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Building a post COVID-19 Configuration between Internet of Things (IoT) and Sustainable Development Goals (SDGs) for Developing Countries

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Abstract
The COVID-19 pandemic has caused significant havoc to personal and professional activities. Digital technologies as the Internet of things (IoT) are being harnessed to support the public-health response to COVID-19 worldwide that can make a significant impact to achieve SDGs in developing regions. Thus, the study targets to analyze the underlying configuration between IoT and SDGs through the lens on the COVID-19 emergency. The study has been conducted over the last 10 years through a systematic selection, in-depth review, and synthesis of relevant literature. The analysis confirms that the COVID-19 emergency can be one of the most important drivers, influencing the accomplishment of SDGs through the implementation of IoT. This pandemic sets the perfect platform for digitalization in a sustainable development outline to obtain specific goals avoiding high infrastructure expenses and policy-related limitations.Research limitation illustrates that prior analytical or empirical attempts from multiple viewpoints are consequently needed to inquire about the proposed conceptualization. The direction of the paper provides recommendations for new business models, policies, private investments, and incentives to collaborate in achieving the SDGs. In addition, this article is the first to discuss IoT focused achievement of SDGs in developing regions to harness the hidden potential of the pandemic.

Keywords: Big-data, COVID-19, Digitalization policy, IoT, SDGs.
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Introduction

The COVID-19 epidemic, which caught the world unaware and unprepared, has caused massive havoc on personal and professional practices, with substantial adverse effects on the economic outline of the country (Katz et al., 2020). The frenzied attempt to curb the human-to-human dissemination of COVID-19 has culminated in neighborhood lockdowns and business closures (Akpan et al., 2020). A fundamental threat to the global socio-economic structure is the COVID-19 emergency. There are signals that the COVID-19 's effect on the global economy would be more severe and long-lasting than that encountered during the global financial crisis of 2008-2009 (Leal Filho et al., 2020). The data shows that the consequences of developed nations will be broadly felt (Reardon et al., 2020) as the pandemic is forcing all countries to face a rising financial strain. Alarmingly, developing regions are exposed to the emergency of COVID-19, partly owing to the shortage of international funding in order to ensure success towards the Sustainable Development Goals (SDGs) (Barbier and Burgess, 2020; Figure-1). In addition, emerging regions may experience from a shortage of accessible international support for climate change mitigation and adaptation of biodiversity protection. At this point, 736 M of world's populace still endure in severe poverty, 821 M are suffering from undernourishment, 785 M populace do not even have necessary clean water supplies, 673 M are also committing free defecation, and one in seven persons still lacks electric infrastructure in developing regions (UN, 2019). As a consequence, it is crucial to achieving SDG goals relevant to the above-mentioned concerns that are essential for the overall rate of economic growth (Banerjee et al., 2019). As an unparalleled political consensus and policy compass for bridging the sustainability divide, the United Nation's 2030 Agenda based Sustainable Development Goals (SDGs) emerged brilliantly in 2015 by discussing the environmental, social, and economic challenges facing mankind (Brandli et al., 2020). The SDGs have set the foundation for trying to create a sustainable setting for all, not leaving anyone behind. The recent epidemic-related emergency presents a significant danger to the developing region's growth opportunities and to the introduction of the UN SDGs by 2030. In fact, a main problem for developing countries is innovative structures to ensure urgent socio-economic backing after the COVID-19 epidemic and sustained development towards the SDGs (Barbier & Burgess, 2020).

