

# Editorial

## How Technology Can Build Resilience to Achieve a Sustainable World: Overcoming Challenges for Humanity to Fight Global Outbreaks

**T**ECHNOLOGICAL advances can help in designing and building computer-based solutions, offering resilient and effective ways to find high-quality service solutions aligned with organizational strategy and global economic growth. Given the importance of these technologies, those who discover them can achieve commercial success [1]. The global movement toward artificial intelligence (AI) solutions is based on emerging analytical techniques associated with Big Data, web analytics, data and text mining, ontology engineering, the Semantic Web, and many other advances. Together, these techniques help generate fresh insight to support the fight against emerging global outbreaks on multiple fronts. For example, a model based on a global, publicly articulated social network shows that this simple method can contribute to advanced warning of contagious outbreaks [2].

The circumstances of the COVID-19 pandemic hint at the high probability of similar outbreaks in the near future, with uncertain consequences. Such pandemics are particularly harmful in a socially and economically globalized world. Outbreaks of diseases, such as avian influenza in Asia (2004), Ebola in Africa (2014), and COVID-19 worldwide (2019), together with the spread of endemic diseases associated with warmer temperatures due to climate change (e.g., tuberculosis, malaria, dengue fever, yellow fever, and West Nile virus), could endanger a billion people in previously unaffected regions by 2080 [3]. The threat of these warmer temperatures is growing. In 2020, a vast ozone hole (probably the biggest ever recorded in the north) opened in the skies above the Arctic. The scientific community has reported that it is larger than any ozone loss observed in the past, including the Arctic ozone depletion in 1997 and 2011. If the hole grows or drifts to lower latitudes over more populated areas, the consequences could be drastic [4].

The recent COVID-19 outbreak has been described as a black swan event. Its unexpected occurrence, rapid spread, and immense impact indicate the need for analysis of its causes and consequences, as well as the proposal of specific measures to prevent and increase resilience to this and other infectious diseases. In a recent briefing for the European Parliament, Delivorias and Scholz [5] cited rapid urbanization, climate change, and increased international travel as key factors and warned of the massive impact on international trade, health, transport,

agriculture, and tourism. They also demanded broader solutions from developing and developed countries beyond those coming from within the health system.

Advances in automated data processing and machine learning (ML) allow epidemiologists to sift through the millions of digital traces left each day from Internet searches, social media posts, mobile phones, and so forth to provide valuable information that can track the spread of diseases [6]. The spread of Industry 4.0 (I4.0) technologies and solutions (and the next wave in the form of Industry 5.0) has given rise to new human-computer interaction technology. This technology allows users to experience a vast array of possibilities related to training or decision-making processes, with a wide range of implications for organizations and their growth prospects. For example, I4.0 and additive manufacturing can act together to bring about rapid change to manufacturing processes to react to the needs of global outbreaks through the creation of customized and dynamic products. Undoubtedly, technological advances can be used to ensure economic growth through strategies around sustainable development capable of avoiding or mitigating the negative effects of new epidemics and pandemics, both globally and locally. Therefore, at this point, it is increasingly important to anticipate technical and practical challenges to identify experience-based best practices that show how to enhance the connections between the social sphere of health and the economic and technological domains under the prism of sustainability. By combining blockchain and IoT devices, a more reliable, trustworthy, and extendable traceability system could be built [7]. Recently, Di Marco et al. [8] affirmed that sustainable development must account for pandemic risk and that mitigating this risk must be an integral part of sustainable socioeconomic planning. The occurrence of local or global epidemics or pandemics, the intensity of their impact, and the resilience of the socioeconomic and ecological systems to these events are intrinsically linked to the connectivity between technological, social, and economic processes.

Previous outbreaks have shown that merely perceiving the risk of a pandemic can have devastating consequences for the global economy, affecting countries and industries in a range of ways and to varying degrees. This collective vulnerability to the social and economic impacts of infectious disease outbreaks appears to be increasing [9]. New financial and technological instruments must be used to support pandemic preparedness and response, highlighting the need for analysis of the factors related to

cryptocurrency adoption [10] and the characteristics and properties of blockchain and the associated technological applications [11]. Understanding how to prevent and build resilience to infectious disease outbreaks is more than just a political task and requires action and planning at the macro level. Here, technological advances can play a crucial role. Agogo et al. [12] noted the need to build community resilience by strengthening government collaboration, encouraging greater interdisciplinary research at universities, and involving private actors to design innovative strategies. In this scenario, integrated research is needed to analyze the role of technology in dealing with the social and economic impacts of pandemics. The current data revolution is likely to have a profound, disruptive effect on empirical research disciplines, such as economics and management. It is now imperative to explore relevant issues in relation to the connections between the aforementioned disciplines and disease outbreaks.

