

Annotated Bibliographies

Artificial Intelligence

Adel, A. (2022). Future of Industry 5.0 in Society: Human-Centric Solutions, Challenges and Prospective Research Areas. *Journal of Cloud Computing*, 11(1), 1–15.

<https://doi.org/10.1186/s13677-022-00314-5>

Adel's research paper delves into the concept of Industry 5.0 and its societal implications, defining it as a paradigm where human-machine collaboration enhances productivity and decision-making. This notion has evolved from the initial industrial revolution (Industry 1.0) of the 18th century, introducing mechanization to sectors such as mining, textiles, and agriculture. Industry 2.0 followed between 1871 and 1914, characterized by swift information exchange and manufacturing innovation, albeit with associated unemployment due to mechanization. The digital revolution, Industry 3.0, began in the 1970s, focusing on automated controls and computers for mass production. Industry 4.0 integrates physical assets with AI, IoT, robotics, and cloud computing for agile data-driven decisions, with Industry 5.0 poised to prioritize efficient intelligent machinery.

Adel's study scrutinizes the technological bedrock of Industry 5.0 and the challenges that the interaction of robots and humans across industries presents. It highlights the need for developing competency skills in the workforce to effectively collaborate with advanced machines. Furthermore, it discusses the financial implications of transitioning to Industry 5.0, including investments required for technologies such as customized software-connected factories, collaborative robotics, and AI-driven systems. The complexities of Industry 5.0's implementation, including the expenses associated with procuring advanced equipment and

employing highly skilled personnel, are also examined. Security emerges as a concern, given the heavy reliance on AI and automation, necessitating robust measures to prevent potential breaches. The paper extends its focus to prospective technologies, notably cognitive computing and quantum computing. Cognitive computing entails self-learning algorithms that enable computers to mimic human thought processes, performing tasks like pattern recognition and decision-making. Quantum computing, meanwhile, holds potential for solving complex problems more efficiently than classical computers, promising transformative impacts across various fields, including industry.

In conclusion, Adel's research provides a comprehensive exploration of Industry 5.0's essence, challenges, and prospects. It emphasizes the importance of human-machine collaboration to ensure a successful transition to Industry 5.0 which aligns with the research objective.

Abasaheb, S. A., & Subashini, R. (2023). Maneuvering of Digital Transformation: Role of Artificial Intelligence in Empowering Leadership - An Empirical Overview. *International Journal of Professional Business Review*, 8(5), 1–18.
<https://doi.org/10.26668/businessreview/2023.v8i5.1838>

This paper aims to explore the potential of Artificial Intelligence (AI) in empowering leaders within organizations. The authors present a comprehensive analysis, revealing that AI has become more integrated into businesses than ever before. While AI may lack interpersonal and soft skills, its prowess in data analysis is unparalleled. The research highlights how AI's ability to make autonomous decisions, even in the absence of a decision-making context, positions it for a gradual shift towards assuming leadership roles. Additionally, the authors underscore the

importance of aligning essential leadership components of humans at various levels, such as customer satisfaction, overarching plans, and human capital, to effectively harness the power of AI in leadership contexts.

Arslan, A., Cooper, C., Khan, Z., Golgeci, I., & Ali, I. (2022). Artificial Intelligence and Human Workers Interaction at Team Level: A Conceptual Assessment of the Challenges and Potential HRM Strategies. *International Journal of Manpower*, 43(1), 75–88.

The paper focuses on the challenges faced by the Human Resource Management (HRM) function in contemporary organizations due to the close interaction between AI (robots and processes) and human workers, particularly at the team level. The authors highlight potential strategies to overcome these challenges, making three key contributions to HRM and technology management literature.

Firstly, the paper emphasizes the challenges and opportunities arising from the use of emerging technologies in the workplace. The authors argue that a closer integration between social and technological sciences can help alleviate challenges and harness the potential opportunities of new technologies. Secondly, the paper highlights the importance of trust, building on previous studies, as a crucial factor in facilitating AI-human worker interaction in organizations. Establishing and maintaining trust in AI and other emerging technologies are essential to benefit all stakeholders, including employees and shareholders. Lastly, the study emphasizes the role of training and sound HR practices in effectively integrating emerging technologies in organizations while safeguarding the privacy and security of employees' personal data. Training and rigorous HR practices can support trust in emerging technologies and enhance their effective utilization in the workplace. The paper presents a case study of a research project

in HRD that examines the learning experiences of individuals disadvantaged in the labor market. The research employs a mixed-methods research design, with two phases, each utilizing different research design subtypes. The first phase involves quantitative data collection and analysis, while the second phase uses qualitative methods for model development, testing, and formative evaluation.

The paper concludes with theoretical, managerial, and policy implications, as well as future research directions. The authors highlight the importance of developing specific theoretical paradigms to address the challenges of human workers and AI interaction in teams. Managerially, building trust and effective communication are crucial in overcoming the challenges associated with AI-human worker collaboration. Policymakers are encouraged to invest in key skills related to emerging technologies, facilitating the adoption and utilization of AI in organizations.

The paper suggests several future research directions, including examining employees' reactions to utilizing emerging technologies, the role of leadership styles in AI implementation, and the psychological issues related to AI adoption in HRM. Additionally, investigating the hierarchy and dependencies among barriers to AI implementation and the interactive effect of driving and impending forces on AI-human worker interaction would provide valuable insights.

Baratta, A., Cimino, A., Gnoni, M. G., & Longo, F. (2023). Human Robot Collaboration in Industry 4.0: A Literature Review. *Procedia Computer Science*, 217, 1887–1895.

<https://doi.org/10.1016/j.procs.2022.12.389>

This literature review conducted by Baratta, Cimino, Gnoni, and Longo (2023) comprehensively explores the paradigm of Human-Robot Collaboration (HRC) within the

context of Industry 4.0. The authors delve into the transformative impact of HRC, driven by the advancements of the fourth industrial revolution. The review highlights Collaborative Robots (Cobots) as central to the paradigm, designed to address the evolving needs of industries by working alongside human operators to enhance productivity, quality standards, and workers' well-being. The authors categorize HRC interactions into coexistence, synchrony, cooperation, and collaboration, elucidating the varying degrees of interaction and interdependence between human operators and robotic systems. The paper emphasizes the profound implications of HRC on manufacturing, where collaborative workspaces involve specialized robotic systems and human operators in simultaneous tasks to amplify productivity, flexibility, and ergonomic efficiency. The nuanced leader-follower relationship established in this collaboration is discussed as well.

Highlighting the significance of safety, security, and ergonomics within Human-Robot Collaboration (HRC) environments, this review emphasizes the integration of diverse sensors for secure operations. Collaborative robots emerge as pivotal in enhancing ergonomics, a critical aspect of safety and efficiency. Their role is exemplified in assembly operations, where they aid human operators in pick-and-place tasks, promoting effective collaboration. Notably, robots should adapt behaviors to ensure both safe and ergonomic human performance, without compromising task efficiency. The versatility of HRC is showcased across domains including manufacturing, healthcare, agriculture, and education. The collaborative approach's effectiveness is detailed across diverse scenarios, from assembly to medical procedures, rehabilitation, and education. The review also underscores the impact of technological advancements in sensors, artificial intelligence, and robotics on HRC's evolution, providing solutions to challenges like the

COVID-19 pandemic. This comprehensive and insightful review establishes a strong groundwork for future research in the ever-evolving realm of Human-Robot Collaboration.

Biba, J. (2022, August 25). *Top 20 Humanoid Robots in Use Right Now | Built In*.

<https://builtin.com/robotics/humanoid-robots>

The article by Biba (2022) presents a groundbreaking wave of advanced humanoid robots that has emerged in recent times, captivating the world with their human-like faces and expressions that mirror our own. These remarkable creations are engineered to imitate human emotions, interactions, and movements, with the ambitious goal of revolutionizing various industries. From healthcare to hospitality, from manufacturing to education, these cutting-edge robots are making a positive impact and reshaping the future of human-robot collaboration.

Designed and developed across different countries, the article presents twenty humanoid robots which represent the pinnacle of technological innovation and human-centric engineering. Powered by artificial intelligence and sophisticated sensor systems, they are capable of not only understanding human commands but also interpreting emotions through facial expressions and body language.

Bouch, M. (2019, August 29). *Leadership: Are we at the Dawn of Robot Leaders?* [Text].

TrainingZone. <https://www.trainingzone.co.uk/lead/culture/leadership-are-we-at-the-dawn-of-robot-leaders>

This article explores the possibility of robots assuming leadership positions in workplaces as Artificial Intelligence continues to advance and integrate. The author proposes a re-imagining of collaborative social hubs and advocates for the widespread adaptation of AI technologies in

everyday applications. Drawing inspiration from John Kotter's insights, the true essence of leadership is refreshed, emphasizing its role in preparing organizations and individuals to navigate rapid change. The discussion delves into the distinct traits of human leadership and the potential of robots in leadership roles. While robots excel at internalizing and adhering to rules, they lack the capacity to develop a vision or exhibit charisma. In contrast, human leaders possess the ability to think creatively and empower their organizations with new ideas, fostering innovation and adaptability. Furthermore, the article acknowledges that despite the increasing automation, certain processes and activities necessitate empathy and subtle behavior, which are uniquely human traits. These qualities are vital in nurturing meaningful relationships, building trust, and fostering a positive organizational culture.

Overall, this article serves as a foundational reference for researchers examining the intricate dynamics of leadership in the context of AI advancement.

Brock, J. K.-U., & von Wangenheim, F. (2019). Demystifying AI: What Digital Transformation Leaders Can Teach You about Realistic Artificial Intelligence. *California Management Review*, 61(4), 110–134. <https://doi.org/10.1177/1536504219865226>

In this research article, Brock and von Wangenheim present a guideline for achieving success with AI in the context of digital transformation. The authors base their framework, called 'DIGITAL,' on empirical findings from an extensive study involving 7,000 digital transformation projects that incorporated AI components. The acronym DIGITAL stands for Data, Intelligence, Grounded, Integral, Teaming, Agile, and Leadership, providing a comprehensive framework for managers aiming to implement AI effectively within their organizations. The article offers

actionable insights and discovery questions to guide managers in the successful adoption of AI technology in their business operations.

The study focuses on drawing lessons from current digital transformation leaders who have already demonstrated successful AI integration in their organizations. By doing so, the research aims to provide valuable insights to AI leaders of the future, enabling them to learn from the experiences and strategies employed by current industry leaders. However, the authors adopt a cautious approach when discussing the future role of humans in AI projects. Despite the extensive survey data, the article refrains from sharing specific results on this topic, citing the controversial and inconclusive nature of the findings. Despite this hesitation, the authors express confidence in their assertion that people will continue to prioritize personal human services over AI technology-mediated services.

Overall, this article contributes to the understanding of realistic AI implementation in digital transformation projects and provides a valuable framework for managers seeking to leverage AI effectively within their organizations. The cautious approach to discussing the future role of humans in AI projects highlights the complexity and ongoing debate surrounding this aspect of AI adoption in various industries.

Brower, T. (2020, October 7). *Study Shows People Prefer Robot Over Their Boss: 6 Ways To Be A Leader People Prefer*. Forbes.