Source: UN (2020)

Figure-1: The sustainable development goals (SDGS)

On the other hand, during the COVID-19 pandemic, digital innovations or technologies have gradually become humanity's strongholds (Panigutti et al., 2020). Modern digitalized defense strategies in the war against COVID-19 have been implemented by many governments (Buckee, 2020). It is clear that the unparalleled humanitarian and financial needs posed by COVID-19 are pushing emerging digital innovations to be built and implemented at scale and pace (Budd et al.,2020). The creation and deployment of emerging digital technology at certain scale and pace (Budd et al.,2020) are strongly motivated by the unparalleled humanitarian and economic needs posed by COVID-19. In order to promote the public health answer to COVID-19 internationally, digital tools are being used, including population monitoring, event recognition, touch tracking, and action assessment focused on mobility data and engagement with the public. To minimize the possible spread of COVID-19, IoT-enabled/linked devices/applications are used to early detection, patient surveillance, and the practice of established protocols after patient recovery (Nasajpour, 2020; Rahman et al., 2020). In attempts to control the emerging pandemic, the integrated position of IoT and related advanced technology has the potential to be a significant advancement. Some researchers, however, still hope that the potential of IoT in the developed world would have a major effect on achieving SDGs (López-Vargas et al., 2020; Ono et al., 2017). Sustainability and digitalization are, in effect, the key factors that shape the climate, the economy, and culture. The nexus between both domains shows excellent, yet not exposed, possibilities for promoting a transition to sustainable development phases (Osburg and Lohrmann, 2017). However, sustainability issues based on digitalization remain unresolved (Kohler et al., 2019).

The COVID-19 pandemic is underway, and the contribution added of emerging technology to the pandemic response is too early to completely measure. Although IoT-based emerging technologies have pandemic response support tools, they are not a silver bullet. However, digitalization is nethermost exciting sustainability oriented transitions (Gouvea et al., 2018) to counter the UN proposed SD objectives (Sachs et al., 2019; Seele and Lock, 2017; Walker et al., 2019). The relationship between digitalization and SDGs is discussed by only a few studies, becoming a core that remains underrated in the research investigations (GeSI, 2019; Kostoska and Kocarev, 2019; Vinuesa et al., 2019; Wu et al., 2018). Rather than grasping the position of IoT benefits in connecting the complexities of the 2030 Agenda, groundbreaking studies concentrate primarily on configuring ICTs commitment to tracking SDG metrics within stand-alone 'for-good' initiatives in particular realms. Some recent research, on the other hand, such as Islam and Wahab (2020), Seetharaman (2020), Oldekop et al. (2020), Barnes (2020), and Dwivedi et al. (2020), has effectively systemized the equation between the emergency of COVID-19 and the growth of new digital technology. But the ability of IoT through the pandemic lens for achieving SDGs in emerging regions is only considered by a few scholars. Therefore, the main objective of this paper has been selected as twofold through a standardized and thorough analysis of applicable findings and recent improvements in the spheres of sustainable development and digitalization which are a) to explore the connection between the COVID-19 pandemic and IoT development in the global arena, and b) to conceptualize a policy-oriented path that can help IoT achieve SDGs related to food, clean water, and energy solution in developing regions.

The analysis of the above mentioned objectives will satisfy the research question on how IoT implementation can help to achieve SDGs in developing regions through the lens of COVID-19 emergency. The current study just scratches the surface, and a holistic systemic conceptualization, capable of untangling the complete image of the study limitations, consequences, and prospective directions relevant to the nexus in the sense of the 2030 SDGs Agenda and the position of the IoT prompted by COVID-19 to resolve them, has not yet been delivered to our best knowledge. This paper, therefore, leads to a specific seminal reference to lead scholars, professionals, and policymakers from diverse backgrounds to consider both the challenges of the SDGs based 2030 Agenda as part of the Covid-19 scenario and the link between the SDGs and the IoT, by theorizing an area of research that is still uncharted.