This Special Issue provides an operational and technical perspective. It addresses the challenge of technological innovation in a disruptive world, where industrial sectors must adapt to the new global economic situation, with a particular focus on sustainable development [13]. Technology is the most efficient tool to adapt to new demands and drive innovation and entrepreneurship. The key issue is to change the way technological innovation is measured [14]. Decision-making analysis of new technology projects adapted to the sustainable economy is essential for this purpose. New, rising economic sectors, such as biotechnology, health engineering, pharmacology, AI adapted to cities, and applied Big Data are important in this regard [15].

### I. CONTRIBUTIONS TO THIS SPECIAL ISSUE

The outbreak of COVID-19 prompted the use of digital contact tracing (DCT) apps to control the spread of the virus. However, the adoption of such technology is subject to individuals' privacy concerns and the perceived effectiveness of privacy policies. In Sharma et al. [A1], use a conceptual framework combining various theories to examine the factors influencing the intention to adopt DCT apps. They employ a quantitative approach, analyzing data from 714 respondents to test the proposed model. The findings highlight the significant role of privacy concerns, cultural factors, and the effectiveness of privacy policies in shaping attitudes toward DCT apps. The study reveals that the cultural dimension of collectivism moderates the impact of privacy concerns on attitudes toward DCT apps, suggesting an interplay between cultural context and technology adoption. In addition, privacy self-efficacy and subjective norms enhance the intention to adopt DCT apps. The paper contributes to the theoretical understanding of digital health innovation in the context of a pandemic and offers practical insights for promoting DCT app adoption through tailored privacy policies and consideration of cultural differences.

Resilience is now an interdisciplinary concept. In Phillips and Chao [A2], use the term "resilient ecosystem" to refer to an ecosystem that has a certain tolerance for the continuous changes of the outside world, can adapt to these changes, and maintains its fluctuation within the key threshold. In economic research,

regional economic resilience is the ability of a regional economy to withstand external shocks from markets, competition, and the environment, while returning quickly to the original growth path or transitioning to a new growth path characterized by fuller and more effective use of material, human, and environmental resources. Resilience studies are context-dependent. In organizational strategic planning, resilience means not only returning to the situation prior to a shock but also finding a new path to achieve goals by leveraging that shock. In this process, an important behavior of an organization is learning, which allows it to respond appropriately to external shocks. The obvious measure of resilience is thus how long it takes an organization to regain its path toward achieving its goal or mission, accounting for the severity of the external shock. This severity is measured on a five-level scale: setback, crisis, disruption, disaster, and wicked problem. A setback is the lowest level of severity of an external shock, reflected by normal disturbances to a business's activities, such as losing a customer to a competitor. At the other end of the scale, a wicked problem is an ongoing, highly complex, interrelated combination of physical, political, and social problems that are extremely difficult to solve (e.g., conflicts in the Middle East) and the business risks that come with them. Considering exogenous shocks, an organization repursues its strategic goal through the cycle of response, recovery, development, prevention, mitigation, and preparedness. In the case of the COVID-19 pandemic, firms digitized products and services in response to the outbreak, heavily hit economies took a long time to recover, office facilities became more well ventilated, homes added office space, health organizations analyzed the structure of the virus and developed vaccines to prevent infection, and governments built emergency stockpiles and incentivized businesses to prepare for rare events. When a disturbance is severe and an organization realigns quickly to a goal or mission, it shows high resilience. When a disturbance is severe and an organization realigns slowly, it is resilient only if it demonstrates that it has learned new responses to this highly disruptive event and has prepared for future ones. When a disturbance is of low severity and an organization realigns quickly to a goal or mission, it is unclear whether it is resilient. Finally, when a disturbance is of low severity and an organization realigns slowly to a goal, it shows itself to have little resilience.

