Berrocal, 2022). Developing emotional intelligence can help leaders manage their emotions, improving their decision-making abilities and ultimately enhancing their leadership effectiveness (Dasborough *et al.*, 2022). Entitlement constraints arise from organizational formalization, which outlines responsibilities and hierarchical structures (Monteiro & Adler, 2022). Balancing the need for formalization with flexibility allows leaders to adapt to changing circumstances and maintain effectiveness. By doing so, they can create a more agile organization, better equipped to respond to dynamic market conditions (Newman, Mintrom, & O'Neill, 2022). Ethical constraints involve leaders facing ethical dilemmas and navigating morally complex situations (Al Halbusi, Tang, Williams, & Ramayah, 2022). By practising ethical leadership, leaders maintain trust and foster a positive organizational environment, thus increasing their effectiveness, especially in the long term (Dey, Bhattacharjee, Mahmood, Uddin, & Biswas, 2022). Informational constraints reflect the challenges leaders face in collecting, processing, and acting upon information. Developing strategies to manage these constraints, such as leveraging technology and cultivating networks to access relevant information, can enhance a leader's decision-making capabilities and improve their overall effectiveness (Delanoy & Kasztelnik, 2020). Motivational constraints relate to the diminished motivation of a leader or their followers. By employing various motivational techniques, leaders can maintain high levels of engagement and productivity within their teams, ultimately boosting their effectiveness in achieving organizational goals (Tang, Chen, van Knippenberg, & Yu, 2020). Political constraints stem from power dynamics and office politics that can hinder leadership effectiveness. Navigating these challenges by building alliances, managing conflicts, and fostering a positive political environment can enhance a leader's ability to influence and create strategic alignment within the organization (Borah, Iqbal, & Akhtar, 2022). These arguments lead to the following hypothesis:

H1: Coping with constraints is positively associated with leaders' effectiveness.

Technology and Leadership Effectiveness

Generative AI technologies, such as ChatGPT, are revolutionizing the way leaders manage information and make decisions in various industries (Kellogg, Sendak, & Balu, 2022). One of the primary challenges leaders face is dealing with informational constraints because of vast amounts of data and the limited possibility to extract valuable insights from them. Generative AI models can address this issue by rapidly processing and analysing large datasets, enabling leaders to access data-driven recommendations or alternative perspectives based on historical data, trends, and patterns (Lund & Wang, 2023). This capability can help leaders refine their strategies, set priorities, and make more effective decisions. Moreover, generative AI technologies can also help leaders overcome motivational constraints among employees, business partners, or clients. These tools can assist leaders in crafting clear, concise, and persuasive messages tailored to different audiences, which can improve communication and engagement (van Dis, Bollen, Zuidema, van Rooij, & Bockting, 2023).

Blockchain technology, originally developed for cryptocurrency transactions, has evolved into a versatile tool with applications beyond finance, including the facilitation of leadership functions. By providing a secure, decentralized, and transparent platform for various types of transactions, blockchain-related technologies enable leaders to bypass centralized authorities, thus addressing entitlement constraints (Sharif & Ghodoosi, 2022). One of the key benefits of blockchain technology is its ability to create a single source of truth (Hartelius, 2023), which can help leaders overcome informational constraints. By ensuring that all parties involved in a project or business operation have access to the same data, blockchain can facilitate smoother communication and decision-making processes (Çolak, 2022). Additionally, Blockchain's decentralized nature also allows for greater collaboration and resource sharing among organizations, which can contribute to overcoming entitlement constraints, where leaders need to rely on centralized authority that approves various business operations.

Virtual reality (VR) technology has emerged as a powerful tool for leadership training, particularly in addressing emotional constraints (Maslova, Gasimov, & Konovalova, 2022). Virtual reality can create immersive and realistic simulations of emotionally challenging situations, allowing leaders to practice their responses and develop the necessary skills to handle such interactions more effectively. One notable aspect of VR training is the concept of body transfer, which enables leaders to observe a trained leader's body movements (*e.g.*, side glances, eye rolls, and dismissive hand gestures) on an avatar during emotionally charged discussions with employees (Bailenson, 2018). By observing and mimicking these nonverbal cues, leaders can gain a better understanding of how their body language affects their interactions with others and learn to communicate more effectively in emotionally charged situations and this way influence positively their effectiveness.