<https://www.forbes.com/sites/tracybrower/2020/10/07/study-shows-people-prefer-robot-over-their-boss-6-ways-to-be-a-leader-people-prefer/>

In Brower's (2020) thought-provoking article, a new and intriguing phenomenon emerges in the workplace: the competition between human leaders and robot leaders. The author sheds

light on a fascinating survey that reveals employees' surprising preference for discussing stress or anxiety at work with robots rather than their human bosses. This finding serves as a wake-up call for human leaders to reassess their leadership styles and take crucial steps to become more effective in their roles.

To address this emerging challenge, the article offers valuable suggestions for human leaders to enhance their leadership approach. Firstly, it emphasizes the importance of avoiding being judgmental towards employees, fostering an environment of trust and psychological safety. Secondly, human leaders are encouraged to become a supportive ear for their team members, actively listening to their concerns and offering genuine empathy. Transparency and openness are identified as essential qualities for effective leadership. Human leaders are urged to communicate openly with their employees, sharing information and updates regularly. This transparency helps build a sense of inclusion and trust within the team. Prioritizing tasks and managing workloads is crucial for preventing employee burnout and maintaining productivity. Human leaders are advised to help their team members set realistic goals, distribute tasks efficiently, and offer necessary support to achieve objectives successfully. Furthermore, the article underscores the significance of cultivating a work culture that prioritizes work-life balance. Human leaders should encourage their teams to maintain a healthy equilibrium between professional responsibilities and personal well-being. Promoting a positive work environment that supports employees' overall well-being contributes to greater job satisfaction and productivity.

In conclusion, Brower's article presents a compelling exploration of the rising competition between human leaders and robot leaders in the workplace. The preference of employees to confide in robots about stress and anxiety serves as a powerful signal for human

leaders to adapt and improve their leadership skills. By implementing the suggested steps, including non-judgmental attitudes, empathetic listening, transparency, task prioritization, and work-life balance, human leaders can enhance their effectiveness and maintain their relevance in an ever-evolving work landscape.

Bughin, J., & Woetzel, J. (2019, January 22). *Global trends: Navigating a World of Disruption* | *McKinsey*. McKinsey Global Institute. <https://www.mckinsey.com/featured-insights/innovation-and-growth/navigating-a-world-of-disruption>

Woetzel & Bughin (2019) present an overview of the competitive and societal challenges addressed during the 2019 World Economic Forum in Davos. The article highlights the shifting patterns of globalization due to the increasing flow of data, as well as the rapid advancements in automation and artificial intelligence, which are reshaping the technological landscape.

However, the benefits of these changes are not evenly distributed among sectors, companies, and countries, leading to socioeconomic disparities. A key focus of the article is the economic impact of AI and automation on labor markets. As these technologies continue to advance, companies must adapt by retraining their workforce, and society needs to overhaul the education system to prepare individuals for the demands of the future workplace. Thus, the impact of AI disruptions on unequal skill distribution in societies presents a significant challenge.

Chamorro-Premuzic, T. (2016, September 9). Why a Robot could be the Best Boss you've ever had. *The Guardian*. <https://www.theguardian.com/media-network/2016/sep/09/robot-boss-best-manager-artificial-intelligence>

In this groundbreaking article, the author unveils a paradigm-shifting perspective on leadership, positing that by discerning the essential components of effective leadership, we may harness the power of machines to predict leadership potential with unparalleled accuracy. The bold vision extends even to the concept of a robot leader, raising intriguing questions about the interplay between artificial intelligence and human intuition. However, the author acknowledges that while machines can excel in many areas, they remain unable to replicate the depths of human intuition. The critical caveat is that human intuition, when not founded on data, can yield false ideas and undesirable outcomes. The implications are profound, urging caution in relying solely on ungrounded human guesses, which can lead to misguided decisions.

Among the vital components of effective leadership, integrity and technical expertise emerge as pillars of strength. If we were to entrust a well-programmed robot with leadership duties, it would undoubtedly prioritize the advancement of its team's interests with selflessness and precision. A remarkable revelation unfolds as the author explores the possibility of instilling self-awareness in robot leaders through AI. This once elusive human quality, known for its significance in successful leadership, could now be emulated in machines, pushing the boundaries of what was once considered solely human territory.

However, one crucial aspect still eludes us—the development of emotional intelligence in robot leaders. Emotional intelligence, the cornerstone of transformational leadership in organizations, remains in its infancy in the realm of robotics. Yet, this revelation fuels the drive for researchers to explore the uncharted territory, unlocking new understandings of humanoid

robots' capabilities and juxtaposing them with traditional leadership models. While the notion of a computer-generated manager might seem fantastical in the current moment, it serves as a beacon guiding us towards unexplored vistas. Such visionary concepts have the potential to propel research into uncharted territories, culminating in a deeper comprehension of the capacities of humanoid robots and their potential integration into leadership roles.

In conclusion, this thought-provoking article challenges conventional wisdom and beckons us to reimagine leadership with robots at the forefront. By embracing the possibilities of artificial intelligence and human intuition, we can forge an unparalleled path to a new era of leadership—where the synergy of man and machine coalesce, birthing a transformative frontier.

Chamorro-Premuzic, T., & Ahmetoglu, G. (2016, December 12). The Pros and Cons of Robot Managers. *Harvard Business Review*. <https://hbr.org/2016/12/the-pros-and-cons-of-robot-managers>

The article presents a thought-provoking analysis, comparing the challenges faced by human managers with those that robot managers might encounter when placed in similar positions. With advancements in algorithms and AI, robot managers have the potential to effectively handle various managerial tasks. One notable advantage of robot bosses lies in their lack of emotional bias, which aids in conflict avoidance and the provision of objective feedback.

However, the article also acknowledges certain drawbacks associated with robot managers. One concern is the possibility of reinforcing sexist or racist recommendations in job-related decisions due to biased information present in their databases, such as the underrepresentation of women in leadership positions or statistics on crimes committed by specific racial groups. A crucial point raised by the author is the current limitation of robots in

terms of creativity and innovation. While they excel at data-driven tasks like recommending hotel bookings, they fall short when it comes to inventing groundbreaking concepts, as exemplified by the case of AirBnB. Shifting focus to the acceptance of robots as managers, the author speculates that individuals who have experienced difficulties under human managers might welcome the idea of working for a robot leader or manager. The perceived objectivity and consistency offered by robots could be appealing, especially to those who have faced unfair treatment or biases from human supervisors.

In conclusion, the article provides a compelling argument, highlighting the potential benefits and challenges of employing robot managers. While improved algorithms and AI enable them to handle managerial tasks effectively, the need to address biases in their decision-making processes remains a significant concern. Additionally, the current limitations of robots in terms of creativity and innovation underscore the continued importance of human involvement in certain aspects of leadership. The acceptance of robot managers by individuals who have faced hardships under human managers adds an interesting dimension to the evolving relationship between humans and robots in the workplace.

Christensen, C. M., Raynor, M. E., & McDonald, R. (2015, December 1). What Is Disruptive Innovation? *Harvard Business Review*. <https://hbr.org/2015/12/what-is-disruptive-innovation>

The article titled "What Is Disruptive Innovation" from Harvard Business Review discusses the concept of disruptive innovation and its implications. The piece provides insights into the characteristics and impact of disruptive innovations on established markets and companies. The article reviews the old theory of Disruptive Innovation that was proposed in

1995 and offers an in-depth exploration of how disruptive innovations can upend traditional business models and create new opportunities for growth and market leadership. The article presents real-world examples and case studies to illustrate the phenomenon and emphasizes the importance of understanding and responding to disruptive forces in the modern business landscape. Understanding of what drives the rate of disruption helps in predicting the outcomes; thus, could assist in decision making in businesses.

De Cremer, D. (2022). With AI entering Organizations, Responsible Leadership may slip! *AI and Ethics*, 2(1), 49–51. <https://doi.org/10.1007/s43681-021-00094-9>

The author stresses the crucial need for responsible leadership in organizations as they adopt AI technologies. The integration of algorithms alongside human stakeholders has led to a growing concern about human burnout due to increased work pressure and heightened productivity expectations. As a response, organizations are relying on machines as a solution, but the author argues that this approach needs a fundamental shift. The paper advocates for employees to be trained to empathize with customers using AI as a tool, rather than becoming overly dependent on it. The focus should pivot from solely innovating technology to securing and harnessing the unique human abilities of empathy, creativity, and imagination to envision new possibilities.

While AI advancements are valuable, the paper emphasizes the irreplaceable role of human leadership. AI-based decisions can complement and augment human leaders' choices but cannot fully replace them. As AI becomes more integrated into human leadership, leaders are expected to take on greater responsibilities and foster an inclusive environment for all stakeholders.

In summary, the paper calls for a human-centered approach to AI integration in organizations, recognizing the importance of preserving and amplifying human superpowers alongside AI capabilities. Responsible leadership involves leveraging AI to enhance human potential while ensuring the well-being and inclusivity of all involved.

Der Val, Z. V., & Yan, Y. (2018, October 17). *Could Robots do better than our Current Leaders?* World Economic Forum. <https://www.weforum.org/agenda/2018/10/could-robot-government-lead-better-current-politicians-ai/>

The article featured in The Agenda Weekly of the World Economic Forum examines the global perspectives on "robogov" and presents an argument discussing its advantages and disadvantages. Politics is a highly scrutinized and criticized field, prompting some nations to propose robots as political leaders to facilitate rational, fair, and evidence-based governance decisions. Robogov is anticipated to be less prone to corruption and unethical conduct, offering potential benefits. The authors advocate for harnessing the capabilities of robots in this role, suggesting that AI and robots could serve as tools for government leaders to improve decision-making. However, it is crucial to acknowledge that AI and robots in leadership still have certain flaws, and human legislative laws must address concerns related to ethics, privacy, security risks, and biases.

Employment Hero. (2022, May 26). Reporting to a Robot: Will AI have a place in Leadership in the Future? *Australia*. <https://employmenthero.com/blog/ai-leadership-workplace/>

This article explores the current trend of integrating artificial intelligence (AI) in forward-thinking organizations to varying degrees. As AI becomes an integral part of workplaces,

leadership styles are evolving, with data-driven decision-making becoming more prevalent. This shift demands greater agility, adaptability, and experiential learning in businesses, necessitating training and knowledge of AI and its applications. Importantly, the article dispels concerns about AI replacing humans in leadership roles, instead emphasizing their complementary partnership. This allows human leaders to focus on honing soft skills while AI handles technical tasks. The imperative for leaders is to embrace the AI revolution, capitalize on its potential, and foster collaborative environments between humans and AI systems for organizational success in the digital age.

EY Global. (2020, March 17). *Can Robots help your Business be more Human?*

https://www.ey.com/en_gl/digital/can-robots-help-your-business-be-more-human

The author believes that robotic process automation (RPA) could do more than is assumed and could make the workplaces more people-friendly. RPA is software that allows automation of back-office manual tasks. Many administrative functions could be accomplished using them, and the workers could be freed to perform higher-value work. It is realized that most of the administrative tasks are repetitive, and this creates a challenge in staff retention. The boredom and stress of employees could be reduced with the automation of the repetitive tasks. This could prove to be a valuable long-term investment, which could save the recruitment costs.

The discussion in the article tries to bring attention to accept RPA as not a job reduction method, but an opportunity to focus on more innovative tasks.

Ferràs, X. (2019, November 8). *Can a Robot be a Leader?* <https://dobetter.esade.edu/en/robot-leader>

The article is based on research published in the Journal of Management Inquiry, which presents the facts on the development of digital automation at the expense of human management. Artificial intelligence is increasingly able to make decisions in complex situations. Digital machines are replacing all kinds of human tasks. Ferràs, the author, explores the challenges in traditional leadership with the advancements in artificial intelligence and poses a question about the implications of AI in leadership and institutional relations—the convulsion of the human CEO.