The ultimate motivation of this article, however, is to contribute to the ongoing pool of transdisciplinary solution studies contributing to a fresh socio-technical model. Transdisciplinarity can be interpreted as a method that combines diverse empirical and extra-scientific perspectives with the goal of contributing to social and scientific advancement, according to Jahn et al., (2012). The research has been carried out over the last few years by a methodical compilation, extensive analysis, and integration of applicable literature as a generally accepted review method (Aldieri et al., 2019). The emphasis was on the detection, clustering, and critical review of current debates on COVID-19, IoT as part of emerging technologies, SDGs, and integration in sustainability and digitalization. To get knowledge of the number and adequacy of publications available, numerous databases were investigated. Afterward, suitable publications and scholars were listed for further papers and citations, contributing to a refining of the screening. Due to the multidimensional existence of the disciplines examined, subject fields, embracing ICTs, ecological, communal, political, market insights and analysis, were not overly limited. To ensure validity, an initial analysis of the abstract/summary was done, after the papers were chosen. Reliability and validity have been properly checked based on parameters provided by Hart (2001) in this review of the literature.

IoT (Internet of Things)

A modern criterion alteration in the digital arena is the Internet of Things (IoT). The idea of IoT initially became very popular via the Auto-ID centre in 2003 and in related industry analyst literatures

(Madakam et al., 2015). Some have argued that Kevin Ashton first brainstormed the term Internet of Things in 1999 in the form of supply chain management (Gubbi et al., 2013). From the very beginning, the maturation of the Internet of Things begins, based on the form of object and the convenience of human capacity, there were several things or artefacts linked to the internet for the various applications through various technology. The idea of IoT focused on the combination of different processes such as recognition, sensing, networking, and computation is explained by Čolaković and Hadžialić (2018). It makes for large-scale technical advances and value-added services that personalize the engagement of consumers with different "things." In terms of 6 C's-Convergence, Content, Collections, Computation, Communication, and Connectivity, this allows artefacts a lot of versatility in the sense of smooth interconnection between people and items (Sundmaeker et al., 2010). Again, IoT is described by the Internet Architecture Board (IAB) (Tschofenig et al., 2015) as below—
"The word Internet of Things (IoT) denotes a trend where a large number of embedded devices employ communication services offered by the internet protocols. A number of these focused devices, often referred as "smart objects,'' are not directly controlled by humans but function as elements of building structures or vehicles, or are distributed out in the surroundings."

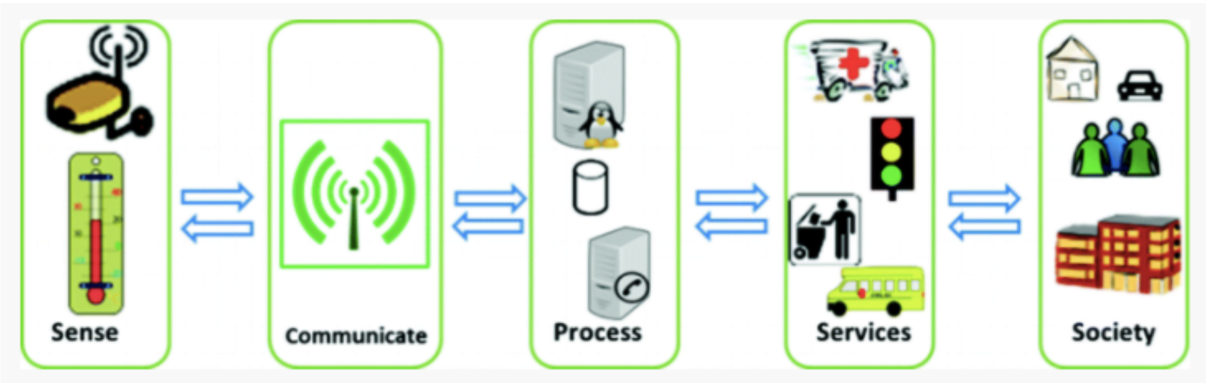

Figure-2: Basic understanding of IoT configuration

Here, in the debate on IoT matters, especially in debates between stakeholder segments or market categories, the disparate meanings may be a source of misunderstanding. The phrases 'Internet of Things' and 'IoT' apply generally to the application of network networking and computational capacities to structures, machines, sensors, and artefacts not usually known to be computers for the purposes of our article. In order to produce, share, and ingest data, such "intelligent or smart objects" need limited human interference; they also feature access to remote information storage, resolution, and management competence. IoT, however, takes Web 3.0 to a new level by allowing anyone and anything to enable seamless connectivity at any time and anywhere. By dynamically assembling various types of capabilities (sensing, networking, data processing, actuation, etc.) (Paganelli and Parlanti, 2012), it allows the development of new value-added services.