Supply chain resilience is mostly understood from an organizational perspective. Broadening this perspective from an organization level to a network level addresses the propagation effect of risks arising during the COVID-19 crisis. Organizations share interconnected relationships, which can be generalized into some form of buyer-supplier relationship. During COVID-19, a supply chain network's exposure to disruptions came primarily from stringency of measures adopted to control the spread of the pandemic. In Choudhary et al. [A3], exploit these two aspects to construct a supply chain network based on a focal company and develop an agent-based simulation model that captures the propagation of risk in the supply chain network. The outcome is to expand the understanding of network-level characteristics of organizations during the disruption due to the pandemic. The network-level characteristics of betweenness centrality, closeness centrality, and degree centrality have

interesting implications, especially in understanding the role of an organization in a supply chain network facing disruption. For an organization, having knowledge and transparency of the extended supply chain network is imperative to deal with supply chain disruptions that extend beyond the supply chain.

With the development of e-commerce and the popularity of online shopping, product evaluation management (PEM) systems are important for providing consumers with purchase references. However, most PEM systems store all evaluation data in a centralized server, making their internal data vulnerable to tampering attacks. In light of the characteristics of decentralization, traceability, and tamper-proofing, recent research presents blockchain as a way of building decentralized evaluation management systems for various application scenarios such as industrial IoT, smart healthcare, finance, and vehicular ad hoc networks. Although these blockchain-based decentralized evaluation management systems can defend effectively against tampering attacks, they are still relatively unreliable and unsustainable. Moreover, the major increase in assessment data and computational complexity means that these systems suffer from efficiency issues. For instance, they lack an effective economic incentive mechanism, leading to low motivation for consumers to submit their comments on e-commerce platforms. To address these issues, in Zhou et al. [A4], explore blockchain technologies, including Ethereum blockchain, the InterPlanetary File System (IPFS), and smart contracts, to build a reliable and sustainable PEM system for online shopping. The proposed blockchain-based PEM system stores evaluation data on the IPFS and retains the addresses of the evaluation data file on the Ethereum blockchain. This storage strategy minimizes the storage burden of blockchain, thereby improving the efficiency of data processing. In addition, they propose a reliable retrieval scheme to improve the consumer shopping experience. The proposed PEM system extracts keywords from the product comments by the keyword extraction algorithm to index evaluation data. Given a product-related keyword, consumers can rapidly see the performance of the product in a certain area. Two smart contracts are designed (i.e., Product Contract and Auxiliary Contract) to implement the proposed PEM system. The Product Contract is used to implement basic functions, such as selling and purchasing products, storing addresses of product information and comments, uploading product information, and the like. The Auxiliary Contract is designed as an economic incentive mechanism to allocate a certain reward to the buyer automatically after the buyer submits evaluation data for the product. This economic incentive mechanism encourages users to submit evaluation data on an ongoing basis, resulting in a virtuous circle and highly sustainable online shopping. The proposed blockchain-based PEM system is simulated on a standard PC platform, with the Geth-test client used to test its performance. After testing function deployment 20 times using identical parameters and settings, the authors observe consistent and stable deployment costs, indicating that the proposed PEM system offers high usability. As the number of comments increases, the cost of the search function grows modestly, indicating reliable data management. The simulation shows that the economic incentive mechanism can effectively encourage

buyers to submit evaluations of products, thereby improving the sustainability of the proposed PEM system. The extensive experimental results suggest that the proposed PEM system achieves good performance in terms of usability, reliability, and sustainability.