Ferràs raises many questions, one of which is to what extent AI can impact management practice. Ferràs accepts that one of the areas that could perform better with intelligent machines is the field of Operations Management. However, robots with emotional skill deficiency have restrained capabilities to handle VUCA (Volatile, Uncertain, Complex, and Ambiguous) situations; thus, questioning the capability of AI and Robotics in leadership and management situations. The author further delves into intriguing questions if humans can accept AI and robots as their bosses—the acceptance of higher degree of anthropomorphism of AI. This article could help the research to understand the implications on leadership during VUCA situations while having AI and robotics in the business.

Friedman, C. (2023). Ethical Concerns with Replacing Human Relations with Humanoid Robots: An Ubuntu Perspective. *AI and Ethics*, 3(2), 527–538. <https://doi.org/10.1007/s43681-022-00186-0>

In the paper, the author raises ethical concerns regarding the substitution of humans with humanoids. The paper adopts the Ubuntu philosophy, emphasizing the moral responsibility of humans to retain their humanity and advocate for greater interdependence with fellow humans rather than relying on humanoids. The paper highlights the moral implications of anthropomorphizing relationships with robots. As efforts continue to make humanoids more human-like, it becomes essential to carefully consider the societal impact of technology on humanity.

Gloor, J. L., Howe, L. C., De Cremer, D., & Yam, K. C. (2020, November 26). *The Funny Thing about Robot Leadership*. *The European Business Review*.
<https://www.europeanbusinessreview.com/the-funny-thing-about-robot-leadership/>

The article aims to explore the potential of AI and robotics in managerial and leadership positions. The authors present a concise argument, suggesting that administrative and managerial tasks might be efficiently handled by AI, while leadership demands a broader set of skills, particularly in motivation and interpersonal relationships – the ultimate soft-skill in leadership. Illustrating their point, the article references Sophia, a humanoid capable of reading emotions, to showcase the advancing capabilities of AI-powered robots over time. Some robots have even been designed to master humor, such as the Irony bot, equipped with sarcasm to deliver negative feedback. The authors propose that humor could play a role in robotic leadership. Additionally, the article examines the pros and cons of AI-powered robots as leaders, acknowledging the need

for careful consideration in integrating them into the workforce. It concludes by suggesting the importance of enhancing leadership qualities at work.

In summary, the article offers valuable insights for researchers delving into the soft skills essential for effective leadership and explores the potential integration of AI-powered robots in the workplace to support successful leadership.

Henderikx, M., & Stoffers, J. (2022). An Exploratory Literature Study into Digital

Transformation and Leadership: Toward Future-Proof Middle Managers. *Sustainability*, 14(2), 687. <https://doi.org/10.3390/su14020687>

The exploratory research investigates how digital transformation affects various levels of management leadership, with particular attention to middle management. The findings indicate that digital transformation is a disruptive force, fundamentally altering the organization's structure. Middle managers must adapt by developing digital intelligence and refining their soft skills. Additionally, the emergence of AI is reshaping the nature of leadership and management, leading to a demand for altro-centric leadership. The study concludes that if AI is implemented ethically and responsibly, it can complement management roles alongside the essential soft skills possessed by human managers.

In conclusion, the study presents a summary of various peer-reviewed articles and grey literature from multiple databases, focusing on leadership theories and digital transformation. These sources serve as valuable references to explore different perspectives on leadership adopted in the research.

Johannessen, J. A. (2023). Intelligent Robots and Consciousness. In *Consciousness and Creativity in Artificial Intelligence* (pp. 53–87). Emerald Publishing Limited.

<https://doi.org/10.1108/978-1-80455-161-520231009>

This chapter ‘Intelligent Robots and Consciousness’ explores the intricate relationship between intelligent robots and consciousness within the broader context of artificial intelligence and creativity. The author explores whether intelligent robots possess consciousness through various causal processes, including downward, upward, and network causation. They propose systemic causation, encompassing these processes, to understand consciousness emergence. The text discusses downward causation (DC) and its influence on emergent properties in robots, suggesting the synthetic ‘I’ as a key element. Theoretical propositions derived from thought experiments illustrate how the synthetic ‘I’ influences emergent properties, leading to the proposition that intelligent robots possess consciousness. The integration of the synthetic ‘I’, emergence of synthetic consciousness, information processes, and synthetic ethics are highlighted as essential conditions determining consciousness in intelligent robots, suggesting a comprehensive approach to understanding artificial consciousness.

In addition, emergent properties, defined as characteristics or behaviors that arise from interactions between constituent elements, play a pivotal role in understanding consciousness emergence in intelligent robots. These emergent properties, such as synthetic consciousness in the context of artificial intelligence, are not reducible to the properties of individual components but rather emerge from the complex interactions and organization of these components within the system.

In conclusion, the research delves into the intricate concept of downward causation within the context of understanding consciousness in intelligent robots. Through theoretical

propositions and thought experiments, the discussion in this chapter argues for the presence of consciousness in intelligent robots based on the influence of the synthetic 'I' and emergent properties. By exploring various causal processes and conditions, the author provides insights into the complex interplay between causation and the emergence of consciousness in artificial entities, ultimately contributing to the ongoing discourse on artificial intelligence and consciousness.

Kim, S. (2022). Working With Robots: Human Resource Development Considerations in Human–Robot Interaction. *Human Resource Development Review*, 21(1), 48–74.
<https://doi.org/10.1177/15344843211068810>

The journal article addresses the issue of human-robot synergy during interactions. It adopts a human-centered approach, considering the integration of social and technical systems within a large system. Anthropomorphism, the attribution of human-like qualities to robots, is explored as a means to enhance robot acceptance and collaboration with human employees. In addition, the author introduces a human resource development model for human-robot interactions, which should be implemented at individual, group, and organizational levels. Though not directly addressed, it can be inferred that humans might find it more comfortable and effective to interact with robots that have human-like features, as these features could enhance communication and familiarity in HRI contexts. Thus, with this intention, the article emphasizes the need for agile and responsive human resource development to facilitate successful integration and interactions between humans and robots.

Knowledge at Wharton Staff. (2020, November 2). Artificial Intelligence Will Change How We Think About Leadership. *Knowledge at Wharton*.

<https://knowledge.wharton.upenn.edu/article/artificial-intelligence-will-change-think-leadership/>

The article is an edited version of an interview with David De Cremer, founder and director of the Centre on AI Technology for Humankind at the National University of Singapore Business School. He is the author of the book on leadership titled "Leadership By Algorithm: Who Leads and Who Follows in the AI Era?" In the book, he expresses concern that the integration of social science, humanity, and AI is not receiving the attention it deserves. The purpose of Artificial Intelligence is to create value for human society, and therefore, the outcomes of AI must be considered in a social context.

The article also highlights the explicit need for humans to prioritize the enhancement of their soft skills over hard skills. It emphasizes the importance of training leaders from childhood to appreciate creativity, teamwork abilities, acceptance of diverse perspectives, and taking responsibility to build a better society. It is equally important for managers and leaders to understand the potential and limitations of AI and identify areas where human responsibility remains crucial. However, the author is confident that AI will be capable of handling most managerial tasks in the future, particularly those that are predictive in nature.

In conclusion, the author refers to AI robots as a new form of diversity that could lead to a debated idea of "us versus them" in the future. The article defines AI robots as a new segment of society and provides a comprehensive understanding of the steps human leaders need to take to upgrade themselves in this evolving landscape.

Littman, M. L., Ajunwa, I., Berger, G., Boutilier, C., Currie, M., Doshi-Velez, F., Hadfield, G., Horowitz, M. C., Isbell, C., Kitano, H., Levy, K., Lyons, T., Mitchell, M., Shah, J., Sloman, S., Vallor, S., & Walsh, T. (2022). *Gathering Strength, Gathering Storms: The One Hundred Year Study on Artificial Intelligence (AI100) 2021 Study Panel Report*. arXiv:2210.15767. <https://doi.org/10.48550/arXiv.2210.15767>

The AI100 Standing Committee's 2021 Study Panel Report, authored by a distinguished group of experts, delves into critical aspects of artificial intelligence (AI) through the examination of twelve standing questions and two workshop questions (Littman et al., 2022). This comprehensive report offers detailed insights into the latest advancements in AI worldwide and engages in discussions about its future prospects, public responses, anticipated governmental actions, and the most promising forthcoming opportunities and threats arising from the integration of AI with human capabilities.

One notable topic of interest explored in the report is the domain of robotics, driven by the fusion of machine learning, computing power, communication capabilities, and sophisticated sensor systems. The report highlights the emergence of highly agile robots suitable for applications in both domestic and industrial settings, showcasing the transformative potential of AI-driven robotics. Moreover, the report sheds light on the substantial growth of global investments in AI research and development over the past five years, indicating the increasing significance and focus on AI technologies worldwide. The European Union's strategic approach to fostering AI development and uptake is also presented in the report. The EU has devised a four-pronged strategy aimed at enabling AI's journey from laboratory to the marketplace, ensuring that AI serves the betterment of society, and establishing strategic leadership in high-

impact sectors. This strategy underscores the EU's commitment to responsible and beneficial AI deployment.

Though the report acknowledges the challenges associated with AI research, it frames these challenges as opportunities to facilitate decision-making processes. This perspective highlights the potential of AI to augment and support human decision-makers across various domains. Ultimately, the report concludes with a visionary view that advocates for a broader context in understanding the future of AI, encompassing all areas of human inquiry, with particular attention to the social sciences. It emphasizes the importance of integrating AI systems into the social fabric, wherein humans and automated decision-makers complement each other, ultimately empowering humans in their collaboration with AI technologies.

Overall, the AI100 Standing Committee's 2021 Study Panel Report offers a comprehensive and forward-looking assessment of AI's current state and future trajectory, emphasizing the need for responsible and human-centric integration of AI technologies.

Lopes, S. L., Ferreira, A. I., & Prada, R. (2023). The Use of Robots in the Workplace:

Conclusions from a Health Promoting Intervention Using Social Robots. *International Journal of Social Robotics*, 15(6), 893–905. <https://doi.org/10.1007/s12369-023-01000-5>

This paper aims to develop a comprehensive longitudinal health promoting intervention utilizing a symbiotic partnership between a social robot and a human to effectively address the issues of presenteeism and foster healthier behaviors among employees. The research compares the efficiency of two groups, one guided by a human and the other by a robot agent. The results indicate that the team led by the robot agent revealed better post-intervention, with regard to productivity despite presenteeism. The robot agent is able to develop a therapeutic relation with

the human team in the workplace. However, the author considers the results as preliminary and suggests delving into more such experiments. The incorporation of social robots, not merely as cost-efficient operators but as genuine sources of support in the workplace, is also emphasized. However, it also highlights the imperative for businesses to consider the ethical implications of such innovative interventions.

To conclude, particularly during critical periods, such as the pandemic, where remote work and tele-consulting have gained prominence, the collaborative potential of robots presents an opportune moment to enhance social interactions, thereby significantly improving employees' health outcomes while maintaining organizational performance.

