

A Conceptual Approach for the Effects of COVID-19 on Digital Transformation

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I. Introduction

In the wake of the unprecedented COVID-19 pandemic, there has been an escalating demand for digital transformation, propelling businesses, public institutions, and governments to expedite their integration of digital technologies (Fu, 2020). Over the course of the three-year period characterized by diminished face-to-face interactions,

alternative methods for conducting business have emerged, giving rise to innovative work processes (Deloitte, 2018). To facilitate these paradigm shifts, Information and Communication Technology (ICT) has been actively harnessed for its limitless potential (Ulas, 2019).

While extant literature delves into the factors influencing digital transformation and the realms where it manifests, Lee (2020)

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underscores the imperative to scrutinize the impact of both pre and post-COVID eras on this transformative phenomenon. Although this study refrains from providing empirical analysis, its objective is to present a conceptual framework and delve into the ramifications of these temporal shifts. The exploration of the essence of digital transformation, the factors molding its trajectory, the domains it permeates, and the imprint of COVID-19 on its course draws inspiration from a synthesis of preceding scholarly works. Despite the absence of empirical data, this study introduces a conceptual framework to dissect the factors and spheres of digital transformation before and after the upheaval induced by the pandemic.

Recognizing that digital transformation is not without its drawbacks, this study probes into its adverse facets, proposing cautious solutions. In the dynamic landscape of contemporary Information Technology, comprehending the significance of digital transformation becomes imperative. Beyond mere enhancements in efficiency and competitiveness, the digitization of processes and services cultivates an environment of innovation and adaptability in an increasingly digitalized world. Consequently, this research accentuates the pivotal role of digital transformation within the realm of IT services.

As the study concludes, it meticulously delineates the significance and contributions of

there search, identifies avenues for future research, and candidly acknowledges its limitations. In this ever-evolving digital epoch, grasping the multifaceted implications of digital transformation becomes not only pertinent but also instrumental in steering the course of technological progress.

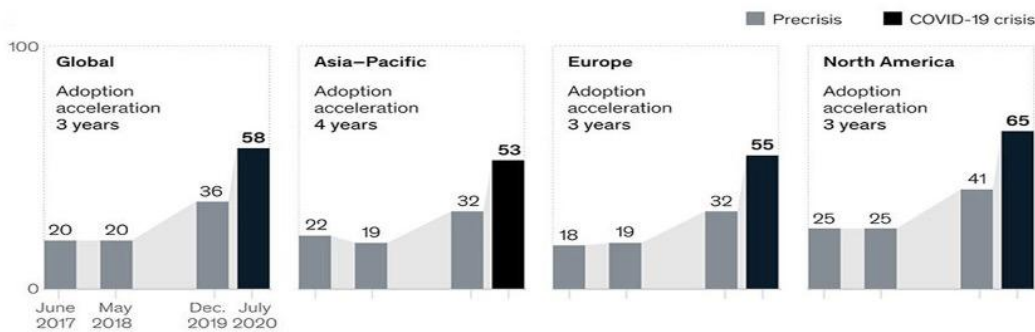
II. Literature Review

The conventional interpretation of digital transformation resides in its role in augmenting the competitiveness of organizations through the strategic utilization of Information and Communication Technology (ICT) (Ra, et al., 2021). Recognizing the pivotal role played by an organization's ecosystem, there is a discernible shift towards the evolution of sophisticated information systems. The application of digital transformation within organizational frameworks is orchestrated with a tripartite focus on business optimization, customer communication, and product innovation, with the latter assuming an increasingly central role for organizations aspiring to attain sustained growth (Paidakula, 2021).

Recent surveys underscore the heightened emphasis placed by companies on the imperative of digital transformation, a trend exacerbated by the transformative impact of the COVID-19 pandemic (see <Figure 2>).