IoT will serve as a vital part of achieving greater and sustainable growth in the developing world (Hostettler et al., 2015; López-Vargas et al., 2020). The IoT has a huge capacity for human and economic development; it would be a failure to underestimate the ability of developed countries to have a much greater and more important impact (Rahim, 2017). For IoT creativity, these regions are ideal: the challenges facing the developed world will open up diverse and unexplored areas on which IoT can be applied. In addition to promoting economic growth, IoT also makes a big contribution to social, financial, and cultural progress (Barro et al., 2018). In recent years, IoT ventures, primarily in sub-Saharan Africa and southern Africa, have begun to be developed for their use in the developing world. Here, lack of resources implies that in a developed world context, simpler, more cost-effective solutions can prove more effective (Rose et al., 2015).

Challenges of IoT Adoption in Developing Regions

Infrastructure related to advanced technological adoption is often very weak or non-existent in developing countries (López-Vargas et al., 2020), and there is very little spending in government or private-sector research and development. One of the key considerations is to use easy, affordable technologies to achieve high IoT propagation in developing countries. With the emergence of IoT, multiple works have explored the expansion of this technology in the developed world with Rahim (2017), Hong et al., (2014), Miazi et al., (2016), and Rey-Moreno et al., (2016) by illustrating the obstacles for IoT to meet billions of people living in developing countries to boost sales growth and social progress.

Internet access is a primary problem when IoT has activated by authority (Mavromoustakis et al., 2016). Flawless and sufficient communication between any single thing is required by the Internet of Things. Fast internet speed, continuous power supply, stable contingency networks, and secure and flexible infrastructure are required to ensure seamless connectivity (Pham et al., 2016). The big challenge here is to install a hybrid backbone around the country that can be adequate to allow IoT in these countries to trade off with the problems and promote optimum usefulness for end-users. In addition, in developing regions, due to IoT networks requiring frequent servicing, upgrades, and feature checking, another major problem is the shortage of technically competent workers (Fuentes et al., 2018). In developed nations, on the other hand, data centers that are clustered and operate on extracted electricity can guarantee electricity quality and reliability. At this point, as electricity industries are among the most extreme in an economy, energy production is difficult. This adds to the extreme draining of financial wealth.

The lack of access to core banking resources for financial systems in developed countries is highly restricted (Barua, 2020; Rimer, 2017). Only if the developing world is prepared to embark on this technology at the same rate as scientists and technologists in the developed world and the financial problems related to these developments are resolved will the IoT potential become a possibility. This includes low procurement, maintenance, and financial sustainability costs. Again, Ivaşcu et al., (2016) argued that security and privacy were the two key barriers to IoT. The research by Babar et al., (2010) also notes that one of the main IoT problems is the protection of data and privacy. In large part, IoT devices are designed without security in mind. The lack of security controls would lead to a decline in consumer usage and is thus one of the motivating forces for the IoT's performance. In addition, several researchers have claimed that the IoT has been broadly uncontrolled thus far, taking into account government regulations (González-Zamar et al., 2020; Tzafestas, 2018; Weber, 2009). Here, a consistent regulatory structure could intensify and increase the opportunity for IoT growth. Among other factors, a vast number of IoT customers lack interest in IoT devices and prefer more regulatory controls to protect data access and usage. The Government of India has recently adopted policies and measures to simplify licensing and regulatory structures while maintaining sufficient security frameworks to harness IoT benefits in multiple sectors (Chatterjee and Kar, 2018). In addition, rural-urban disparities are another significant challenge, as there are large differences between rural and urban areas: 85% of poor people live in rural areas of developed countries (Alkire et al., 2014). These variations impact the IoT implementation infrastructure, such as telecommunication networks or the power grid.