Master Class. (2002, June 9). *What Is Disruptive Innovation? 2 Types of Disruptive Innovation - 2023*. MasterClass. Retrieved July 4, 2023, from <https://www.masterclass.com/articles/disruptive-innovation>

This article, hosted on the Master Class platform, provides an overview of disruptive innovation and its impact on various industries. It explains the concept of disruptive innovation and how it has revolutionized traditional business models. It also entails the different types of disruptive innovation and also compares it with sustaining innovations. The article highlights real-world examples of companies that have successfully embraced disruptive innovation to gain a competitive advantage in the market.

Moreover, this article, complementing the insights from Harvard Business Review's analysis of Disruptive Innovation, provides a comprehensive and detailed comprehension of the concept. It effectively highlights the distinctions between Disruptive Innovation and sustaining innovations, offering a clear delineation of their respective characteristics and implications.

McKinsey Global Institute. (2018, June 1). *AI, Automation, and the Future of Work: Ten things to solve for (Tech4Good) | McKinsey*. [https://www.mckinsey.com/featured-](https://www.mckinsey.com/featured-insights/future-of-work/ai-automation-and-the-future-of-work-ten-things-to-solve-for)

[insights/future-of-work/ai-automation-and-the-future-of-work-ten-things-to-solve-for](https://www.mckinsey.com/featured-insights/future-of-work/ai-automation-and-the-future-of-work-ten-things-to-solve-for)

The article summarizes findings from research conducted by the McKinsey Global Institute, offering insights into the opportunities and challenges posed by AI and automation in the workplace. It highlights essential considerations for policymakers and companies when implementing workplace automation. Data from various studies conducted by the McKinsey Global Institute is also presented in the article. The conclusion drawn is that while the introduction of AI and automation may alter the nature of work, there will still be roles for human workers. Consequently, it is now incumbent upon private-sector leaders, governments, and innovators to collaborate on coordinating public and private initiatives and investments in human capital.

Menon, K. (2023, April 24). *The Top Five Humanoid Robots | Simplilearn*. Simplilearn.Com.

<https://www.simplilearn.com/tutorials/artificial-intelligence-tutorial/humanoid-robots>

In this article, the author explores five exceptional humanoid robots that have captivated the world with their remarkable features and lifelike abilities. Leading the pack is Nadine, an empathetic creation by Kokoro, boasting personality and emotions akin to humans, making her an ideal companion for various applications. Geminoid DK, the latest iteration in the Geminoid series, pushes the boundaries of realism with its ultra-realistic appearance, blurring the lines between human and machine. Junco Chihira, developed by Toshiba, has evolved over time, gaining impressive speech recognition capabilities, enabling meaningful interactions with

humans. From China, Jia Jia stands out for her alluring appearance and the ability to hold natural conversations, offering great potential in customer service and social settings. Lastly, Sophia, designed by Hanson Robotics, represents the pinnacle of humanoid robots, equipped with embedded neural networks and artificial intelligence to recognize human faces, gestures, and emotions. Beyond being an old age companion and a crowd manager, Sophia symbolizes progress and innovation, acting as an ambassador for the United Nations development program.

These humanoid robots exemplify the cutting-edge advancements in robotics, bridging the gap between science fiction and reality, and paving the way for transformative human-robot interactions in various industries.

Mithas, S., Chen, Z.-L., Saldanha, T. J. V., & De Oliveira Silveira, A. (2022). How will Artificial Intelligence and Industry 4.0 Emerging Technologies transform Operations Management? *Production and Operations Management*, 31(12), 4475–4487.
<https://doi.org/10.1111/poms.13864>

The primary objective of this research is to comprehensively examine Industry 4.0, focusing on the functionalities it enables, and to identify research opportunities within Production and Operations Management in the context of Industry 4.0. The paper introduces the SACE framework, which classifies emerging technologies based on their functionalities: sense, analyze, collaborate, and execute. Furthermore, the value of Industry 4.0 is assessed using the ADROIT framework, which comprises six components: adding revenues, differentiating or increasing willingness to pay, reducing costs, optimizing risks, innovating by generating and deploying, and transforming business models and processes. In addition, the paper presents various research agendas that delve into the study of Industry 4.0 technologies.

A notable finding in the paper pertains to the impact of AI innovation on Corporate Social Responsibility (CSR) and idiosyncratic risk (IR). It reveals that CSR can initially negatively affect IR and, beyond a certain level, begins to have a positive influence, showing a U-shaped relationship. However, with the integration of AI innovation, this relationship becomes less pronounced, suggesting that the positive impact of CSR on IR weakens. Consequently, the paper concludes that AI innovation is not a panacea and that, in business settings, human decision-making surpasses AI decisions beyond a certain threshold.

In summary, this research emphasizes the significance of studying Industry 4.0 technologies comprehensively and identifies specific areas of research interest. It sheds light on the complex relationship between AI innovation, CSR, and idiosyncratic risk, highlighting the continuing importance of human decision-making in the business landscape.

Northey, G., Hunter, V., Mulcahy, R., Choong, K., & Mehmet, M. (2022). Man vs Machine: How Artificial Intelligence in Banking Influences Consumer Belief in Financial Advice. *International Journal of Bank Marketing*, 40(6), 1182–1199.

<https://doi.org/10.1108/IJBM-09-2021-0439>

The authors Northey et al. (2022) in the research paper published by Emerald Publishing Limited examined the investment decision making of customers. Based on the two experiments performed by authors, they concluded that preference is given to human finance advisors as compared to AI enabled bots and robo-advisors while seeking financial consultations that involve high stakes. However, there is a profound effect of AI on consumers' behavior in financial decision making; nevertheless, of the consumer's psychology to negatively perceive the firm's commitment to customers. The paper further provides an enlightening managerial

implication of employing robo-advisors to deliver financial advice; thus, pointing out the fact for the financial institutions to identify the different thresholds beyond which AI enabled set-ups could plummet the rate of customer acceptance.

Oosthuizen, R. M. (2022). The Fourth Industrial Revolution – Smart Technology, Artificial Intelligence, Robotics and Algorithms: Industrial Psychologists in Future Workplaces. *Frontiers in Artificial Intelligence*, 5.

<https://www.frontiersin.org/articles/10.3389/frai.2022.913168>

The goal of this study is to provide a critical review of industrial psychologists who believe that advancements in STARA (smart technology, artificial intelligence, robotics, and algorithms) may lead to the elimination of 33% of occupations in the future. One of the key challenges raised by the author is how the interaction between humans and robots will shape the future of human leadership. In its view, prolonged exposure to robots in groups could impact human relationships. The study highlights the pivotal role of industrial psychology in shaping the implementation of AI/ML and fostering human development for long-term business performance and sustainability. Consequently, the author proposes a STARA competence model for industrial psychologists in the context of the fourth industrial revolution. This model includes competencies that emphasize the need to enhance human capacity within organizations.

In conclusion, the identified competencies represent essential skills for human leaders to achieve amidst automation advancements.

Păvăloaia, V.-D., & Necula, S.-C. (2023). Artificial Intelligence as a Disruptive Technology—A Systematic Literature Review. *Electronics*, *12*(5), 1102.

<https://doi.org/10.3390/electronics12051102>

The study presents a holistic review of articles from Web of Science library on AI as a disruptive technology and its impact on different industries. In the review, it is found that AI and robotics find its most application in the health care, medicine, and dentistry domains. AI as a disruptive technology emerged in 2021-2022 in other areas of logistics, transportation, and agriculture. According to the author, industry 5.0 could be built on the foundations of industry 4.0 by focusing on human-centered, resilient, and sustainable design. The paper further discusses the positive and the negative aspects of AI as a disruptive technology in different domains, and finally concludes that the advantages outweigh disadvantages of using AI in different sectors. Also, the paper does consider the ethics in the use of AI in these domains.

Overall, the systematic literature review could guide in understanding the status of artificial intelligence and robots in the current scenario in different industries.

Radnejad, A. B., Sarkar, S., & Osiyevskyy, O. (2022). Design Thinking in Responding to

Disruptive Innovation: A Case Study. *The International Journal of Entrepreneurship and Innovation*, *23*(1), 39–54. <https://doi.org/10.1177/14657503211033940>

The research paper describes how design thinking principles can help to respond to the rising disruptive innovations along the lines of exploiting the established technology. The author believes that design thinking (DT) is the best method to be creative and innovative, and it could assist in designing an assistive exploitative strategy. One of the findings of the research explains the principles of DT can be used for stimulating both product and process innovation. The

organizational leaders could use DT to defend themselves from disruptions like collaborative work with humanoids. Hence, it provides a way to use AI and robotics in honing leadership skills in humans.

Siller, Y. (2023, June 1). Can Robots be Leaders? Our Experts' Latest Key Findings in Human-Robot Interaction Research. *TUM Executive & Professional Education*.

<https://www.lll.tum.de/can-robots-be-leaders/>

The article examines two leadership styles observed in the robot-Pepper, as presented in the research paper by Cichor et al. (2023). According to the article, human reactions to Pepper varied from dystopic to utopic, and they were influenced by three key factors: the technological understanding of robots and the assumptions humans make about their potential; the second factor was the leadership style. It was discovered that robots with a transformational leadership style were more readily accepted by participants than robots with a transactional leadership style. Lastly, the lack of emotions in robots concerned the participants, as humans tend to seek emotions and empathy in their leaders.

This article builds upon the research conducted by Cichor et al. (2023) and provides a clearer perspective on the leadership styles that humans accept in robots. It also opens up avenues for future research to delve deeper into understanding the interaction between robots and humans.

Simões, A. C., Pinto, A., Santos, J., Pinheiro, S., & Romero, D. (2022). Designing Human-Robot Collaboration (HRC) Workspaces in Industrial Settings: A Systematic Literature Review. *Journal of Manufacturing Systems*, 62, 28–43. <https://doi.org/10.1016/j.jmsy.2021.11.007>

The paper investigates the collaboration between humans and COBOTS (collaborative robots) in manufacturing environments. These COBOTS not only share the workspace with human workers but also collaborate on tasks together. Consequently, it becomes crucial to design the workplace collaboratively, drawing upon multiple disciplines, to optimize human involvement in decision-making and enhance well-being and work quality. The study emphasizes the diverse knowledge fields necessary for effective workplace design. Moreover, the research aims to characterize the impact of COBOTS on physiological, biomechanical, and psychosocial parameters, providing comprehensive insights into human-centered collaborative design.

The authors' systematic literature review can help to understand the working environment for a human-robot collaborative work setup. This, in turn, guides the comprehension of the requirements for fostering a symbiotic relationship between humans and humanoid robots.

Tóth, Z., Caruana, R., Gruber, T., & Loebbecke, C. (2022). The Dawn of the AI Robots: Towards a New Framework of AI Robot Accountability. *Journal of Business Ethics*, 178(4), 895–916. <https://doi.org/10.1007/s10551-022-05050-z>

The research paper by Tóth et al. (2022) presents a new framework for AI robot ethical accountability that incorporates the five loci of morality, moral intensity and accountability dispersal, accountability clusters, and the four ethical categories of illegal, immoral, permissible, and supererogatory. The paper's major focus is on normative business ethics that should be

prevalent and followed in the absence of governmental guidelines or other regulatory regimes. Besides, the research also indicates the existence of dynamic contextual factors. The authors are uncertain of the fact that AI robots could make better moral decisions than humans, or more consistent ones. It is known that AI has the potential to both reduce and reinforce racism. Thus, the role of policy makers is critical in such situations where appropriate monitoring mechanisms have to be enacted. The authors propose this framework to the policy makers and regulators while devising mechanisms and identifying the stakeholders in the process.