<Figure 1> Need of Digital Transformation among Companies(Paidakula, 2021)



<Figure 2> The Effect of COVID-19 on Digital Transformation(Paidakula, 2021)

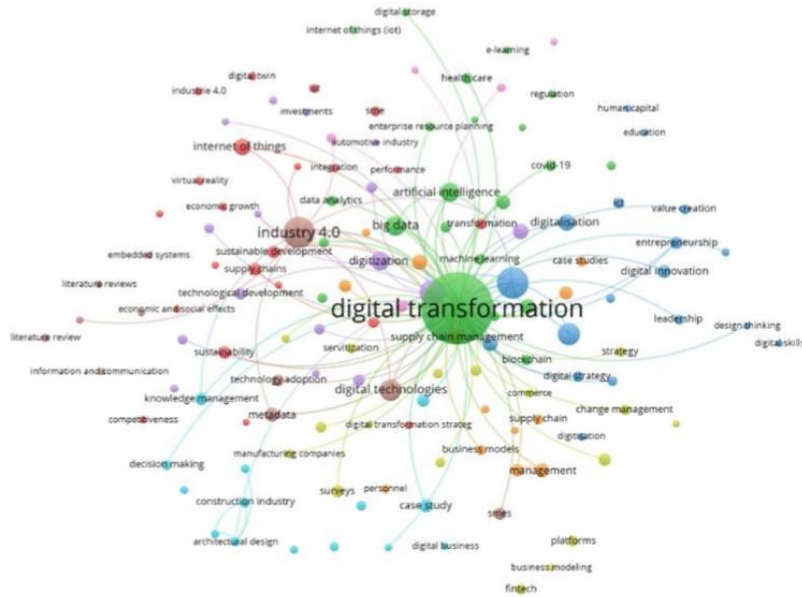
While the exigency for digital transformation exhibits some variability across continents in the pre and post-pandemic landscape, its prominence becomes more pronounced in the aftermath of the global health crisis(refer to <Figure 1>).

Within the realm of bibliometrics, the delineation of interconnected terms germane to digital transformation unveils discernible relationships, as elucidated in <Figure 3>. This illustrative representation underscores that the terms most tightly interwoven with digital transformation encompass the Fourth Industrial

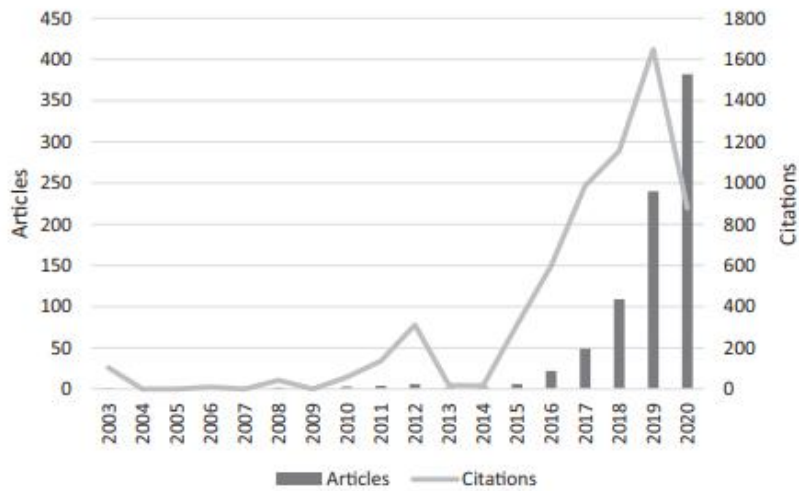
Revolution, Internet of Things, Big Data, Artificial Intelligence, and digital technologies. The coexistence of these terms within bibliographic data aligns with the inherent nature of digital transformation, wherein advanced information technologies associated with the Fourth Industrial Revolution play a pivotal role.

<Figure 4> serves as a visual depiction of both the publication and citation counts pertaining to the domain of digital transformation. This visualization offers insights into the scholarly landscape

surrounding digital transformation, shedding light on the extent of scholarly output and the reception garnered through citations in academic discourse.