Human capital management systems play a vital role in helping leaders address various leadership constraints, such as cultural, informational, and motivational constraints, ultimately leading to improved leadership effectiveness. Cultural constraints refer to the limitations leaders face in aligning their organization's values, norms, and practices with the diverse backgrounds and perspectives of employees and stakeholders (Kozminski *et al.*, 2022). Human capital management systems facilitate a range of processes related to human capital, including recruitment and selection, onboarding, performance assessment, and talent management. These systems enable leaders to identify candidates who exhibit cultural fit and promote desired social behaviours within the organization, thus minimizing cultural constraints (Dastmalchian *et al*., 2020). In terms of addressing motivational constraints, HCM systems can facilitate leader-follower interactions at suitable times and improve communication within the organization. Leaders began treating employees as customers, focusing on improving their experiences and satisfaction levels (Nikolova, Schaufeli, & Notelaers, 2019). This shift in approach resulted in increased motivation and productivity among employees. Moreover, HCM systems can provide leaders with tools to track employee performance and identify areas for improvement, helping them to address performance-related motivational constraints. By offering personalized feedback and development plans, leaders can empower employees to take charge of their professional growth, resulting in a more engaged and motivated workforce (Ehrnrooth, Barner-Rasmussen, Koveshnikov, & Törnroos, 2021).

Social media platforms, particularly professional ones such as LinkedIn, play a crucial role in helping leaders overcome various leadership constraints, including motivational, cultural, and political constraints. By leveraging social media, leaders can enhance communication, collaboration, and networking within and beyond their organizations, leading to better overall performance (Borah *et al.*, 2022). Social media platforms enable leaders to share their vision, goals, and achievements with a wider audience, fostering motivation and buy-in from employees and other stakeholders (Cortellazzo, Bruni, & Zampieri, 2019). Additionally, social media platforms facilitate the sharing of best practices, success stories, and industry news, which can inspire employees and help them stay informed and engaged in their work (Korzynski *et al*., 2020). Social media platforms provide also an opportunity for leaders to celebrate diversity, promote inclusive organizational culture, and share initiatives that support underrepresented groups (Sun, 2020). By leveraging social media, leaders can foster a sense of belonging and unity within their organizations, ultimately leading to a more inclusive and high-performing workforce. Social media platforms offer leaders a space to overcome political constraints that refer to the challenges leaders face in navigating the complex web of relationships, power dynamics, and interests

within their organizations and the broader business environment. On social media, leaders can build their personal brand, establish credibility, and develop strategic relationships with key stakeholders, influencers, and decision-makers (Yue, Thelen, Robinson, & Men, 2019).

Based on the above discussion, the following hypothesis was established:

H2: The use of technologies in organizations such as generative AI, virtual reality, blockchain, human capital management systems, robotic process automation, or social media is positively associated with leadership effectiveness.

RESEARCH METHODOLOGY

We hired a professional survey agency to conduct a study among experienced managers in four countries: the US (203), India (n=201), Japan (211), and France (216). To analyse how the use of different technologies such as AI (internal chatbots), VR, human capital management systems, social media platforms, robotic process automation, and blockchain-related technologies and coping with constraints facilitate leaders in fulfilling their roles more effectively, we collected the following data: leaders' technology use, participants' application of each technology in their work; leaders' coping with constraints, replies to statements on coping with specific constraints, *i.e.* political, entitlement, motivational, informational, cultural, emotional, and ethical in a 1-7 scale, in which 1 meant totally different behaviour and 7 meant very similar behaviour; and leaders' effectiveness, *i.e.*, responses to questions about effectiveness on individual, team, organizational, and stakeholder level on a 1-7 scale (Kozminski *et al*., 2022).