In the vulnerability, uncertainty, complexity, and ambiguity (VUCA) world, an important question is how firms can maintain their sustainable development goals to balance their economic growth, social progress, and environmental performance. In Xie et al. [A5], address this question. Integrating these sustainability goals into normal business activities also poses a major challenge in various respects. Responsible innovation, defined as “a transparent, interactive process by which societal actors and innovators become mutually responsive to each other with a view to the (ethical) acceptability, sustainability and societal desirability of the innovation process and its marketable products,” has recently attracted considerable attention. More and more researchers argue that responsible innovation practices allow companies to cope with uncertainty during global crises and yield smart ideas for firms to become sustainable in the long term. However, little research has examined the role of responsible innovation in promoting firms’ sustainable development. This study explores how firms can achieve superior sustainable performance through responsible innovation. The extended resource-based view (ERBV) suggests that firms’ sustainability efforts could be furthered by enhancing organizational capabilities to absorb and exploit external resources. Therefore, ERBV provides a holistic theoretical foundation for a sustainable performance research framework by suggesting that sustainable performance may be embedded in a wide network of interorganizational exchange relationships. Given that many studies highlight the importance of supply chain resilience in terms of sustainable performance, this paper extends the unit of analysis from supply chain networks to broader business networks. Because collaborative relationships are more vulnerable to being interrupted in the VUCA world, the resilience capability of business networks is strategically essential for firms to thrive and achieve sustainable development. Thus, business network resilience, which refers to a firm’s operational capability to anticipate, adapt to, respond to, and recover promptly from an unpredictable disruption, could act as a stabilizing mechanism to help firms leverage resources in their business networks and manage unforeseen events that threaten innovation processes. Based on the ERBV, this study examines the impact of responsible innovation on firms’ sustainable performance via business network resilience. To investigate this impact, the study uses survey data gathered from 422 Chinese manufacturing firms during the COVID-19 pandemic. Analysis shows that responsible innovation has a positive effect on firms’ sustainable performance and that business network resilience mediates this relationship. In addition, this research shows that absorptive capacity and social media adoption not only moderate the relationship between responsible innovation and business network resilience and the relationship between business network resilience and sustainable performance but also moderate the mediating effect of business network resilience on the relationship between responsible innovation and sustainable performance. Because the real-world uncertainties

and dynamic changes faced by society require new information and knowledge to promote business sustainability, this study not only investigates when and how responsible innovation can be transformed into firms' sustainable performance via business network resilience but also presents practical suggestions for management, policymakers, and researchers involved in such considerations.

In Burström et al. [A6], explore the transformative impact of software use in business over the past three decades, highlighting its role in innovation and business characteristics. The authors acknowledge the burgeoning interest in software ecosystems (SECOs) from both practitioners and researchers, driven by the development of digitalization efforts. A comprehensive literature review is presented, offering new definitions for software ecosystems and their configurations. The authors propose a theoretical model that describes the relationship between vital contingency categories and processes within SECOs, identifying major research gaps and suggesting a future research agenda. The study underscores the need for managers to comprehend their firm's position within a SECO and the role they play. It suggests that an architectural understanding can enable managers to connect with SECO leaders or even co-orchestrate the SECO in the absence of clear leadership, thereby securing a resilient market position. The paper also explores the connection between SECO studies and traditional business ecosystem research, advocating increased integration and cross-fertilization between these domains. This integration is pivotal for advancing the understanding of value creation, delivery, and capture in the context of SECOs. The authors call for further research in areas such as SECO boundary conditions, key contingency processes, the intersection of SECO and AI, cross-disciplinary research, and the role of SECOs in sustainability. These areas are critical for deepening the understanding of SECOs and their potential to drive sustainable innovation and growth. In summary, the paper provides a nuanced examination of software ecosystems, offering valuable insights for both academic research and practical management. It sets the stage for future explorations that could shape the trajectory of software ecosystems and their contribution to the digital economy.

Ride-hailing platforms are popular. However, during pandemics, such as COVID-19, many customers feel unsafe using ride-hailing services and hence develop a "safety risk-averse" (SRA) attitude. The number of SRA customers is generally unknown. Hence, it is challenging for ride-hailing platforms to establish an optimal service pricing strategy. In Choi and Sheu [A7], present a theoretical study to explore the impacts of a blockchain-based system on ride-hailing platforms, customers, and drivers. The authors consider the case where the platform is risk-averse and serves a market with both SRA and non-SRA customers. They theoretically show that, using blockchain, the optimal service price will be higher, and blockchain is particularly helpful for risk-averse cases with a highly risk-averse ride-hailing platform. They also find that when using blockchain is beneficial to customers, it will also be beneficial to drivers, and vice versa. Finally, the authors extend the analysis to consider various cases, with the key qualitative conclusion in the main model remaining valid.