<Figure 3> Bibliometric Map of Digital Transformation (Kraus et al., 2021)



<Figure 4> Articles and Citations about Digital Transformation (Kraus et al., 2021)

III. Digital Transformation

3.1 Definitions of Digital Transformation

The definition of digital transformation varies among organizations and scholars, but it can generally be described as the process of utilizing information technology to enhance a company's competitiveness, increase customer satisfaction, and achieve sustained growth (Verina and Titko, 2019). Given the significant

and growing importance of the digital ecosystem in both internal and external business environments, companies are actively advancing and investing in digital systems (Bondar, et al., 2017). While digitization and digital transformation are slightly different concepts, digital transformation can be seen as an intensified form of digitization (Kwon and Kwon, 2021). The following <Table 1> presents the definitions of digital transformation.

<Table 1> Definitions of digital transformation

Author(s)	Definition
Fitzgerald et al. (2014, p.2)	Digital transformation is the use of new digital technologies such as social media, mobile technology, analytics, or embedded devices to enable major business improvements including enhanced customer experiences, streamlined operations, or new business models.
Bondar et al. (2017, p.33)	Digital transformation is a consistent networking of all economic sectors and an adaption of actors to new circumstances of the digital economy.
European Commission (2019)	"Digital transformation is characterized by a fusion of advanced technologies and the integration of physical and digital systems, the predominance of innovative business models and new processes, and the creation of smart products and services."
OECD (2018)	"Digital transformation refers to the economic and societal effects of digitization and digitalization. Digitization is the conversion of analog data and processes into a machine-readable format. Digitalization is the use of digital technologies and data as well as their interconnection which results in new or changes to existing activities."
Deloitte(2018)	"Digital transformation is the use of technology to radically improve the performance or reach of an organization. In a digitally transformed business, digital technologies enable improved processes, engaged talent, and new business models."

3.2 Affecting Factors and Technologies of Digital Transformation

3.2.1 Affecting Factors

Diverse factors exert both direct and indirect influence on the trajectory of digital transformation, as posited by Tripathi (2021). A salient emphasis is placed on the paramount

significance of technological advancement and innovation, underlining the indispensability of digital transformation as a conduit for companies to attain sustained growth, as articulated by Paidakula (2021). The ubiquitous proliferation of social media, coupled with the imperative for enterprise operations to harness big data, underscores the imperative for digital systems that seamlessly

align with evolving business practices in the contemporary landscape (Schwertner, 2017). The exigency for proactive adaptation to the rapid globalizing and the transformative impact of the Fourth Industrial Revolution on everyday business operations further accentuates the imperative for companies to recalibrate their strategies in light of these overarching changes.

In navigating this dynamic landscape, companies are urged to discern potential customer segments, including the discerning Generation MZ, and continually introduce innovative products to the market, as underscored by the insights of Yoon and Lee (2020). Furthermore, echoing this sentiment, the European Commission (2019) advocates for ongoing investments in both business process enhancement and information technology infrastructure. Such investments are deemed essential to fortify global supply chains, cultivate smart factories, and establish

resilient digital platforms that can adapt to the evolving business milieu. Recognizing the multifaceted nature of these internal and external business environments, Kim (2019) underscores their role as pivotal driving forces behind the imperative for digital transformation within organizations.

3.2.2 Key Technologies

According to insights from the KT Economic and Management Research Institute (2020), the technological facets integral to digital transformation are inherently aligned with the foundational technologies underpinning the Fourth Industrial Revolution. A comprehensive roster of these pivotal technologies encompasses smart devices and cloud computing, 5G communication technology, artificial intelligence and robotics, Internet of Things and big data, autonomous vehicles and drones, 3D printing and bionics,



<Figure 5> Returns to Capital versus Returns to Labor, US Bureau of Economic Analysis

as well as block chain and virtual reality, as expounded upon by Fehér et al. (2017).

While the implementation of digital transformation undeniably bolsters the operational efficiency of businesses, its overarching objective is the attainment of sustained growth through corporate innovation. As elucidated by Lee (2022), this necessitates not only a strategic vision but also meticulous planning and execution throughout the digital transformation process.