We applied variance-based structural equation modelling (SEM), *i.e.*, partial least-squares SEM, due to the presence of formatively measured constructs (Wong, 2013). Moreover, we decided to calculate and compare the average values of the above-mentioned variables on a country level.

RESULTS AND DISCUSSION

Figure 1 demonstrates the percentage of leaders using specific technologies. From an overall perspective, HCMS emerged as the most popular technology across all four countries, with adoption rates ranging from 44% to 56%. Social media also demonstrated significant popularity as the second most adopted technology, with adoption rates ranging from 32% to 43%. On the other hand, V, with adoption rates between 9% and 24%, and blockchain, with adoption rates between 11% and 22%, generally had lower adoption rates, making them the least popular technologies among the listed options.

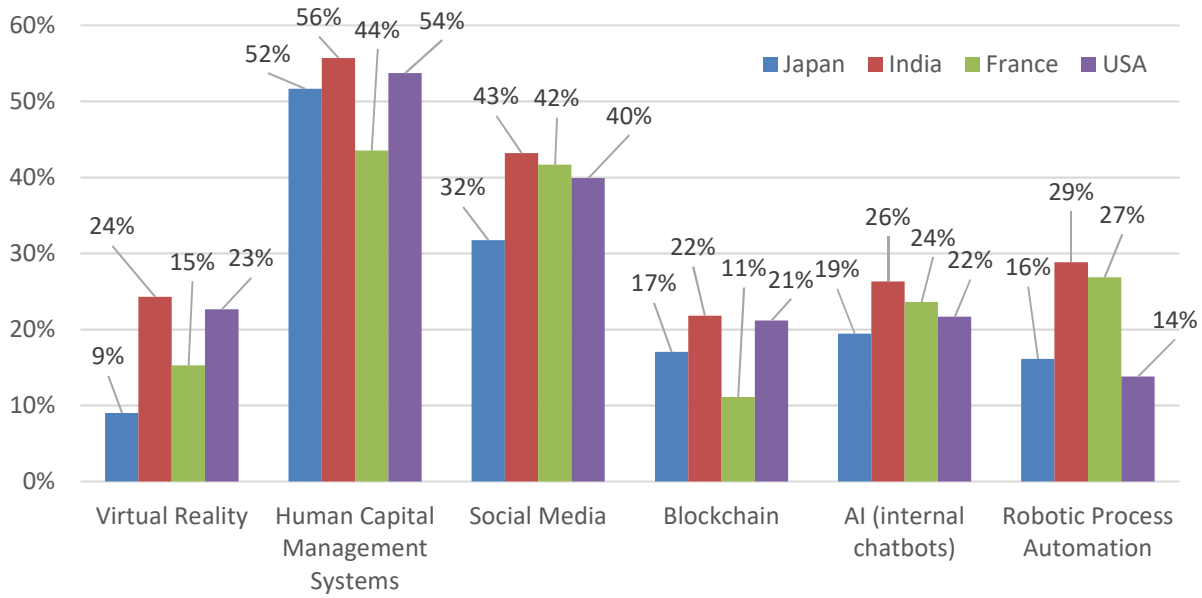

Figure 1. Percentage of leaders taking advantage of specific technologies

Source: own elaboration of the survey (n = 831).

Comparing the countries, India demonstrated the highest adoption rates for all technologies among the four countries, with the most popular technologies being HCMS (56%) and social media (43%). The USA and France showed similar adoption rates for the most popular technologies, with HCMS respectively at 54% and 44%, and social media at 40% and 42%, respectively. Japan has the lowest adoption rates for most technologies, with the most popular being HCMS (52%) and social media (32%). A possible factor contributing to Japan having lower adoption rates for most technologies could be the characteristics of Japanese managers who participated in the survey. Japanese managers might be less open or more reserved when providing information about their organization's use of technology. Cultural norms and practices, such as a higher emphasis on privacy or a tendency to be more cautious and discreet about sharing information, could have influenced their responses. This could potentially lead to an underreporting of technology adoption rates in Japan, which might make the results appear biased. To account for this possibility, it is essential to consider cultural differences and their potential impact on survey responses when comparing countries.