In Méndez Suárez et al. [A8], investigate the previously unexplored reasons why companies engage in forbidden AI practices, which incur substantial fines under the European General Data Protection Regulation (GDPR). Understanding the motivations behind these severe ethical AI misconduct behaviors, which threaten the future development of AI, is crucial to rectify them. Fuzzy-set qualitative comparative analysis of a sample of companies fined under the GDPR for severe violations of AI ethical principles is presented. The results indicate that, for a company to conform to AI ethical standards and comply with the GDPR, it must have an AI ethics statement, show a strong concern for information cybersecurity, and be located in countries known for high ethical standards. The theoretical contribution of this research is to provide a new perspective on the relevance of AI ethical principles, defying the view of some scholars who argue that these principles are ineffective. By showing a cause-effect relationship between corporate configurations and AI ethical failures, this study enriches the understanding of the conditions that make firms prone to ethical misbehaviors. In particular, the absence of an AI ethical statement is a critical factor leading to such unethical practices. From a managerial perspective, the findings highlight the importance of adopting AI ethics statements as part of a company's strategic actions to mitigate the risks associated with GDPR noncompliance. In addition, the results highlight the critical role of cybersecurity and ethical standards in the countries where companies operate or oversee their activities to ensure compliance with AI ethical guidelines. Therefore, this research offers practical insights for managers and policymakers aiming to cultivate an ethical business ecosystem on AI. In conclusion, this research explores the complex interaction between corporate governance, national ethical standards, and cybersecurity practices in shaping companies' commitment to AI ethics. By identifying the configurations of conditions that lead to AI ethical misconduct, it provides a roadmap for companies and regulators to address the challenges posed by the increasing integration of AI technologies into business practices. This study not only advances the theoretical debate on the ethics of AI but also offers practical recommendations for fostering an ethically supportive landscape for the ethical use of AI.

In Mardani and Saberi [A9], explore how I4.0 technologies, particularly within the context of sustainable supply chain management (SSCM), can drive resilience and sustainability in the manufacturing sector. Through a detailed examination and empirical case study, they identify and prioritize the key drivers for the adoption of I4.0 technologies that foster sustainable practices. They begin by highlighting the transformative potential of I4.0 technologies such as the Internet of Things (IoT), Big Data analytics, autonomous robots, cloud computing, and cybersecurity. These technologies enable manufacturing companies to enhance their operational efficiency, flexibility, transparency, and customization, reducing waste, energy consumption, and greenhouse gas emissions. However, they also acknowledge the challenges in adopting these technologies, including organizational and technological barriers. To evaluate and prioritize the drivers for I4.0 adoption in SSCM, the authors present a novel integrated decision-making framework that combines the weighted

aggregated sum product assessment method with the criteria importance through inter-criteria correlation method, within the framework of q-rung orthopair fuzzy sets. This hybrid approach allows for a more nuanced and accurate analysis by accounting for the vagueness and imprecision in human judgment and the multifaceted nature of sustainability drivers. An empirical case study is presented to assess the drivers of I4.0 adoption in the context of SSCM within the manufacturing sector. Through this case study, the authors identify key drivers, such as reduced production waste, energy savings, lean production flow, and smart product design. They emphasize the importance of these drivers in achieving environmental sustainability, economic benefits, and social responsibility. The findings suggest that adopting I4.0 technologies is critical for manufacturing companies to improve their sustainability performance. The identified drivers and proposed decision-making framework provide practical insights for managers and policymakers on how to prioritize investments in I4.0 technologies to enhance the resilience and sustainability of supply chains. The findings imply that the integration of I4.0 technologies within SSCM practices not only contributes to operational efficiency and cost savings but also plays a crucial role in achieving broader sustainability goals. The authors call for further research to explore the dynamic interactions between I4.0 technologies and sustainable practices in different industrial contexts. In essence, this study underscores the pivotal role of advanced technologies in driving the transition toward more resilient and sustainable manufacturing operations, highlighting the necessity of a strategic approach to adopting and implementing these technologies within the framework of sustainable supply chain management.

In Skare et al. [A10], explore the intricate decision-making issues within the tourism sector that are increasing in complexity and scope. Recognizing the need for multifaceted analyses, the authors address the complexity of the tourism industry by developing a sophisticated decision-making model that employs advanced methods and algorithms. This innovation opens new avenues for further investigation and analysis. The objective of the paper is to construct a fuzzy multicriteria model to evaluate the perceived image of a destination by considering various factors, such as cost, duration of stay, tourist satisfaction, and the sustainable development levels of the regions within the Visegrád Four (V4) countries. The model is rigorously tested and refined using data from 2343 tourists from 2017 to 2021, covering regions in the V4 countries. A detailed example based on data from 126 experts after their trips in 2020 to specific regions is provided. The essence of the approach lies in the novel integration of fuzzy multicriteria decision making with sustainable tourism evaluation in order to offer policymakers a robust analytical tool. This tool is useful not only for assessing current sustainability levels and destination image but also for forecasting future development trajectories in sustainable tourism. Through this model, the authors envision equipping decision makers with the ability to evaluate and enhance the attractiveness and sustainability of regions, encouraging a balance between tourism development and sustainable regional growth. This paper contributes substantially to the evolving discourse

on sustainable tourism and destination management, offering a vital resource for both researchers and practitioners.