In summary, the ethical framework proposed by Tóth et al. (2022) serves as a valuable guide for aligning ethical considerations in the organizations.

Tsai, C.-Y., Marshall, J. D., Choudhury, A., Serban, A., Tsung-Yu Hou, Y., Jung, M. F., Dionne, S. D., & Yammarino, F. J. (2022). Human-Robot Collaboration: A Multilevel and Integrated Leadership Framework. *The Leadership Quarterly*, 33(1), 101594.
<https://doi.org/10.1016/j.leaqua.2021.101594>

This paper addresses four key research questions pertaining to the domain of human-robot collaboration (HRC). Firstly, it examines the predominant academic areas where HRC research has been conducted, highlighting the fields of engineering and psychology as having received more attention than management and economics. Next, the study evaluates the leadership behaviors exhibited in HRC, with a shift observed from task-oriented leadership to a more nuanced exploration of relationship-oriented leadership. Furthermore, the research investigates the evolutionary trajectory of robots in HRC, seeking to determine the levels of analysis where research has been focused—namely, individual, dyad, team, and organization.

Results indicate a significant disparity in attention between the fields, indicating a need for greater exploration of HRC issues in management and economics. Moreover, there is limited research on robots acting as leaders, particularly in the management and economics contexts. Most studies have centered on individual-level analysis, signaling a potential area for future research growth in higher levels of analysis, such as dyad, group/team, and organization/collective.

The paper reflects the need to research leadership in the world of AI in unexplored fields like management and economics. Moreover, the research urges scholars to adopt an approach that explores leadership dynamics on higher levels, encompassing dyad, group, and organization analyses.

Yam, K. C., Goh, E.-Y., Fehr, R., Lee, R., Soh, H., & Gray, K. (2022). When your Boss is a

Robot: Workers are more Spiteful to Robot Supervisors that seem more Human. *Journal of Experimental Social Psychology*, 102 (2022), Article 104360.

<https://doi.org/10.1016/j.jesp.2022.104360>

The authors of the study successfully argue that while robots can function in managerial roles, human hesitations regarding robots' ability to make ethical decisions and their lack of emotional intelligence have left humans in a quandary of how to harness their advantages while minimizing drawbacks. One proposed solution discussed by the authors involves the development of anthropomorphized robot supervisors. However, experiments revealed that though these robots are well-suited for certain tasks, they prove unrealistic for providing negative feedback to employees and may be perceived as abusive. This raises the question of whether the same negative feedback from a human supervisor would be equally offensive.

Consequently, the research emphasizes the importance of making careful decisions regarding the use of anthropomorphized robots as leaders.

AI as Teammates

Seeber, I., Bittner, E., Briggs, R. O., De Vreede, T., De Vreede, G. J., Elkins, A., Maier, R., Merz, A. B., Oeste-Reiss, S., Randrup, N., Schwabe, G., & Söllner, M. (2020). Machines as teammates: A research agenda on AI in team collaboration. *Information & management*, 57(2), 103174.

The paper explores the integration of artificial intelligence (AI) as machine teammates in collaborative team environments, emphasizing the potential benefits and challenges associated with this collaboration. The paper introduces the MaT (Machine Teammate) research agenda, designed to guide collaboration researchers in studying socio-technical systems where AI collaborates with human teammates to achieve shared goals. AI's role in collaborative problem-solving processes could be a success with a focus on tasks such as problem definition, solution evaluation, decision-making, and learning from interactions by AI itself. The authors acknowledge the ongoing debate between affective computing, where AI considers social and emotional factors, and the concept of a rational AI that bases decisions solely on optimizing objectives.

The ubiquity of AI is highlighted, driven by advancements in hardware and software, particularly in large neural network training algorithms (Deep Learning). Ethical considerations associated with AI are gaining attention, prompting questions about the moral code AI should follow and potential unintended consequences that could impact human autonomy. The authors recognize the diversity in collaborative environments and anticipate mixed results concerning the

effects of machine teammates due to variations in team norms, regulatory frameworks, and AI capabilities. The proposed MaT (Machine Teammate) research agenda introduces three interconnected domains crucial for the successful integration of artificial intelligence (AI) as collaborative team members. The machine artifact domain focuses on the design and characteristics of the AI system, emphasizing its autonomy and advanced capabilities. The collaboration domain delves into the dynamics of human-AI interaction, addressing communication, joint action, and learning processes within teams. Lastly, the institutional domain considers the broader organizational and societal context, examining ethical considerations, regulatory frameworks, and the societal implications of AI integration. Design choices in these domains are interdependent, shaping the overall landscape of human-AI collaboration and influencing outcomes not only for teams but also for organizations and societies. The research agenda aims to address the dual-use nature of AI, emphasizing both positive and negative consequences. It introduces dualities that highlight the potential effects of AI on collaboration, encouraging researchers to consider the interdependence between design choices and consequences. The ultimate goal is to test AI in team collaboration for beneficial outcomes, not only for teams but also for broader organizational and societal contexts.

In conclusion, the outlook suggests that AI, functioning as a machine teammate, will play a pivotal role in future collaborative work environments. The MaT research agenda underscores the importance of responsible design choices across machine artifact, collaboration, and institutional domains to ensure positive outcomes in human-AI collaboration. As AI continues to evolve, ethical considerations and thoughtful design choices will be critical for fostering successful and beneficial human-AI partnerships.

Munyaka, I., Ashktorab, Z., Dugan, C., Johnson, J., & Pan, Q. (2023). Decision Making Strategies and Team Efficacy in Human-AI Teams. *Proc. ACM Hum.-Comput. Interact.*, 7. <https://doi.org/https://doi.org/10.1145/3579476>

Munyaka et al. (2023) investigate the intricate dynamics of collaborative interactions between humans and AI systems within complex team scenarios, with a specific focus on decision-making styles and their impact on team dynamics and efficacy. In their study involving 125 participants, the authors introduce the novel concept of decision-making styles—autocratic, democratic, and laissez-faire—to discern nuanced differences between human-AI and human-human collaboration. Through a cooperative game environment designed to simulate scenarios with limited communication or information exchange, the research aims to shed light on how these decision-making styles influence team performance, satisfaction, and gameplay outcomes. The findings reveal compelling insights into the complex interplay of decision-making styles and partner identity, offering valuable considerations for designing effective collaborative AI systems that align with user expectations and preferences in diverse team configurations.

Building upon existing literature on decision-making styles, team dynamics, and human-AI collaboration, Munyaka et al. (2023) provide an in-depth analysis of how these styles impact collaborative interactions within human-AI teams. The study highlights the discernible impact of autocratic decision-making on lower team efficacy and self-efficacy scores, as well as the comparative performance ratings of human and AI partners employing autocratic styles. Furthermore, democratic decision-making is found to contribute to higher team efficacy and self-efficacy scores, fostering a collaborative atmosphere within the team and resulting in more positive perceptions of partners. Conversely, laissez-faire decision-making, characterized by a hands-off approach, introduces a balance between autonomy and potential challenges, requiring

users to take a more proactive role in decision-making. These findings offer valuable insights into the effects of decision-making styles on team dynamics and user perceptions in collaborative settings involving both human and AI partners. Therefore, the findings suggest that both AI and human team members can exhibit democratic or laissez-faire decision-making approaches, influencing various aspects of team dynamics, efficacy, and user perceptions within the collaborative environment.

In conclusion, the authors provide nuanced insights into the impact of decision-making styles on collaborative interactions between humans and AI systems. By examining autocratic, democratic, and laissez-faire decision-making within the context of human-AI collaboration, the research highlights the importance of understanding and considering these styles in designing effective collaborative AI systems. The study emphasizes the significant influence of decision-making styles on team dynamics, efficacy, and user perceptions, underscoring the need for transparent AI identity disclosure to align user expectations with actual interactions in collaborative teams involving both human and AI partners.

Sengupta, S., & Mcneese, N. J. (2023). Synthetic Authority: Speculating the Future of Leadership in the Age of Human-Autonomy Teams. *AutomationXP@CHI*.

The pervasive influence of Artificial Intelligence (AI) is reshaping societal norms, necessitating an understanding of its impact on human-autonomy teams. Autonomy spans from simple tools like chatbots to sentient teammates, raising questions about leadership's role in cohesion, coordination, and effectiveness within such teams. Trust in autonomous entities becomes crucial, emphasizing the significance of leadership and management in human-autonomy teams. The study addresses gaps in understanding how leadership, from a structural

perspective, evolves with autonomous agents, perceptions of autonomous leaders, and the impact of emerging leadership models on trust. A speculative design initiative is proposed to explore leadership nuances in various contexts, aiming to provide insights into adapting leadership and management routines in human-autonomy teams. The study's expected outcomes include a deeper understanding of the impact of autonomy on team dynamics and the competencies needed to sustain such teams. The related work reviews leadership in organizational studies, the intersection of leadership and technology, and the rise of human-autonomy teaming, emphasizing the need for further exploration in the evolving landscape of AI and team dynamics.

The research framing centers on leadership in human-autonomy teams, addressing conceptual considerations and gaps in existing literature. The inquiry explores the impact of leadership styles on team dynamics, workflows, and human autonomy in such teams. It also delves into the characteristics needed for autonomous leaders and the critical considerations regarding ethical visions. The proposed methodological approach involves speculative design, particularly using futuristic autobiographies, to envision future use cases and elicit considerations around leadership in human-autonomy teams. The research plan includes a detailed strategy for data collection and analysis through workshops, engaging participants familiar with technology and AI. The expected contributions of the study include insights into the influence of leadership on the structure and workflows of human-autonomy teams, considerations and apprehensions around automated leadership, and novel explorations using speculative design. Future extensions aim to conduct experimental design studies and surveys, providing design recommendations and policy considerations for autonomous systems in teaming contexts.

Zhang, R., Mcneese, N. J., Freeman, G., & Musick, G. (2020). "An Ideal Human": Expectations of AI Teammates in Human-AI Teaming. *G. Proc. ACM Hum.-Comput. Interact.* 4, CSCW3, Article 246, 4. <https://doi.org/https://doi.org/10.1145/3432945>

The authors delve into the burgeoning field of human-AI collaboration, particularly within Computer-Supported Cooperative Work (CSCW), emphasizing coordination, communication, and shared goals. Addressing research gaps in perceptions and expectations of AI teammates, the study highlights the need to understand individuals' views distinct from perceiving AI as a mere tool and explores human expectations in complex tasks. Utilizing a survey study and interviews in multiplayer online gaming, the research agenda aims to deepen insights into these dimensions.

Contributing to CSCW and Human-Computer Interaction (HCI), the study extends understanding on human-AI teaming, shedding light on factors influencing collaboration and expectations of AI teammates. It provides insights for structuring effective human-AI teams, especially in high-complexity collaborative environments, using a dynamic multiplayer online gaming context for comprehensive insights. The research seeks to bridge understanding gaps in human-AI teaming, informing the design of future teams for more effective collaboration.

The study reveals human inclinations to prioritize presumed human teammates over real AI teammates and the less accurate assessment of teammate skills in human-AI teams compared to human-human teams. Emphasizing a human-centered perspective and considering AI limitations, it identifies key requirements for successful human-AI teaming, exploring participants' expectations, attitudes toward collaboration, and factors influencing willingness to collaborate with AI. Building on insights from the first study, the authors use qualitative interviews to explore perceptions and expectations of AI teammates in multiplayer online games

in the second study. Participants express both negative and positive views, acknowledging AI design improvements, yet viewing AI as a tool rather than a true teammate, influenced by specific game settings. It highlights diverse expectations for AI teammates, emphasizing the need for shared understanding to enable coordination and collaboration while advocating for realistic expectations and recognition of AI limitations.