Covid-19 and rise of IoT

During the COVID-19 pandemic, the cornerstones of personal and professional life soon become digital technologies (Islam and Wahab, 2020). Digital devices that are connected allow for both remote work and education. In addition, chatbots have immediate information that saves lives, partly relieving exhausted health systems (Leite et al., 2020). The IoT offers a website in this sense that helps public health authorities to access data for tracking the COVID-19 pandemic. The 'Worldometer' offers, for instance, a real-time report on the actual number of individuals reported to having COVID-19 globally, including regular new cases of the disease, spread of disease by countries, and seriousness of disease (Ting et al., 2020). Furthermore, IoT is a modern digital platform that guarantees the quarantine of all sick people due to this virus. During quarantine, a good surveillance system is useful. Using the Internet-based network, all high-risk patients are tracked easily. For biometric measures such as blood pressure, heartbeat, and glucose levels, this procedure is used (Mohammed et al., 2020; Vaishya et al., 2020). The use of the IoT definition makes it very useful for people to be able to access them and ultimately helps provide them with vital treatment so that they can get out of this illness.

In fact, IoT is a revolutionary technology platform to tackle the COVID-19 pandemic and during the lockdown, scenario will face major challenges. This technology is helpful in collecting the infected patient's real-time data and other required information (Ting et al., 2020). Instead of flesh-and-blood spooks, many policymakers or authorities today rely on pervasive instruments (sensors) and efficient algorithms. Several governments have adopted these new security instruments in the fight against COVID-19 (Rahman et al., 2020). The Indian Government has therefore offered a mobile app called ArogyaSetu to address and make civilians more conscious of the pandemic, aimed at creating a connexion between the significant possible health care facilities (Singh et al., 2020). On the other hand, IoT-based digital financial resources allow governments to provide fast and stable financial assistance to 'hard-to-reach' individuals and companies during the COVID-19 lockdowns, as seen in Namibia, Peru, Zambia, and Uganda. This will continue to mitigate the economic fallout and strengthen recovery theoretically (IMFBlog, 2020). We, the authors of this paper, assume that IoT networks, sensors, and applications activated by COVID-19 will contribute significantly to understanding not only global, state, or jurisdictional consequences, but the fiscal, mobility, social and environmental micro-level impacts of this crisis. According to Wells et al., (2020), the COVID-19 pandemic has contributed to a global socio-technical catastrophe with several potential future outcomes. It is undermining traditional practices worldwide, quickly and pervasively (Huynh, 2020), and is rapidly evolving as a case of catalytic and meta-transition that threatens and reshapes the authority and usefulness of established legislative and monetary systems (Sendak et al., 2020, Woodside, 2020). Future market practices and environmental burdens will be redefined by these socio-technical adjustments (Islam and Wahab, 2020; Kanda and Kivimaa, 2020).

