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# Developing Countries' Continuance Usage of E-services after Covid-19 in the 4IR Era

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**Abstract**

The Corona virus (Covid-19) pandemic highlighted the need for many enterprises to digitize their services leading to a good number of the world's population moving into the online realm to minimize the virus spread. However the use of e-services has been slow in many developing countries as compared to the developed nations hence it is not clear whether this e-services usage will continue after the Covid-19 pandemic. This study sought to develop a model for the unprecedented and unforeseen growth continuance usage of e-services after the Covid-19 pandemic coupled with the exponential growth of 4IR. Data for the study was collected from the South African revenue services (SARs) customers that use e-filling and was analyzed quantitatively. The model was validated by the use of confirmatory factor analysis and structural equation modelling. Results indicated that perceived usefulness and exerted pressure are good antecedents of continuance usage of e-services. More so, the 4IR path indicated that the future will have to embrace telecommuting that will require upskilling therefore, governments and businesses should consider extending benefits and protections to independent workers and to all other employees needing to develop their skills and knowledge mid-career. This study contributes theoretically to the literature of continuance usage of technology, e-services and in the explanation of the shift from simple digitization to innovative use of combined technologies that are changing the way organization do their businesses. The study recommends that, future research should include the analysis of moderating factors as such will assist in equipping skills and expertise to citizens needed for e-services effective usage. More still, future research should also consider the triangulation of methods to have a more understanding of users perception towards mandatory usage of e-services.

**Keywords:** Fourth industrial revolution, E-services usage, digital transformation, technology use during Covid-19 era, continuance usage of technology

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# 1 Introduction

The fourth industrial revolution (4IR) caused disruptions in almost every industry in both developed and developing countries. The breadth and depth of 4IR changes foreshadowed the transformation of production, management, and governance of all activities Worldwide. The advent of the Fourth Industrial Revolution (4IR) has changed people's daily lives and has reshaped the way government and non-government sectors do business be in education, healthcare or commerce. This increasing leverage on information technology (IT) has given birth to the use of electronic services (e-services) that has exponentially expanded the provision of services and products. The increasing convergence of e-service platforms has enabled citizens to remain in contact with governments and other business entities regardless of geographical location and beyond time limits. This increasing use of e-services was heightened by the wide spread of Covid-19 pandemic that saw many organizations closing abruptly and remained to provide products and services virtually (Vargo et al., 2021). Electronic services became the centre of every organizations as each entity tried its best to reduce face to face contacts and increase social distancing. Citizens on the other hand, remained with no choice apart from joining the virtual environment.

Electronic service (e-service) can broadly be defined as services provided via the internet with the most dominant application areas being e-business and e-government (Kvasnicova et al., 2016). According to Taherdoost et al. (2015), e-services embrace e-commerce transaction services such as online buying and selling of products and services, application hosting by service providers as well as processing capabilities done on the Web. They further indicated that, e-services may also be looked at from its characteristics that include but not limited to process nature, self-service, homogeneity, intangibility, inseparability, inter action, non-ownership, and non-rival. Both government and businesses worldwide have been developing smarter online services for citizens so as to improve service delivery by providing just on-time solutions through online transactions. Much as this has been so, the use of e-service optimally in many developing countries especially those in Africa has hardly reached the stage of integration (Bakunzibake et al., 2019 ). This has been a centre of research for many years calling for an attention to balance social and technical factors in developing countries to improve e-service usage.

The fall of 2019, saw the advent of the Covid-19 pandemic crisis that led to many businesses to come to a standstill. However, for the sake of business continuity and service delivery organizations revisited their digitization strategies and intensified the campaign of using e-services (Vargo et al., 2021). This intensified use of e-services saw governments and businesses including those in developing countries where the use of e-services has been low to start building online portals and mobile apps, using social media and relying on instant messaging. In South Africa for example, government departments, parastatals and higher institutions of learning closed most of their branches and depended mainly on electronic means to register new businesses, file tax returns and court applications, renewing driving licenses and in offering classes to learners using blended learning (Al-Samarrai et al., 2020; Sirimanne, 2021).

Since the Covid-19 pandemic was abrupt and the use of e-services in many organizations was mandatory for survival, this leaves a big question of the sustainability of continuance usage of e-services after the Covid-19 era even in the awake of the 4IR. According to Venkatesh et al. (2003); Kalema et al. (2014) in mandatory usage users may use technology as there might not be another option but such usage may fade away as the crisis decreases. They argue that some factors like exerted pressure due to customers' demands, competitiveness and economic survival may influence usage at the peak of the crisis like in the case of Covid-19 but such cease to be significant with time and might negatively impact on continuance usage. Nevertheless, with the increasing digital transformation and 4IR, mandatory usage could later change into voluntary use, if the benefits of the technology become clear and other factors like competitive advantages become salient (Mkansi & Landman, 2021). Though Azizi et al. (2020) argue that jumping into the technology implementation and use bandwagon may hinder the

transformation of technology from mandatory to voluntary usage. Hence this calls for adequate address of all factors needed to inform continuance usage in order to sustain e-services continuance usage after Covid-19 pandemic.