Figure 2 presents average results on coping with the constraints in four countries. In Japan, leaders reported an average rating of 4.66, suggesting a moderate level of similarity in their coping behaviours with the constraints. India had a slightly higher average rating of 4.79, indicating a somewhat similar approach to coping with constraints as Japan. France and the USA showed higher average ratings, with 5.18 and 5.06, respectively, suggesting that leaders in these countries have more similar coping behaviours when dealing with constraints compared to Japan and India.

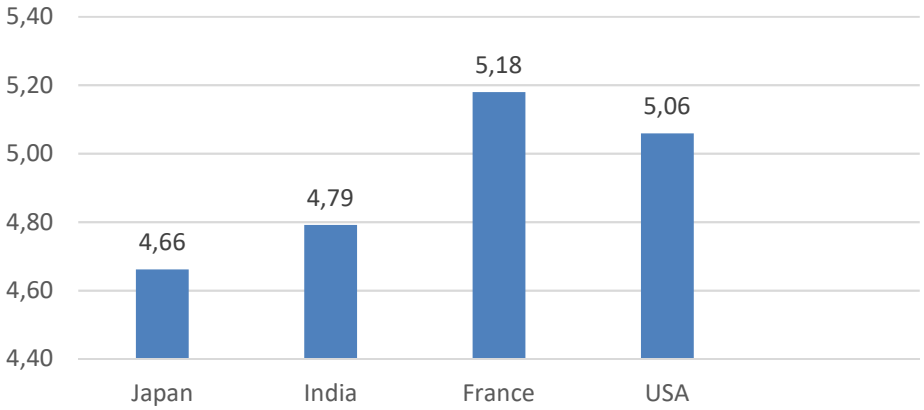

Figure 2. Coping with the constraints across countries
Source: own elaboration of the survey (n = 831).

To test hypothesis 1 and hypothesis 2, we used the resampling method for significance testing and bootstrapping of 5000 resamples and 100 cases per sample. The results (Table 1) confirmed the relationship between coping with constraints and leaders' effectiveness (p-value less than 0.045). Thus, we can confirm hypothesis 1. However, we cannot confirm the relationship between technology and leaders' effectiveness, and thus, hypothesis 2.

Table 1. Path coefficients and p-values

Path	Parameter Estimate	p-value
H1: Coping with constraints → Leaders' effectiveness	0.081	0.045
H2: Use of technology → Leaders' effectiveness	0.103	0.375
Managerial experience → Leaders' effectiveness	0.012	0.790
Tenure → Leaders' effectiveness	0.003	0.962
Country → Leaders' effectiveness	0.048	0.286
Gender → Leaders' effectiveness	0.074	0.181

Source: own elaboration of the survey (n = 831).

In addition to the SmartPLS analysis, we decided to compare the average values of our main variables at the country level (Figure 3). This approach allowed us to gain a better understanding of the differences

between countries in terms of leadership effectiveness, coping with constraints, and technology use. By doing so, we could identify patterns and insights that might not be apparent through the SmartPLS analysis alone, and further our understanding of the interplay between these factors in various national contexts. We discovered that both coping with constraints and the use of technology might play a significant role. Intriguingly, French leaders demonstrated a high ability to cope with constraints (average 5.18) but a lower adoption of technology (average 0.27) compared to their counterparts in the US and India. Conversely, Indian leaders, on average, exhibited the highest utilization of technology (average 0.33) but a relatively lower proficiency in coping with constraints (average 4.79). Consequently, neither French nor Indian leaders achieved the highest effectiveness scores (France: 5.34, India: 5.22). Thus, we cannot fully confirm hypotheses 1 and 2. This implies that in today's technology-driven era, leaders require a variety of tools to enhance their effectiveness. However, an overemphasis on technology could potentially diminish the human touch and reduce the ability to address various constraints effectively.