3.3 Impact of COVID-19

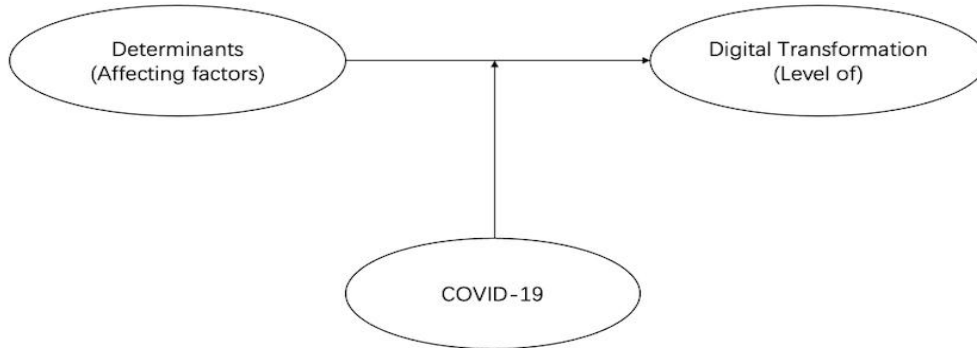
In the context of the prevailing trend toward digital transformation within the competitive business landscape, the COVID-19 pandemic introduces a myriad of influences on various facets of this transformative process, as articulated by An (2021). Specifically, the impact of the pandemic on the domain of digital transformation, as delineated by Bae and Shin (2020), encompasses several critical areas. These encompass the establishment of supporting systems to ensure the health and safety of employees in the midst of the pandemic, the implementation of systematic and efficient remote working practices, collaboration within virtual spaces, fortification of business resilience to surmount future uncertainties, the advancement of lifelong education through remote learning platforms, widespread adoption of telemedicine, and the

development of integrated systems to mitigate cyber security risks, as underscored by the insights of Fitzgerald et al. (2014).

3.4 Shadow of Digital Transformation

Digital transformation has intensified due to the impact of COVID-19. Large companies with capital and technology are making more efforts in utilizing information technology for innovation, driven by the sense of crisis caused by the pandemic (Wahid and Zulkifli, 2021). As a result, while individual workers with limited exposure to digital transformation and the Fourth Industrial Revolution experience a decrease in labor in-come, large companies leveraging capital and technology have witnessed a significant increase in their capital income, as depicted in <Figure 5>.

As a result of digital transformation,(Lee, 2018) said the nature of work for laborers undergoes fundamental changes, and jobs that involve repetitive tasks or require low skill levels will rapidly decline due to the impact of automation. While the Third Industrial Revolution strengthened the position of white-collar workers utilizing information systems, the Fourth Industrial Revolution, driven by advancements in artificial intelligence, has made the position of knowledge workers increasingly unstable. This situation has led to an increase in capital income and post-tax profits for companies, while labor income and



<Figure 6> Conceptual Framework

employment rates for workers have decreased.

In order to overcome the deepening polarization between companies and individuals resulting from digital transformation, it is worth considering, at a national level, the implementation of policies such as basic income tax and robot tax (Kim, 2020). There is a risk that large companies with capital and technology will benefit significantly while workers may find themselves unable to secure employment opportunities. From a national perspective, institutional mechanisms are necessary, and a comprehensive discussion on topics such as basic income, employment security, robot tax, and corporate obligations regarding ESG (Environmental, Social, and Governance) should be conducted (OECD, 2018).

IV. Conceptual Framework

In the contemporary academic landscape,

digital transformation has emerged as a focal point of research. Previous studies have predominantly focused on revealing the impacts, driving factors, and coping strategies related to digital transformation. However, this research takes a step further by placing special emphasis on the temporal disparities before and after the onset of the COVID-19 pandemic. This unique perspective aids in a profound understanding of the evolution of digital transformation across different time periods and provides a conceptual framework to explain its dynamics.