IoT and Sustainable Development Goals (SDGs) in Developing Regions

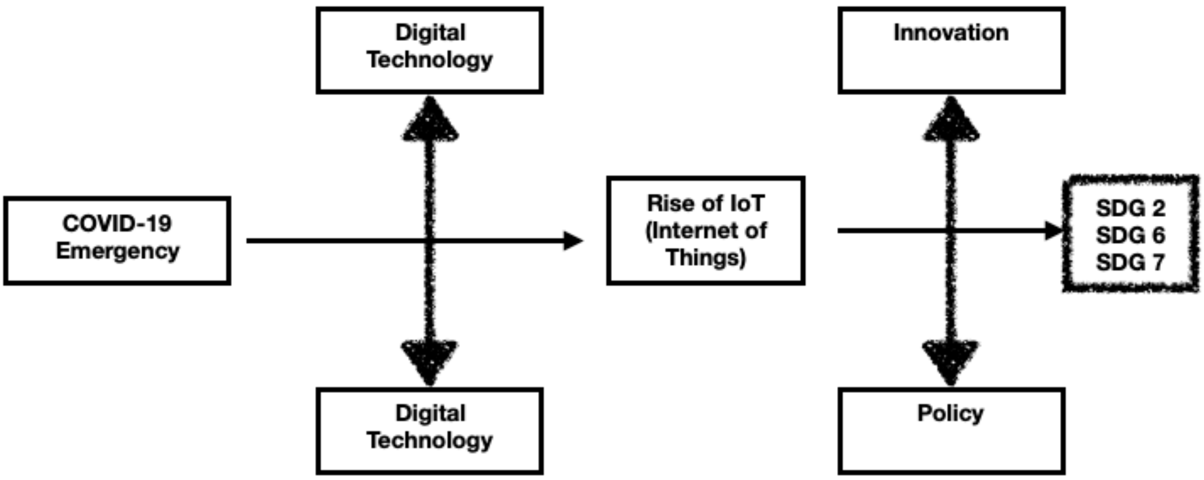

Figure-3: Conceptualization of IoT focused achievement of SDGs

In 2015, in its resolution 70/1, the UN General Conference laid out the SDGs with 2030 as its target year (del Río Castro et al., 2020). With the engagement of society, including universities, governments, and the private sector, these priorities have been established (WHO, 2015). It encompasses three main dimensions of sustainable community development (such as environmental protection, communal divergence and inclusion, and monetary development). To attain the goal of sustainable community development, the SDGs have become the universally agreed standard method and have been adopted. In order to maximize sustainable outline and social effects, these priorities are essential in the entire idea of IoT (Cousin et al., 2018). The IoT production caused by COVID-19 has the ability to tackle some of the most urgent human, economic, and environmental needs. It may also contribute directly to achieving the goals of the SDGs: the evolving IoT paradigm has the ability to create an accessible, efficient and safe environment using connected devices to manage the big global challenges facing it and future generations.

The IoT outline has the important capacity to make significant advances in development and human life in the developed and developing countries (Nonnecke et al., 2016). IoT networks with the interconnection of "things" have become easier to form considering the coverage of wireless networks in developing areas. Although in the diplomatic fallout of COVID-19, the UN Sustainable Development Goals (SDGs) have been severely illustrated. Before the pandemic, they were important; now they are integral. In the decline since the pandemic, hunger, thirst, and energy demands have only become even more pronounced (Chen et al., 2020; Dincer, 2020). Steps must be taken, and in the face of unpredictable recovery, connected devices and multi-use sensors provide a way to accomplish these efforts. Recent IoT growth, when applied carefully and conscientiously, offers an opportunity to change the destiny of billions for the better in developing regions.

Ending malnutrition, achieving food stability, and improving nutritional awareness are significant social hurdles that the latest pandemic has just brought into relief (Béné, 2020). If left unregulated, global farming would require more space and more mouths to eat. The UN is also calling for organic agriculture in an attempt over the next decade to produce greater amounts of food of better quality. At this point, smart farming is a step towards making this a possibility, supported by the power of the IoT. IoT-based smart farming is anticipated to produce two significant improvements in food production practices and data-based automation. New farming technologies would make farms more productive and automate the production cycle of crops or animals, hopefully leading to more food for the ever-growing population in developing regions at cheaper prices. In addition, if SDG 2 is to be fulfilled, our production of food would also need to be: inclusive, safe, effective, and nutritious. For ICT innovations such as IoT, the challenge is to ensure the participation of participants in food systems (economic and social, large and small, women and youth), reduce adverse environmental impacts, and deliver abundant nutritious and balanced foods (Walshe et al., 2020).