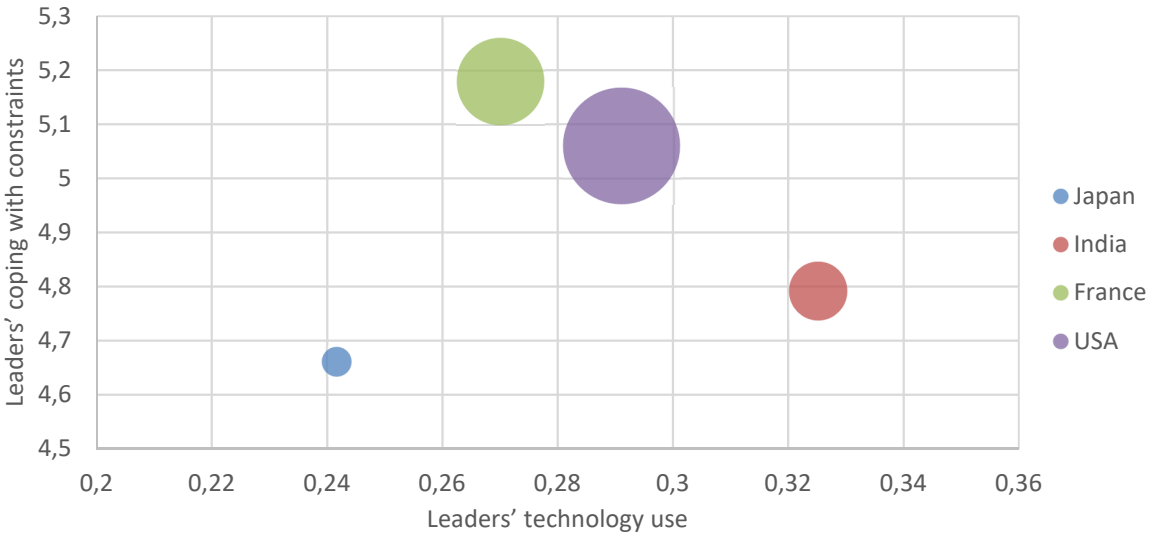

Figure 3. Leaders' effectiveness (bubble size), coping with constraints, and technology use
Source: own elaboration of the survey (n = 831).

CONCLUSIONS

While the statistical analysis conducted in SmartPLS did not confirm a direct relationship between technology use and leaders' effectiveness, examining the data at a country level revealed that a certain level of technology use can be supportive for leaders. Various technologies can help leaders address different constraints and enhance their effectiveness.

Generative AI models, such as ChatGPT, can tackle informational constraints by quickly processing and analysing large datasets, providing data-driven recommendations or alternative perspectives. For instance, Bain & Company integrated OpenAI's technologies into its management systems (Bain & Company, 2023).

Blockchain technologies can help overcome entitlement constraints by reducing reliance on centralized authorities for business operations approval and address informational constraints by granting leaders access to specific data. Home Depot, a US-based home improvement retailer, employed blockchain technology to swiftly resolve transaction disputes within its supply chain (King, 2021).

Virtual reality (VR) can assist leaders in managing emotional constraints, as demonstrated by T-Mobile, which used VR training to help its leaders lead change during the merger with Sprint (Mursion, 2020).

Human capital management systems can help minimize cultural constraints through targeted recruitment and onboarding practices. For example, Arvato Bertelsmann implemented candidate-matching software to identify candidates with suitable cultural DNA (Harver, 2020). Human capital management systems like the one used at Illycaffè can also provide leaders with valuable employee data and insights (Oracle, 2021).

Social media platforms, particularly professional ones such as LinkedIn, can be employed by leaders to address motivational, cultural, and political constraints. These platforms allow CEOs to engage with employees, promote company values, and create connections with various networks. Ramon Laguarta, the CEO of Pepsico, is an example of a leader who uses social media effectively (Jones, 2019). By regularly reacting to the content shared by Pepsico's employees on LinkedIn, he sends positive signals of recognition for their work, thereby addressing motivational constraints. Lynn Good, CEO of Duke Energy, an American electric power and natural gas holding company, leverages LinkedIn to promote specific values such as sustainability and respect for employees at all organizational levels (Gravier, 2019). In doing so, she addresses cultural constraints by fostering a shared set of values within the company. Rafał Brzoska, the founder and CEO of InPost, a logistics company that operates parcel lockers, frequently posts on LinkedIn about his company's achievements, innovations, and challenges (Forbes, 2021). By doing this, he breaks into various political, media, and business networks, overcoming political constraints that arise from industry cliques where members support one another.
By implementing robotic process automation (RPA), leaders can delegate mundane tasks to machines, as exemplified by Uber's application of RPA in processing invoices, which helped address motivational challenges related to long working hours (UiPath, 2021).