In the absence of empirical substantiation, this investigation endeavors to offer a conceptual framework elucidating the factors that shape digital transformation and delineating the domains within which this transformation unfolds. Notably, the framework takes into consideration the temporal disparities that transpire before and after the advent of the COVID-19 pandemic. This conceptual model encapsulates the myriad determinants influencing digital transformation and their consequential

effects on the various realms of this transformative process, encompassing both intended outcomes and potential side effects, as illustrated in <Figure 6>.

The onset of the COVID-19 pandemic has functioned as a catalytic force, expediting and reshaping the contours of digital transformation across an array of sectors, spanning business, education, healthcare, and governance. This temporal shift, delineated by the transition from pre-COVID to post-COVID eras, accentuates profound changes and adaptations. A comprehensive comprehension of these temporal dynamics stands as a prerequisite for a nuanced understanding of the far-reaching impacts stemming from the pandemic-induced digital transformation.

Within the construct of the presented framework, determinants are identified as the pivotal driving forces behind digital transformation. To provide a more detailed insight into these determinants, it is essential to delineate specific aspects, such as defining the levels of digital transformation. For instance, clarifying how different levels of digital transformation are categorized and defined can enhance the precision and depth of the framework. We embark on a thorough exploration to enrich the conceptualization of digital transformation. Additional details can be provided, including the identification of specific levels or stages within the transformation process. This could involve

defining the key components and milestones that constitute different phases of digital transformation. A key contribution of this framework lies in its systematic delineation of the cascading effects of digital transformation across diverse domains, encompassing realms such as business strategies, workforce dynamics, education paradigms, healthcare delivery systems, and governmental policies. This methodical exploration yields invaluable insights into the profound the intricate determinants propelling the trajectory of digital transformation. These determinants, characterized by their multifaceted nature, span technological advancements, economic considerations, social dynamics, and cultural influences. They collectively constitute the foundational elements shaping the evolution of digital transformation, offering a nuanced perspective on the intricate interplay and mutual influences among these determinants. We will delve into the complex interrelationships among these determinants, offering readers a detailed perspective to better comprehend their roles in the evolution of digital transformation.

Digital transformation is not merely a technological progression but a comprehensive transformation affecting various sectors such as business, education, healthcare, governance, and societal repercussions of digital transformation.

The COVID-19 pandemic, acting as a

catalyst, has accelerated and reshaped the contours of digital transformation across multiple sectors. To further enhance the discussion, specific examples or case studies illustrating the transformative impact of COVID-19 on digital transformation in different sectors can be incorporated. This will provide concrete instances of how the pandemic-induced changes have manifested within the framework. We will extensively examine this temporal shift, highlighting profound changes and adaptations in digital transformation from pre-pandemic to post-pandemic eras. A comprehensive understanding of these temporal dynamics is crucial for a nuanced comprehension of the far-reaching effects resulting from the pandemic-induced digital transformation.

However, it is imperative to acknowledge that while digital transformation presents a myriad of advantages, it also ushers in unanticipated consequences. <Figure 6> serves as a visual representation of these unforeseen outcomes, illustrating how certain facets of digital transformation may engender challenges such as workforce displacement, concerns pertaining to data privacy, and the exacerbation of societal disparities. Recognition of these unintended consequences is indispensable for the formulation of well-informed policies and strategies.

V. Discussion

To redress the deepening schism between corporate entities and individuals arising from the pervasive digital transformation, a comprehensive suite of measures is imperative. Engaging in national-level dialogues concerning universal basic income, the imposition of robot taxes, and the formulation of pertinent policies emerges as a viable course of action. Given the potential for capital-rich and technologically advanced corporations to flourish at the expense of individuals seeking employment, there is an urgent need for the establishment of institutional mechanisms. These mechanisms, informed by active dialogues, should encompass pivotal topics such as basic income, employment security, robot taxes, and corporate responsibilities aligned with ESG standards.