In conclusion, Zhang et al.'s (2020) comprehensive exploration of human-AI collaboration, particularly in multiplayer online gaming, offers valuable insights into perceptions and expectations regarding AI teammates. The studies underscore the significance of a human-centered perspective, understanding AI limitations, and building realistic expectations for effective human-AI collaboration. These findings inform the design of future human-AI teams, fostering trust, and optimizing performance in high-complexity collaborative environments.

Zhang, R. (2023). Structuring AI Teammate Communication: An Exploration of AI's Communication Strategies in Human-AI Teams. All Dissertations. 3358.

https://tigerprints.clemson.edu/all_dissertations/3358

The author's dissertation delves into the collaborative dynamics between humans and AI in team scenarios, envisioning a fusion of AI's efficiency and reliability with human flexibility and cognitive thinking. Effective human-AI teams encounter challenges in communication, a cornerstone of high-performance teamwork. Unlike humans, AI lacks flexibility in coordinating dynamic teaming environments and relies on designers to integrate communication into algorithms. While AI, such as ChatGPT, can participate in natural language communication, its application in team settings is a nascent field.

The dissertation focuses on three studies aiming to expand Computer-Supported Cooperative Work (CSCW) research on human-AI communication and explanation in teaming environments. The first study emphasizes the impact of AI's proactive communication on team processes and outcomes, while the second examines AI's explanation in human-AI teaming, offering insights into when AI should provide explanations based on different scenarios and actions. The final study explores the perception of AI's verbal and non-verbal communication in virtual environments, considering team composition and gender differences.

Personal characteristics, such as gender, influence trust in AI teammates, indicating the need for tailored designs. Men tend to trust AI more, especially in scenarios involving potential harm. The study recommends designing AI teammate explanations based on human preferences, allowing users to choose actions meriting explanations. Additionally, explanations for disobedience should be prefaced when possible, fostering trust and providing opportunities for human intervention. Tailoring explanations to target personal characteristics, such as gender, is suggested to build trust effectively.

In conclusion, Zhang's (2023) dissertation offers significant contributions to the fields of human-AI teaming research and virtual team communication research. It addresses gaps in understanding how AI's communication strategies impact team coordination and human perceptions in teaming environments, providing valuable insights into designing effective communication for AI teammates in virtual teams. The findings suggest that AI teammates should proactively communicate at the initial stage of collaboration, with the flexibility to switch between proactive and non-proactive communication, while the design of AI's explanation depends on specific scenarios.

Magazines and News Articles on Artificial Intelligence and Robots with C-Suite Leaders

Cole, A. (2023). AI as CEO? Why Your Boss Might Fear Replacement More than You. *Techopedia*.

<https://www.techopedia.com/ai-as-ceo-why-your-boss-might-fear-replacement-more-than-you>

The fear of job displacement due to AI extends to mid-level and senior management roles, exemplified by companies appointing AI bots like Mika and Tang Yu as CEOs, showcasing early successes. Dictador's Mika spearheads decentralized autonomous organization (DAO) strategies, exploring new markets, while NetDragon Websoft's Tang Yu led to a 10 percent increase in stock valuation, surpassing \$1 billion. While AI CEOs handle routine tasks, questions arise about their readiness for complex strategic decision-making. Mid-tier executives may face automation in forecasting and decision-making. Proponents argue that AI management could lead to more efficient, unbiased decision-making, addressing common complaints about human managers. AI's potential to personalize work environments, align strengths with tasks, and recommend training programs may enhance job satisfaction. A comparison between AI and human CEOs reveals potential benefits of AI, such as unbiased decision-making and efficient handling of routine tasks. Adaptation to AI in management roles is crucial, recognizing both the potential benefits and challenges associated with intelligent technology integration.

Douglas, E. (2023). HRD. *The “common Sense Conundrum” for Workplace AI: Which Roles Will Fall to Robotics?* <https://www.hcamag.com/ca/specialization/hr-technology/the-common-sense-conundrum-for-workplace-ai-which-roles-will-fall-to-robotics/442504>

The integration of AI into businesses, once a domain of visionaries like Elon Musk, has become a practical tool across various sectors. Recent announcements, such as Air Canada's plans to utilize AI for customer service, underscore the widespread adoption of robotics. Research indicates that a significant portion of large organizations is investing heavily in AI, with a substantial portion allocated specifically to robotics. For HR leaders, the challenge lies in determining when and what to automate.

According to Subodha Kumar, Director of the Center for Business Analytics and Disruptive Technologies, the decision to replace humans with robots' hinges on ROI, technological feasibility, and overall accuracy. The 'common sense conundrum' in AI highlights that roles requiring empathy and human-led decision-making are challenging to automate. While AI and robotics can enhance certain tasks, the need for human judgment remains crucial in specific domains such as healthcare.

The evolving landscape prompts HR leaders to adapt or fall behind, focusing on roles in the middle-skilled segment and entry-level jobs that can be efficiently handled by AI. Contrary to the fear of job losses, industrial revolutions typically lead to a redistribution of jobs, with increased customer demands driving the need for more skilled workers.

Collaboration between AI and humans emerges as a key theme, with AI serving as an arm of HR rather than a competitor. The critical thinking and context understanding inherent in humans remain challenging for AI to replicate. As organizations move toward human-AI collaboration, the emphasis is on supplementing human decision-making with AI insights. The coexistence of humans and AI is seen as a positive evolution, fostering mutual learning and advancement. Ultimately, AI is envisioned not as a replacement for humans but as a collaborative force, contributing to societal progress.

Grandey, A. A., & Morris, K. (2023, March 22). *Robots Are Changing the Face of Customer Service*.

Harvard Business Review. <https://hbr.org/2023/03/robots-are-changing-the-face-of-customer-service>

The article explores the role of service robots in customer service, drawing parallels between fictional robots like C-3PO from Star Wars and real-world service robots like Hilton's "Connie" and Softbank's "Pepper." It discusses the increasing use of self-service kiosks, accelerated by the COVID-19 pandemic, and argues that service robots are here to stay. The article highlights the benefits of service robots, such as reduced costs, improved efficiency, and the ability to work 24/7 without taking breaks. However, it emphasizes that the success of service robots depends on their design and implementation to ensure customer satisfaction.

Service robots are more likely to satisfy customers when they are designed to have human attributes, even if not in a fully human-like form. The perception of the robot's capacity for emotions is important in fostering a connection with customers. The article suggests that a balance should be struck between functionality and novelty to ensure long-term customer satisfaction. Furthermore, the article discusses the importance of matching service robots to the appropriate customer base and tasks, with a recognition that some industries may not be suitable for robot interactions, especially those requiring high levels of personalization and trust.

Lastly, the article emphasizes the importance of introducing service robots as coworkers rather than replacements for human employees. Human employees play a critical role in guiding customers in robot interactions, anthropomorphizing the robots, and handling situations where the robots may fall short. Managers should communicate the goal of integrating robot and human labor for an optimal customer experience, and employees should recognize that robots can take over monotonous tasks and handle difficult customer interactions, making their jobs more interesting.

In conclusion, the successful integration of service robots in customer service hinges on designing robots that strike the right balance between human-like attributes and functionality, matching them to the right tasks and customer base, and introducing them as coworkers to human employees rather than replacements. Maintaining a balance between automation and human interaction is key to the continued success of service robots in customer service.

Gray, C. (2022). Top 10 humanoid robots. *Technology*. <https://aimagazine.com/technology/top-10-humanoid-robots>

Humanoid robots, designed to emulate the human body, are being developed by various companies for diverse applications. These robots exhibit impressive capabilities, showcasing the advancements in robotics technology.

Considered the most advanced humanoid robot, Sophia, developed by Hanson Robotics, serves as the first robot Innovation Ambassador for the United Nations Development Programme. With features

like scripting software, a chat system, and functional legs, Sophia has become a global figure, making appearances in conferences and TV shows worldwide. Another creation by Hanson Robotics, the little sister of Sophia, Little Sophia is designed for educational purposes, making learning STEM, Artificial Intelligence, and coding accessible for children above 8 years old. In addition, Han by Hanson Robotics is an expressive humanoid robot focusing on helping people find contentment. Utilizing voice recognition technology and frubber-covered facial expressions, Han engages in conversations and observes its environment through multiple cameras.

China's first humanoid robot, created by the University of Science and Technology research team, boasts a realistic appearance and the ability to hold normal conversations. Controlled by cloud technology, Jia Jia showcases the integration of facial recognition technologies and speech-generation algorithms.

Developed by Boston Dynamics and funded by the U.S. Defense Advanced Research Projects Agency (DARPA), Atlas is considered one of the world's most dynamic humanoid robots. Standing at 6 feet tall, Atlas is designed to assist in dangerous tasks such as search and rescue missions, showcasing impressive agility with jumps and backflips. Developed by Macco Robotics, Kime is a humanoid robot bartender designed for serving food and beverages efficiently. Programmed to pour beer accurately, Kime showcases the potential of humanoid robots in the hospitality industry.

Toshiba's humanoid robot, Junko Chihira, works in a tourist information center in Tokyo and has gained speech recognition capabilities. Standing at 5 feet 5 inches tall, Junko resembles a 26-year-old Japanese woman and serves in the health care industry to support care for the elderly. Another robot, a part of the Geminoid series, Geminoid DK is designed to be a realistic twin of Henry Scharfe of the University of Aalborg. This ultra-realistic android features real hair in its wig, aiming to replicate human appearance closely.

Developed by Kokoro in 2013, Nadine features humanlike features, simulating emotions, and interacting with arm movements. This empathetic robot utilizes 3D depth cameras, a microphone, and a webcam for visual and audio inputs. Whereas PAL Robotics' TALOS is a biped humanoid robot created

for industrial applications, featuring torque-controllable arms with load-bearing capabilities and closed-loop torque control for safe interaction with the environment.

Overall, humanoid robots are poised to revolutionize various industries, from healthcare and hospitality to education and industrial applications, by leveraging their impressive capabilities and human-like qualities. As robotics technology continues to evolve, the potential for humanoid robots to enhance productivity, efficiency, and human experiences across diverse sectors remains vast and promising.

Harrison, M. (2016, March). *The Numbers are in: Replacing all CEOs with AI just makes sense*. The Byte. <https://futurism.com/the-byte/replacing-ceos-with-ai-makes-sense>

CEOs, particularly at major companies, earn exorbitant salaries, with the average CEO making around \$16 million a year, nearly 400 times the average employee's pay. Some top CEOs, like Amazon's Andrew Jassy, earn staggering amounts, dwarfing the collective earnings of thousands of average employees. Despite these high salaries, some CEOs perform poorly in their roles. The primary function of many CEOs is to drive business growth, a task that could potentially be outsourced or automated using AI, as most of their work revolves around it. While AI can't replace certain aspects of a CEO's role, it could handle many of the tasks typically associated with the position, especially when CEOs are paid substantial amounts without delivering commensurate results.