In aging societies, high-quality healthcare services are essential for social sustainability. At the same time, keeping the costs of the healthcare system under control matters for economic sustainability. Digital solutions can increase the effectiveness and efficiency of the healthcare sector, reorganizing and reinventing processes and collaborations. In Roesler et al. [A11], study how smart products improve diagnostics by offering opportunities for data generation and data analytics, while also improving treatment by enabling individualized and remote patient therapies. Although these claims sound promising, progress in the implementation of digital solutions in the healthcare sector is slow. Various factors, such as interrupted information flows, a lack of standards, isolated solutions, data security, and missing regulatory guidance, are preventing a comprehensive digital transformation of the healthcare sector. In this paper, the authors analyze which tensions occur between the providers and customers of digital solutions in the healthcare system and which levers these actors might use to scale digital solutions in healthcare. Based on interviews with experts from hospitals and medical and pharmaceutical companies, the authors identify nine paradoxical tensions in provider–customer relations along the three dimensions of a business model (i.e., value proposition, value creation and delivery, and value capture). The identified tensions pertain to interoperability, cost, the interaction process, time, availability, and further collaborative facets. The authors also note that cooperation partners employ four coping strategies to deal with, and ideally overcome, the identified paradoxical tensions. These coping strategies of avoidance, confrontation, concession, and accommodation are likely to differ in the extent to which they can resolve the paradoxical tensions and promote successful cooperation. Just as the application of appropriate coping strategies helps actors in the healthcare sector deal with paradoxical tensions that can easily disrupt their fruitful cooperation, the coping strategies identified by the authors increase the resilience of these supplier–customers relationships.

In Caño et al. [A12], use public data to gain insights into the role of technology in enabling innovation in healthcare. Understanding which technology trends are shaping healthcare businesses is essential to gain a competitive advantage within the industry. The world is awash with data, and being able to generate insights from this vast amount of information is essential for businesses, especially if the source of the data is publicly given that it is thus available to all competitors. The healthcare industry is witnessing a progressive transformation driven by recent developments in technology. The evolution of AI, which includes ML, natural language processing (NLP), and computer vision, along with Big Data, cloud computing, and blockchain, is uncovering new opportunities in health by enabling the analysis of unstructured information, contributing to the development of digital health. Thanks to technology innovation, digital health enables telemedicine, wearable medical devices, mHealth, electronic health records (EHRs), and medical imaging, among others. These knowledge areas are intended to improve the patient experience and the effectiveness of

disease treatment and diagnosis, while enhancing the efficiency of healthcare systems. This paper focuses on the analysis of textual information to evaluate the role of technology for the innovative development of the healthcare industry. News mining, consisting of analyzing textual information from news media for extracting insights, forms the basis of the analysis in this paper. News mining is based on analysis of public data sources and is widely used to gain competitive intelligence, for example by studying the profitability, sustainability, and innovation of businesses. In this paper, 190 284 news articles were collected from the Global Database of Events, Language and Tone, which is continually updated from a diverse range of news media sources around the world. NLP and graph analytics reveal the relationships between the main technology trends driving I4.0 and the main trends in digital health. AI is observed to exert a notable influence across all disciplines in digital health. In addition, remote patient monitoring and the development of medical and wearables devices are closely related to the development of cloud computing and the IoT, whereas blockchain enables the adoption of more advanced EHRs that support patient privacy. This paper contributes to the literature by reviewing the usage of public data, particularly news mining, to gain insights into the healthcare industry and the role of technology and innovation. In addition, it presents a robust and reusable method for uncovering hidden patterns from vast amounts of textual information through NLP. The use of graph analytics brings context to the data, revealing meaningful relationships, in this case between technology and digital health trends. To conclude, the study highlights the value of insights from public data sources to defend against industry competition, contributing to the development of data-driven decision making in healthcare.

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#### APPENDIX RELATED ARTICLES

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