In addition, large corporations, especially those endowed with substantial capital and technology, must acknowledge their pivotal role in this transformative process (Kraus et al., 2021). While digital transformation bestows substantial advantages upon these entities, it should not come at the detriment of individual livelihoods. Ensuring employment security through robust labor policies and comprehensive social safety nets is paramount. National governments must actively partake in these deliberations and institute the necessary mechanisms to safeguard the rights and interests

of workers amid the rapid technological advancements.

Given the pervasive and transformative impact of information technology on society, educational reform emerges as an imperative. Effectively preparing individuals for the challenges and opportunities ushered in by the Fourth Industrial Revolution and digital transformation is paramount. The overarching objective is to cultivate a workforce that not only exhibits creativity but is also adept at adapting to rapid technological changes.

To further elucidate the positive and negative impacts of digital transformation, it is essential to recognize the intricate relationship between these factors and the COVID-19 pandemic. The pandemic has acted as a catalyst, accelerating certain aspects of digital transformation while also exposing vulnerabilities and exacerbating existing inequalities. On the positive side, the increased reliance on digital tools during the pandemic has highlighted the potential for remote work and digital collaboration. However, it has also underscored the digital divide, with those lacking access to technology facing greater challenges.

Moreover, the pandemic has accentuated the importance of addressing negative consequences, such as the potential for job displacement due to automation and the need for robust social safety nets. The relationship between COVID-19 and digital transformation is nuanced, and a detailed examination of how

these dynamics intersect is crucial for a comprehensive understanding.

To achieve this, educational paradigms must undergo a fundamental shift, prioritizing critical thinking, problem-solving skills, and digital literacy. Educational institutions play a pivotal role in equipping students with the knowledge and competencies essential for confidently navigating the digital landscape (Park et al., 2021). Emphasizing interdisciplinary learning is crucial, encouraging individuals to actively engage with emerging technologies and respond to evolving industry demands. Furthermore, promoting lifelong learning initiatives is essential, allowing individuals to continuously update their skills and remain relevant in the ever-evolving job market. The establishment of public-private partnerships can significantly facilitate access to ongoing education and training programs.

In conclusion, addressing the consequences of digital transformation necessitates a multifaceted approach involving the formulation of policies and measures that ensure equitable benefits. Simultaneously, educational reforms are crucial, empowering individuals to thrive in the digital age. By adopting these strategies, nations can harness the potential of digital transformation while safeguarding the welfare and resilience of their citizens.

VI. Conclusions

This scholarly inquiry delves into the ongoing trajectory of digital transformation, a phenomenon that predates the COVID-19 pandemic and has demonstrated consistent progression. The study, with a particular focus on the impact of the pandemic, underscores the need for heightened attention to external environments, given the potential for future pandemic. In this context, both nations and businesses are urged to fortify their resilience and adaptability.

Through an extensive literature review, the study illuminates the influence of COVID-19 on digital transformation, elucidating the determining factors and the areas within which this transformation occurs. However, the study contends that digital transformation is not a panacea, acknowledging its nuanced shades of negativity. By rigorously analyzing these negative effects, the research cautiously presents potential approaches for nations and businesses to navigate and mitigate these drawbacks, drawing insights from the work of Go et al. (2020).

6.1 Implications and Contributions of Research

Examining the acceleration of digital transformation catalyzed by the COVID-19 pandemic, this study discerns variations in the

domains of digital transformation. The conceptual framework presented provides valuable insights for future research endeavors. The literature review not only sheds light on the active research landscape in digital transformation but also suggests avenues for empirical-based follow-up studies.

Building on prior research, this study underscores the need for governments and businesses to establish preemptive measures to navigate external crises, given the unpredictable nature of pandemics. Furthermore, the study accentuates the pivotal role of digital transformation in enhancing the resilience and adaptability of IT services in the face of unforeseen challenges. Embracing digital transformation, the study contends, is not only essential for ensuring the continuity of IT services but also empowers organizations to thrive in an ever-changing landscape. This is particularly pertinent as IT services become increasingly intertwined with the digital realm, emphasizing the imperative of understanding the significance of digital transformation for the sustained success of IT service providers and their ability to meet the evolving needs of their clients.