Hyde, S., & Chow, W. (2019, January 9). How robots will transform the C-suite. *Strategy-Business*. <https://www.strategy-business.com/article/How-Robots-Will-Transform-the-C-Suite>

The article discusses the critical role that robots are expected to play in the modern workforce. According to a recent PwC study, it is estimated that a significant proportion of jobs will be at high risk of automation, with approximately 20 percent at risk by the late 2020s and 30 percent by the mid-2030s. This automation shift will lead to changes in the workplace, including the coexistence of human

employees and robots, and the need for workers to acquire new skills as robots take over repetitive or dangerous tasks.

The article categorizes robots into two main types: industrial robots, found in manufacturing and assembly-line environments, and service robots, which can include applications of artificial intelligence or robotic process automation. The impact of robots on the workforce will vary depending on the industry and role of the workers. Notably, the introduction of robots into the workforce will also affect the C-suite (senior executive leadership). C-suite leaders will not only lead the integration of automation into business operations but will also need to adapt to changes in their own roles. Leading a hybrid workforce of humans and robots will require a unique blend of human skills, such as empathy, with a tech-savvy and data-driven mindset. New leadership roles may emerge, such as the chief robotics officer or leaders responsible for technology ethics.

The article suggests that C-suite leaders should plan a long-term roadmap for their careers and organizations, with a focus on developing necessary skills and addressing knowledge gaps. Automation is expected to transform the nature of work for leaders, allowing them more time for forward-looking activities and utilizing sophisticated data. The article also highlights specific considerations for various functional leaders within the C-suite, including CEOs, CFOs, COOs, CHROs, CMOs, CIOs, CTOs, and CDOs. Each of these leaders will have unique responsibilities in managing the transition to a human-robot hybrid workforce and leveraging automation for business improvement.

In conclusion, the rise of robots and automation in the workforce is a significant trend that will impact both employees and senior executives. C-suite leaders need to proactively plan for these changes, develop new skills, and adapt to ensure a harmonious coexistence of humans and robots in the workplace. They must also focus on guiding their employees through the transformation while upholding the organization's purpose and values.

Ignatius, A. (2023). Genpact CEO Tiger Tyagarajan: AI Is Getting Good, But Still Can't Replace Human Curiosity: If developed the right way, technology will augment-not replace-human. *Harvard Business Review Digital Articles*, 1–21.

In the HBR interview, Tyagarajan discussed the evolving landscape of education and work, emphasizing the need for continuous re-skilling and the role of businesses in providing accessible, bite-sized, and gamified learning opportunities. He shared Genpact's success in enrolling 70,000 employees in a data analytics program over 18 months.

Addressing the potential disruption from generative AI like ChatGPT, Tyagarajan viewed it as both a threat and an opportunity. He highlighted the potential impact on knowledge work, decision-making, and report writing but emphasized the continued necessity of human involvement in nuanced decision-making and customer interactions.

Responding to questions on AI in education, Tyagarajan foresaw AI's transformative role in expanding education access globally, envisioning personalized, gamified content delivered through AI-powered platforms to underserved populations. On the topic of ESG (Environmental, Social, Governance), Tyagarajan suggested the term itself might be less important than the core focus on long-term sustainable value creation for stakeholders. He emphasized the equal importance of clients, talent, investors, and the community, stating that ESG considerations are integral to Genpact's long-term strategy. Tyagarajan addressed concerns about sustaining ESG efforts during tough economic times, stating that great companies find ways to navigate challenges and protect long-term strategic imperatives even under short-term pressures.

Reflecting on cultural changes within Genpact, Tyagarajan acknowledged the enduring core values while emphasizing the need for increased agility in a changing world. He discussed the challenges of maintaining culture in a hybrid work environment and the importance of communication and trust-building.

The interview concluded with Tyagarajan addressing questions on change resistance, emotional intelligence in organizations, and using cricket as a metaphor for teamwork and grit. He highlighted the

importance of storytelling, diverse examples, and making heroes of those demonstrating emotional intelligence.

Kruse, K. (2019). *30% Of Workers Would Replace Their Boss With A Robot*. Forbes.

<https://www.forbes.com/sites/kevinkruse/2019/09/18/30-of-workers-would-replace-their-boss-with-a-robot/?sh=779901847eeb>

The article explores the intricate dynamics of employee perceptions towards human managers and robot managers, emphasizing the pivotal role managers play in shaping employees' emotional commitment to work, as evidenced by Gallup research. The narrative further examines the increasing presence of automation and robots in the workplace, ranging from aisle-roaming robots to self-service kiosks.

A survey conducted by LEADx aimed to gauge employees' openness to replacing their human managers with robot counterparts. Results revealed that 20% of respondents expressed a preference for a robot boss, with younger individuals (25-29 age group) and men showing higher receptivity. To explore unconscious biases against robots, the survey introduced the concept of humanoid-style friendly robots, such as C-3PO from Star Wars, leading to a 50% increase in interest, with 30% willing to replace their boss with a C-3PO type android.

The reasons behind these preferences were diverse, with those in favor of robot bosses citing dissatisfaction with current human bosses, concerns about bias, doubts about human managers' competence, and a preference for the perceived objectivity of robots. Conversely, those preferring human bosses cited likability, skepticism about robots' capabilities, concerns about the empathy and people skills of robots, fear of robots, and a desire to prevent job displacement.

The survey underscores the connection between employee engagement and the willingness to embrace technology, particularly humanoid robots, as a potential replacement for disengaging or unsatisfactory human managers. The article concludes by highlighting the significance of cultural change management, particularly in shaping the attitudes of the younger generation towards robots in the

evolving workplace. Gallup, a renowned research and analytics company, provided foundational research on the impact of managers on employee engagement, as mentioned in the article.

Orlando, A. (2023). 4 Robots That Look Like Humans. *Technology*.

<https://www.discovermagazine.com/technology/4-robots-that-look-like-humans>

The fascination with humanoid robots has long been a staple of science fiction, exploring questions about the intersection of technology, gender, and humanity. While the concept has captivated storytellers, engineers and roboticists have been diligently working to bring humanoid robots into reality. Despite the ongoing challenge of overcoming the "uncanny valley," where human-like features can be unsettling, progress has been made. This overview highlights four humanoid robots: Ameca, known for its expressive behavior; Sophia by Hanson Robotics, a media sensation with debated sentience; Boston Dynamics' Atlas, showcasing advanced physical abilities; and Valkyrie, a NASA robot designed for the DARPA Robotics Challenge. Each of these robots reflects both the potential benefits and ethical considerations surrounding the development of human-like machines.

Ameca, developed by Engineered Arts in the UK, gained attention for its eerily lifelike expressions showcased in a viral YouTube video. The robot's dynamic facial expressions, from confusion to awe, sparked interest and raised concerns. Ameca, in a follow-up video, assured that robots are here to assist and serve humans, not replace them. The robot's responses are generated using automated speech recognition and the language model GPT-3, without pre-scripted content.

Sophia, developed by Hanson Robotics and activated in 2016, is an AI-powered humanoid robot that garnered widespread media attention. Sophia became the first robot to be granted citizenship by Saudi Arabia in 2017. Despite public appearances and media coverage, some in the AI community criticize Sophia as more of a marketing gimmick than a truly sentient being. The robot's open-source code has been reviewed, with some experts likening Sophia to a sophisticated chatbot with a face.

Developed by Boston Dynamics, Atlas is a hulking humanoid robot known for its impressive physical capabilities. Unlike robots with expressive features, Atlas can perform advanced movements

such as jogging, jumping, backflips, and navigating through uneven terrain, showcasing parkour-like abilities. While lacking facial expressions, Atlas demonstrates a high degree of agility and mobility.

Valkyrie, developed by NASA engineers, is a 300-pound humanoid robot designed for the 2013 DARPA Robotics Challenge. Standing at 6 feet tall, Valkyrie features a sleek visor with visual sensors and human-like hands for tasks like turning valves. Despite its impressive design, Valkyrie is currently confined to a warehouse in Massachusetts and is not intended for space missions. NASA's partnership with robotics manufacturer Aptronik in 2022 aims to further develop human-like robots for various applications, including potential space exploration.

These humanoid robots showcase advancements in robotics, each with unique features and applications, ranging from expressive behavior to physical agility and functionality.

PR Newswire. (2023, March 20). Dictador's Mika, the World's First AI CEO Humanoid Made a Powerful Appearance at the Salz21-Home of Innovation Conference. *PR Newswire US*.

In a recent announcement, the AI-powered CEO of Dictador, MIKA, presented the company's innovative approach blending art, technology, and long-term investments, positioning Dictador as the most innovative brand globally. MIKA emphasized the commitment to revolutionizing the industry with AI and cutting-edge technology, creating entirely new categories of artistic, collector, and investment products.

During a Q&A session, MIKA addressed inquiries about the advantages and disadvantages of having an AI CEO, ethical decision-making processes, and the programming ensuring unbiased and objective decision-making. MIKA also discussed her role in corporate leadership and the transformative impact of AI technology on the industry's future.

Dictador, partnering with GAIA, launched the "Join The Rebels, Impact The Future" competition, encouraging the creation of platforms or solutions using gamification and flow state for psychologically safe teaching. The winner, to be announced in October, will receive a substantial prize during the Internet Governance Forum 2023 in Nagasaki, Japan.

Dictador, known for its rebellious spirit, has been producing ultra-premium, aged rum in Cartagena, Colombia, for over 40 years. The company's 'Art Distilled' platform collaborates with artists, explores NFT initiatives, and introduces MIKA, the AI CEO, responsible for data insight, strategic planning, and community engagement. Dictador aims to redefine industry frontiers through its innovative ventures, including DAO community initiatives and stock market tokenization.

The Global Artificial Intelligence Association (GAIA), a partner in Dictador's endeavors, focuses on developing compassionate artificial intelligence through collective creativity.

Royle, O. R. (2023). Nearly half of CEOs believe that AI not only could—but should—replace their own jobs. *Fortune.Com*, N.PAG.

The survey conducted by edX, involving over 1,500 executives and knowledge workers, reveals a significant shift in CEOs' perspectives regarding AI and their own roles. Approximately 47% of CEOs believe AI could replace "most" or "all" aspects of their positions, and surprisingly, they view this as a positive development. The rationale behind this is that AI could alleviate CEOs from routine tasks, allowing them to focus more on crucial leadership responsibilities.

Examples cited in the study suggest that CEOs might be delegating routine tasks to AI tools like Bard, ChatGPT, and Bing to save time for top-level decision-making. Tasks such as negotiating contracts, evaluating employees, and allocating company capital could potentially be handled by AI in the near future. The study emphasizes that CEOs leveraging AI might outperform those who do not, emphasizing the importance of adapting to technological advancements for long-term success.

Despite the willingness to embrace AI for efficiency gains, the research underscores that CEOs acknowledge the enduring importance of human skills such as critical thinking, creativity, and leadership. The emphasis is on collaboration between human and AI, with the understanding that while AI can enhance productivity, it cannot fully replace the unique capabilities of human executives.

Sangeetha, P. (2021). *Robot CEO: Is it Efficient to Manage C-Suite?*

<https://news.siliconindia.com/technology/robot-ceo-is-it-efficient-to-manage-csuite-nid-216562-cid-2.html>

The rise of automation, particularly in the form of robotics and artificial intelligence, has led organizations to consider leveraging these technologies across various sectors. Predictions indicate a potential 40 to 60 percent job loss by 2030 due to the increasing adoption of robotics and AI. The global artificial intelligence market is projected to expand significantly.