While this study provides valuable insights into the role of technology in helping leaders overcome constraints, it is important to acknowledge its limitations. Firstly, the data collection was limited to four countries, which may not fully represent the global landscape of technology adoption and leadership practices. Expanding the research to include a more diverse range of countries could yield more comprehensive insights. Secondly, the cross-sectional nature of the data does not allow for the examination of causal relationships or the evolution of technology adoption over time. Longitudinal studies could provide a more nuanced understanding of how leaders adapt to and leverage technology over time. Finally, the self-reported nature of the survey data may be subject to social desirability bias, as respondents might be inclined to present a favourable image of their technology adoption and leadership practices. Future research could benefit from incorporating objective measures or triangulating data sources to validate the findings. Acknowledging these limitations not only helps provide a more balanced perspective but also offers opportunities for future research to build upon and extend the current study.

Drawing from our research insights, we developed a practical contribution in the form of a multistep approach that leaders can implement to effectively leverage technology in their leadership endeavours. This framework aims to bridge the gap between technology adoption and leadership effectiveness, ultimately enhancing overall performance.

Frequently, leaders are not fully conscious of all the factors that limit their capabilities. They require a variety of perspectives, such as a helicopter view to grasp the broader context of their organization and industry, a movie director view to understand relationships among employees, social norms, and motivational issues, and a kind of MRI view to introspect on their emotions and ethical dilemmas.

Recognizing some constraints may be straightforward, while others can be more elusive. Addressing political constraints (stemming from power struggles and office politics) and entitlement constraints (arising from organizational formalization and hierarchical responsibilities) necessitates adopting a helicopter view. To tackle informational constraints (associated with difficulties in gathering and processing data), cultural constraints (related to detrimental social norms), and motivational constraints (linked to decreased motivation of team members), leaders need to adopt a movie director view. To identify emotional constraints (involving intense negative emotions inhibiting rational behaviour) and ethical constraints (pertaining to leaders' ethical quandaries), an MRI view is essential.

Applying weights to certain constraints by analysing how important the constraint is in the leader's functioning will help set priorities. We can imagine that there are a number of issues that each leader can identify as a constraint. The time horizon is worth considering. Some constraints will serve as single events while others will occur regularly.

Table 2 below shows some examples of how leaders can match constraints with technological solutions.

Table 2. Leadership constraints and possible technological solutions

Type of constraint	Possible technological solution
Political	Social media platforms
Entitlement	Blockchain
Motivational	Generative AI, robotic process automation, social media platforms
Cultural	HCMS, social media platforms
Informational	Generative AI, HCMS
Emotional	Virtual reality
Ethical	–

Source: own elaboration.

Our study shows that technology is an important issue but the application of too many technological solutions is not effective for leaders. Analysis of non-technological solutions to overcome a constraint is necessary, especially in the long term.

In conclusion, our research provided valuable insights into how leaders can effectively harness technology to overcome constraints and enhance their leadership effectiveness. By developing a practical, multi-step approach, we aimed to bridge the gap between technology adoption and leadership performance. This framework consists of several steps: identifying constraints, analysing the impact of these constraints, matching constraints with appropriate technological solutions, and considering non-technological alternatives in the long term.

By recognizing and understanding the various constraints that leaders face, they can prioritize their efforts and adopt suitable perspectives to address them effectively. Our study emphasized that while technology might play a role in overcoming leadership constraints, relying solely on technological solutions may not always yield optimal results. Hence, it is essential for leaders to strike a balance between technological and non-technological approaches in their pursuit of improved leadership effectiveness.

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