6.2 Limitations and Suggestions for Future Study

Acknowledging the conceptual nature of this study's analysis of the impact of COVID-19 on

digital transformation, future research is urged to pivot towards empirical examination. The study suggests a potential avenue for research that involves surveying experts in the field of COVID-19 and digital transformation to analyze the differences between pre-COVID and post-COVID periods. Rigorous literature reviews, the development of sophisticated research models and questionnaires, and the employment of survey methodologies are proposed as necessary steps for collecting and analyzing empirical data in future research endeavors.

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우송대학교 경영학사와 석사 취득하였다. 현재 동국대학교 일반대학원 경영정보학과 박사과정에 있으며, 주요 관심 분야는 컴퓨터 인간 상호 작용, 보안 및 개인 정보 보호, IT 서비스 등이다.

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동국대학교 경영대학 경영정보학과 교수로 재직 중이다. 서울대학교에서 산업공학 학사, KAIST에서 경영과학 석사, 그리고 The University of Nebraska at Lincoln에서 경영학박사를 받았다. LG전자(금성사) 본사 심사부, 중앙연구소 전산실에서 근무하였다. 국내외 주요 저널에 다수의 논문을 발표하였으며, 주요 관심 분야는 신기술 채택과정, 정보 기술 전략 및 정책, 스마트 팩토리, 소프트웨어 품질, 소셜 데이터 분석 등이다.

<Abstract>

A Conceptual Approach for the Effects of COVID-19 on Digital Transformation

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Purpose

In the contemporary landscape, marked by the enduring impact of COVID-19 and the recent disruptions stemming from the conflict in Ukraine, the purpose of this study is to navigate the era characterized by pervasive risk and uncertainty. Specifically, the study aims to dissect the impact of the COVID-19 outbreak on digital transformation, exploring the factors influencing this process and considering the multifaceted dynamics at play. The focus extends to the post-COVID-19 landscape, scrutinizing the implications and meanings of digital transformation both before and after the pandemic. Additionally, the study delves into future digital trends, with particular attention to climate and environmental issues, emphasizing corporate responsibilities in averting crises similar to COVID-19. The overarching goal is to provide a holistic perspective, shedding light on both positive and negative facets of digital transformation, and advocating for regulatory enhancements and legal frameworks conducive to a balanced and resilient digital future.

Design/methodology/approach

This study employs a comprehensive approach to analyze the impact of the COVID-19 outbreak on digital transformation. It considers various facets, such as smart devices reshaping daily routines, transformative changes in corporate ecosystems, and the adaptation of government institutions to the digital era within the broader context of the Fourth Industrial Revolution. The analysis extends to the post-COVID-19 landscape, examining the implications and meanings of digital transformation. Future digital trends, especially those related to climate and environmental issues, are prognosticated. The methodology involves a proactive exploration of challenges associated with digital transformation, aiming to advocate for regulatory enhancements and legal frameworks that contribute to a balanced and resilient digital future.

Findings

The findings of this study reveal that the digital economy has gained momentum, accelerated by the proliferation of non-face-to-face industries in response to social distancing imperatives during the COVID-19 pandemic. Digital transformation, both preceding and succeeding the onset of the pandemic, has precipitated noteworthy shifts in various aspects of daily life. However, challenges persist, and the study highlights factors that either bolster or hinder the transformative process. In the post-COVID-19 era, corporate responsibilities in averting crises, particularly those resembling the pandemic, take center stage. The study emphasizes the need for a holistic perspective, acknowledging both positive and negative facets of digital transformation. Additionally, it calls for proactive measures, including regulatory enhancements and legal frameworks, to ensure a balanced and resilient digital future.

Keyword: Post COVID-19, Information Technology, Digital Transformation, Digital Trends, IT Impact, Capitalism System, Universal Basic Income, Robot Tax

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