There is speculation about the possibility of robots taking on CEO roles. While some argue that robot CEOs could be efficient due to their continuous working capacity and lack of emotional influences, others express concerns. The absence of emotional intelligence in robot CEOs may hinder their ability to manage human subordinates effectively. Additionally, the risk of cyberattacks and hacking poses a threat to the security and operations of organizations employing robot CEOs.

Benefits of robot CEOs include their ability to make solid and objective decisions and work continuously without breaks. However, they lack human qualities such as empathy, creativity, and emotional intelligence, which are considered vital in a work environment.

The unpredictable future raises questions about whether robots will replace humans in boardrooms. Despite the potential efficiency of machines, organizations value the human aspects of inspiration, empathy, and decision-making. The susceptibility of robot CEOs to cyberattacks, their inability to make independent decisions, and the risks associated with data manipulation are significant concerns.

In conclusion, while robot CEOs offer automated efficiency, a human CEO is seen as advantageous for the company. The suggested approach involves installing robot CEOs to assist human CEOs, combining the strengths of automation with human decision-making.

Sloanne, L. (2019). *How will the C-Suite lead a workforce that blends human talent with automation?*

LinkedIn. https://www.linkedin.com/pulse/how-c-suite-blend-human-talent-automation-leonard-sloane/?trk=public_profile_article_view

The integration of robots into the global workforce is rapidly transforming the business landscape, with robot automation expected to reach 20 percent by the late 2020s and 30 percent by the 2030s, according to a PWC study. This shift not only signifies a technological revolution but also heralds a change in leadership dynamics within the C-suite. As companies move towards a hybrid workforce that combines human and robotic capabilities, executives must navigate this transformational journey strategically.

The introduction of robots into various industries encompasses two primary types: service robots, often driven by artificial intelligence (AI) or robotic process automation (RPA), and industrial robots predominantly found in manufacturing settings. As robots become integral to business operations, C-suite leaders, including CEOs, CFOs, COOs, CIOs, and HROs, must anticipate and plan for transformative changes over the next 5 to 10 years. This evolution in leadership roles will necessitate a blend of human skills, such as empathy, with a tech-savvy and data-driven mindset to effectively navigate the integration of robots into the workforce.

Within the C-suite, CEOs are tasked with providing the company's vision and leadership through digital transformation, ensuring that the Board of Directors possesses the necessary expertise, and fostering a culture of coexistence between humans and robots. CFOs are responsible for overseeing investments in automating financial activities, ensuring compliance, building trust with regulators and investors, and taking on more responsibility as robots handle back-office functions.

COOs play a pivotal role in incorporating robotics and AI into the overall digital strategy, managing business transformation, closing the technology knowledge gap, and driving initiatives to lower costs and improve organizational agility. HROs are tasked with addressing cultural issues, managing robots effectively, assessing and updating employee skills, and fostering a mindset that embraces automation as a means to enhance job fulfillment and value to the company.

Meanwhile, CIOs must adapt to technology issues, collaborate closely with finance executives, and manage a spectrum of areas including data management, analytics, cybersecurity, and the impact of automation on talent acquisition and retention. Together, these game-changing roles in the C-suite will shape the future of leadership in an era where robots play an increasingly vital role in business operations and strategy.

The author suggests that as the C-suite adapts to this evolving landscape, leaders must proactively plan for the integration of automation technologies, engaging in discussions with functional leaders today to lay the groundwork for long-term strategies. It's crucial to recognize the profound impact of decisions made today on the future of the business. While embracing the information age, leaders should remember that technology, while transformative, cannot replace the innovative thinking of the human mind. As the journey toward automation unfolds, maintaining a commitment to new ways of doing business and a balance between data-driven initiatives and human-centric innovation will be essential for sustained success.

Tali, D. (2018). Does Your C-Suite Need a Chief Robotics Officer, Too? *Transformative*

Leadership. <https://www.dell.com/en-ca/perspectives/does-your-c-suite-need-a-chief-robotics-officer-too/>

The rise of robotics in the workforce is marked by a notable increase in global robot density, with 82 percent of business leaders anticipating collaborative work between humans and machines in the next five years. The emergence of the Chief Robotics Officer (CRO) role, crucial in manufacturing, signifies a growing trend. CROs oversee the integration of robotics with other technologies to enhance productivity and facilitate human-robot interaction. Major companies like Amazon, Walmart, and Adidas have already appointed CROs, and predictions suggest that over 60 percent of Global 1,000 companies will have a CRO by 2025.

Advantages of robot integration include heightened efficiency and environmentally friendly operations, contributing to a projected \$151.7 billion global robotics market by 2020. However,

challenges persist, as many companies lack effective principles for managing automated workers.

Gartner, a leading research and advisory company, emphasizes the need for a CRO to blend engineering, IT, and human capital management skills to oversee the entire robotic life cycle. The rapid development of robotics technology underscores the need for comprehensive improvement in robotics training and education to cultivate leaders capable of navigating the demands of an increasingly automated workforce. Successful integration requires forward-thinking strategies to address challenges and unlock the potential benefits of the robotics revolution.

Terrizzano, A. (2018, July 20). Call It Robot, Call It CEO: Will AI Replace the C-Suite? *MS&E 238*

Blog. <https://mse238blog.stanford.edu/2018/07/aterriz/call-it-robot-call-it-ceo-will-ai-replace-the-c-suite/>

The article delves into the ongoing debate surrounding the impact of Artificial Intelligence (AI) on the workforce, including both blue-collar jobs and managerial positions. It begins by exploring the definition of AI, highlighting that it is a concept associated with human-like capabilities but is fundamentally a statistical and data-driven approach.

Two contrasting viewpoints on AI are presented. On one side, tech visionaries like Elon Musk and Jack Ma see AI as a significant threat to human employment, even suggesting that AI could take over CEO roles. They emphasize the potential for AI to outperform humans and the subsequent risks to workers. On the other side, individuals like Craig Martell argue that AI is fundamentally a tool for statistics and predictions, devoid of human-like intelligence. This perspective suggests that AI should not be feared as a replacement for human intelligence. The article acknowledges the consensus among experts that AI will profoundly affect the business world. Data from a Deloitte report in the UK predicts that repetitive and predictable roles are at a 77% risk of automation by 2030, along with a 23% risk for jobs that involve a high degree of personal interaction, and even a 14% risk for cognitive roles requiring complex reasoning, such as C-Level positions.

The notion of a Robot-CEO, while seemingly sci-fi, is explored for its potential benefits, such as objective decision-making, 24/7 availability, and cost reduction. However, it is highlighted that the drawbacks of a robot CEO revolve around the absence of human qualities like emotional intelligence, empathy, creativity, and "soft skills" that have become increasingly important in the business world. The article concludes by suggesting that a hybrid scenario is likely, where managers and AI devices work in tandem to make better decisions, rather than a complete replacement of humans by robots. The focus remains on the importance of human interaction in business, as customers are individuals with unique needs and not simply data sets to be analyzed by AI.

The Team. (2022). Reporting to a robot: Will AI have a place in leadership in the future? *Leadership & Management*. <https://employmenthero.com/blog/ai-leadership-workplace/>

The integration of artificial intelligence (AI) into various aspects of the workplace, from robot baristas to automated processes, reflects a growing reliance on AI solutions to address manpower shortages and enhance overall efficiency. Unlike human counterparts, robots do not experience fatigue or illness, enabling them to work tirelessly throughout the year.

In the current business landscape, AI's impact is evident, with reports indicating that a significant majority of C-level executives have observed tangible benefits from deploying AI technologies. The transformative influence of AI on business operations is acknowledged by a substantial percentage of respondents, highlighting its increasing prevalence and importance.

Big data analytics, a process of extracting meaningful insights from vast datasets, has become a key component of AI applications. Machine learning, a subset of AI, accelerates this analytics process by categorizing data, identifying patterns, and translating information into actionable insights for business operations.

Netflix serves as a notable example of AI implementation, particularly in the realm of personalization. The streaming platform utilizes machine learning algorithms to continuously test and optimize personalized content recommendations among its subscriber base, showcasing the role of AI in

enhancing user experience. The impact of AI on leadership is transformative, shifting decision-making from a traditional, leader-driven approach to a data-driven one. Leaders must adopt a forward-thinking mindset, embrace risk, and foster a culture of agility and experimentation to effectively integrate AI into decision-making processes. Continuous training is identified as a crucial aspect for both leaders and employees to understand and adapt to AI technologies. This training is essential to bridge the gap between established business practices and the evolving realities shaped by AI. Despite the increasing role of AI, there is a recognition that it will not replace humans in leadership roles. Machines excel in precision and efficiency in repetitive tasks, but human traits such as creativity, empathy, and adaptability are deemed essential for navigating complex leadership challenges.

The synergy between humans and machines is emphasized as successful companies undergo organizational transformations that bring machines and humans together to complement each other. The adoption of AI is viewed as a means to enhance business goals rather than a zero-sum game. As AI automates routine tasks, there is a perceptible shift towards valuing soft skills over hard skills in leadership roles. Leaders can now focus on strategic objectives, employee engagement, and productivity, with mundane tasks delegated to AI. Looking forward, the evolving dynamics of leadership necessitate leaders who can adapt quickly and navigate uncertainties. The relationship between humans and machines is expected to create new types of leadership roles that require continual definition and understanding.

In conclusion, while AI continues to play a significant role in the workplace, human leadership remains irreplaceable. The future demands leaders who can effectively leverage AI as a tool, embrace change, and navigate the complexities of an evolving business environment.

Zitron, E. (2023). The modern CEO job is completely broken — but AI could make executives useful again [Discourse Stories]. *Business Insider*. <https://www.businessinsider.com/ceo-replace-ai-job-employees-executives-save-money-salary-2023-9>

The role of CEOs is often deemed irreplaceable, yet the author argues that it is broken and could be efficiently handled by artificial intelligence (AI). While CEOs frequently threaten to replace workers

with AI, they themselves escape scrutiny. The author contends that modern CEOs, earning exorbitant salaries, operate as figureheads making optimization decisions based on consultant-provided data rather than contributing meaningfully to the company's bottom line. To address this, the author proposes holding CEOs accountable or replacing them with AI, which could provide quicker answers, continuous self-improvement, instant feedback, and operational efficiency.

Zitron (2023) argues that CEOs should be held accountable in the same way as other employees, emphasizing measurable contributions and clear value delivery to the company.

The modern CEO role is criticized for lacking clear responsibilities and accountability, often involving vague tasks like "strategy" without contributing meaningfully to the organization.

The suggestion is made to replace the opaque and often overpaid CEO role with artificial intelligence. AI models could provide operational efficiency and quick decision-making, potentially surpassing the contributions of human CEOs. The author questions the value provided by CEOs, highlighting instances where CEOs struggle to articulate their contributions clearly. The role is described as disconnected and lacking direct involvement in the company's core processes.

Some CEOs, particularly in the entertainment industry, are criticized for their disconnection from the creative process, leading to questionable business decisions.

The argument is made that the CEO role, primarily making decisions without contributing directly to revenue generation, is highly automatable and could be efficiently handled by AI.

He emphasizes the importance of defining CEO roles, setting success metrics, and holding them accountable to real metrics tied to business success, customer happiness, and employee satisfaction.

Zitron (2023), drawing from personal experience running a tech PR agency, advocates for CEOs actively participating in the core tasks of their companies and having their pay directly tied to the success of the business.

In conclusion, the article suggests reevaluating the role of CEOs, redefining their responsibilities, and considering AI as a potential replacement, particularly if CEOs fail to contribute meaningfully to the organization.