Entry to clean water and sanitation is still inadequate for billions of people, despite some improvement. As safe water and sanitation services, current disparities in access to the essential necessities of life produce layered vulnerabilities to COVID-19 and can make the preventive steps inadequate or actually counterproductive (Ekumah et al., 2020). In order to investigate how new technology can assist with water and sanitation problems, stakeholder groups are converging (Walshe et al., 2020). In this context, in combination with Big Data Analytics (BDA), IoT sensors can provide efficiencies not only in agriculture but also in sewerage network monitoring through automation and remote monitoring, so that waste is properly disposed of. In the sense of SDG 6, new innovations such as IoT will equitably provide water and sanitation to all in developing countries.

In the general shift away from fossil fuels, wind, solar, hydropower, geothermal power, and biomass resources are increasing and connected devices drive performance and automation in this transition (Armin Razmjoo et al., 2020). IoT integrates both power generation and consumption components, increases process visibility, and provides real control at any phase of the energy flow (Al-Ali, 2016). For advanced storage and analysis, sensors and connected devices enable businesses to access real-time energy data and send it to the power grid. When it comes to producing renewable energy, automation is especially critical. Meanwhile, due to recent perspectives on voltage modulation, load switching, and network tuning, improved load handling is possible. For example, in the wind or solar, IoT devices may help detect the most desirable energy production conditions and adjust the path of turbines or panels automatically. The use of devices and their data to track and effectively run these power generators makes it possible to increase power output and minimize running costs for optimum performance. Via smart monitoring and management of green energy production plants and smart manufacturing using circular economy goals, innovative technologies such as IoT help initiatives to achieve SDG 7 (Kulkarni and Mathew, 2019).

Systemizing a Preliminary Policy

It will be sufficient to include the social principles pertaining to COVID-19 biology, evolution, drug/vaccine technologies, or other disease-related uncertainties in the case of the COVID-19 influenced digitalization strategy configuration (Özdemir et al., 2020). So far, we have called for the participation of the public in collaborative decision making on the future of IoT-based technologies. It will therefore be necessary to foster enduring combination, adjustment, and multidisciplinary cooperation across SD protocols and tactics (Biermann et al., 2017; Krishnan et al., 2020; Leal-Filho et al., 2019; Saner et al., 2019), digital alteration

(Pappas et al., 2018; Vial, 2019) and innovation in order to accelerate the SDGs in emerging regions (El Hilali and Manouar, 2019), via various motivations and policy support. The reinforcement will be carried out in all sizes (Vazquez-Brust et al., 2020), through developing regions (Salvia et al., 2019), and at all levels, focused on provisional benchmarks for a situation-savvy appraisal (Dickens et al., 2020; ElMassah and Mohieldin, 2020). In comparison, a whole-of-society approach will promote this framing, unsealing the commitment of community and industry to the objectives. Matter of fact, public awareness, community interest, ownership, and people-centered metrics are crucial and must be strengthened by legislation (Bain et al., 2019) and further leveraged through the bottom-up government. At this point, the pandemic offers openings for policy outlines to accelerate integration in the midst of ecological, social, and digital change.

Theoretical Contribution and Practical Implication

Our research serves theory and practical consequences. In view of the outcomes, we argue that attaining the SDGs would entail fundamental policy changes led by science and technology and close integration of the fields of SD, technical advancement, and digitalization. The present study tries learning to IoT growth caused by the crisis for researchers to achieve SDGs in emerging regions. The real need for IoT in the sense of sustainability is addressed by the systemic study. Indeed, the COVID-19 pandemic would have a short, mid, and long-term effect on different facets of community and enterprises. It has been an early effort in the area of digital change and sustainability to obtain brainstorming judgement into the conceptual framework of the COVID-19 study. Furthermore, the Quadruple-Helix Innovation Model (QHIM) is a concept that binds government, academia, business, and society together to foster digital IoT-based innovation that leads to SDG achievements through value reconfiguration (Adi, 2017; Cunningham and Whalley, 2020). At this point, our analysis provides insights into regulation, infrastructural expenditure and capability, social knowledge and acceptance, and the creation of market environments to restructure the outline of QHIM considering the emergency scenario (COVID-19 pandemic). It also encourages more study and dialogue between science and policy on the bright nexus between SDGs and digitalization process.

The findings also act as a realistic roadmap for applying IoT technologies to emerging countries' needs through the incorporation of open source technologies and modern business models to work together to achieve the SDGs. This conceptualization would also have a positive effect on people's everyday lives, but the changes it will bring are largely gradual and not drastic changes. In addition, more jobs and simpler working practices could be created instead of reducing work opportunities (Shenkoya and Dae-Woo, 2019). Consequently, the activities of IoT technologies and security standards growth are outlined (Hwang and Kim, 2017). We provide practical scenarios for policymakers to consider that new technologies such as IoT have a significant role to play in the sustainability phase of our world and our societies and our people after a pandemic. Here, to ensure that IoT solutions lead to SDGs, the position of public policy and private investment will be important (Renda and Laurer, 2020).

Final Thoughts, Recommendations and Limitations

Indeed, the global crisis caused by COVID-19 means that it is now more necessary than it was before to pursue and enforce the SDGs. The momentum produced by the pandemic will, in doing so, lead to a shift from what is actually called a global threat to a global opportunity. In this paper, we proposed a thorough systemic analysis to guide the achievement of IoT-focused SDGs in developed countries, taking into account the Covid-19 emergency's ripple effect. Throughout the conceptualization, sustainable development and the interaction between emerging technologies is explored extensively. The introduction of emerging technology, such as the Internet of Things (IoT), would be a driving force for a fundamental transition. To guide this shift in a direction that supports the SDGs, new policies and initiatives will be necessary. In this respect, we promote an excellent opportunity for humanity to establish a liable and equitable digital transition, leading to the fulfillments of SDGs in developing regions. Digital paradigms are called SD's enablers (Fernandez-Portillo et al., 2019), as they may facilitate HR development, boost customization, and replan the business outlines for both concerned investors and customers (ElMassah and Mohieldin, 2020; Holst et al., 2017), change habits and allow circular form of economic configuration (Berg and Wilts, 2019).

Taking all of this into consideration, it becomes apparent that advanced digital technology poses a challenging puzzle for the SDGs: emerging developments could exacerbate inequality and create negative externalities; while, at the same time, they may be critical for the SDGs to be accomplished. How to ensure that technological progress is harnessed and mitigate its counterproductive consequences for the good of sustainable development? Therefore, collaboration and the use of the 'collective intelligence' of society would be necessary, engaging both stakeholders and people from the first stage. In addition, we find that IoT technologies or technology-enabled capabilities do not address all the problems of SDGs. Any barriers are systemic and, outside technology, should be figured out. Further direct steps are needed to change the playing ground and can be driven by ethical and equitable legislation, regulatory outlines, and financial enablers. It is important that developed countries identify creative policy frameworks in a cost-effective way to meet growth and growth goals. This includes finding affordable measures that will put together immediate gains in many SDGs, rather than compromising those targets in order to reach others and aligning economic conditions for sustainable growth in the longer term.

Limitations As well as the advancement of digitalization by COVID-19, both the SDGs embody nascent and multidisciplinary fields of science in which empirical literature has not been produced at the same speed as the phenomenon under review. The literature, however, poses an immature, fractured terrain of numerous conflicts and unexplored problems. However, no proof is gathered to generalize to other countries or regions, since this is a conceptual research article. Also, generalization is not sufficient for the application. In addition, the position of COVID-19 for the achievement of SDGs can theoretically be evaluated through future research activities via the inclusion of AI or Big-data Analytics (BDA) elements.

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