This study therefore sought to develop a model for continuance usage of e-services after the Covid-19 pandemic era. The study used the South African Revenue Services e-filing system as a case for data collection to evaluate the model for continuance usage of e-services. According to the South African Government News Agency (2020), when Covid-19 pandemic struck South Africa, the South African Revenue Service (SARS) closed most of its branches and urged taxpayers to remain compliant by making use of its online services. In the effort to support social distancing measures, the tax collecting body redesigned its website to include the online appointment system that enabled taxpayers and practitioners to make appointments so that the tax body could solve their problems either through telephone or video interaction or go to office for issues that required face –to-face interaction.

# 2 Theoretical Perspectives of E-services Continuance Usage

The implementation of e-government service-oriented initiatives is a continuous process that requires change of activities, way of doing things and human behaviour. More so, this also requires the organization in which the technological innovation is implemented to go through an institutional transformation process that leads to total organizational change. Bakunzibake et al. (2019) allude that, the organization that goes through this transformation is seen as a socio-technical system and such is comprised of two sub-systems namely social and technical subsystem. They indicate that the technical sub-system relates to the tasks, processes, and the technology needed to transform inputs to outputs whereas the social sub-system deals with the individuals' characteristics, perceptions, relationships and anxiety that leads them to use the implemented technology. As Kwon and Zmud (1987) noted, understanding these socio-technical systems has been the core of research of technology acceptance, adoption and use that led to the many fragmented models trying to explain influencing factors of these aspects.

Researchers such as Venkatesh et al. (2003); Kalema et al. (2014) and Tarhini et al. (2015) who carried out comprehensive critical review of factors influencing acceptance and use of technological innovations concur that many factors of use ceases to be significant for continuance usage. These arguments are in support of previous researchers such as Oliver (1980); Bhattacherjee (2001) who alluded that customer's post-participation behaviour leading to satisfaction or dissatisfaction after a technological innovation adoption and use, are paramount for continuance usage. Additionally, Bhattacherjee (2001); Rahi and Ghani (2019) indicate that post-participation affections are as a result of cognitive appraisal of disconfirmations of need expectations and is essential for customers' decisions of whether to continue or discontinue using a technological innovation.

According to Rahi and Ghani (2019), continuance use of technology is more to do with post-acceptance and post-consumption expectation factors as explained in the Expectation Confirmation Theory (ECT) Bhattacherjee (2001) and in the Self-Determination Theory (SDT) Ryan and Deci (2000). Both theories ECT and SDT indicate that for individual to continue performing given tasks, they need to have had their behaviour reinforced with rewards, satisfied or enjoyed the act of doing. This also implies that change in ex-post expectations is highly influenced by perceived usefulness rather than perceived performance unless perceived performance resulted in satisfaction and confirmation. Additionally, Rahi and Ghani (2019) further indicate that, playfulness and word of mouth are other good antecedents of intention to reuse or continue to use a technological innovation. These factors can be boosted by other external factors such as exerted pressure, customers' increased demands, competitiveness, cognitive closure and time monitoring and deadlines as well as moderating factors such as enjoyment, habit, experience and skills (Bhattacherjee, 2000; Rahi & Ghani, 2019).

Holistically, the e-services usage during the Covid-19 pandemic can be synthesized into four aspects namely; technology characteristics, users' characteristics and perceptions towards technology, activities that needed to be accomplished, and effects that rose from external factors. By the fact that developing countries have been facing a challenge of scarcity of resources, sustainability of e-services usage so as to provide services with accountability, transparency and efficiency may become over constrained after the Covid-19 pandemic when the pressure to work from home has been relieved. In their systematic review of 15 years literature ranging from 2000 to 2014, Shaikh and Karjaluoto (2015) found no study explaining users' continuous behavior to use technology in non-mandatory usage. Other researchers Rahi and Ghani (2019) echoed the same concern that, there are limited studies that have investigated the factors influencing continuance usage of e-services. They further alluded to the need more research that could develop an apposite model to bridge this gap.

This paper developed a model for e-services continuance usage by leveraging the Expectation Confirmation Theory (ECT) Bhattacherjee (2001) and the Self-Determination Theory (SDT) Ryan and Deci (2000) as the underpinning theories. In addition, exerted pressure was introduced to signify the mandatory usage of technology as well as the continuance intention to behavior that elicits the actual continuance usage. The model design also considered the use of moderating factors of habit, experience, skill and enjoyment. The conceptual model is as demonstrated in Figure 1.

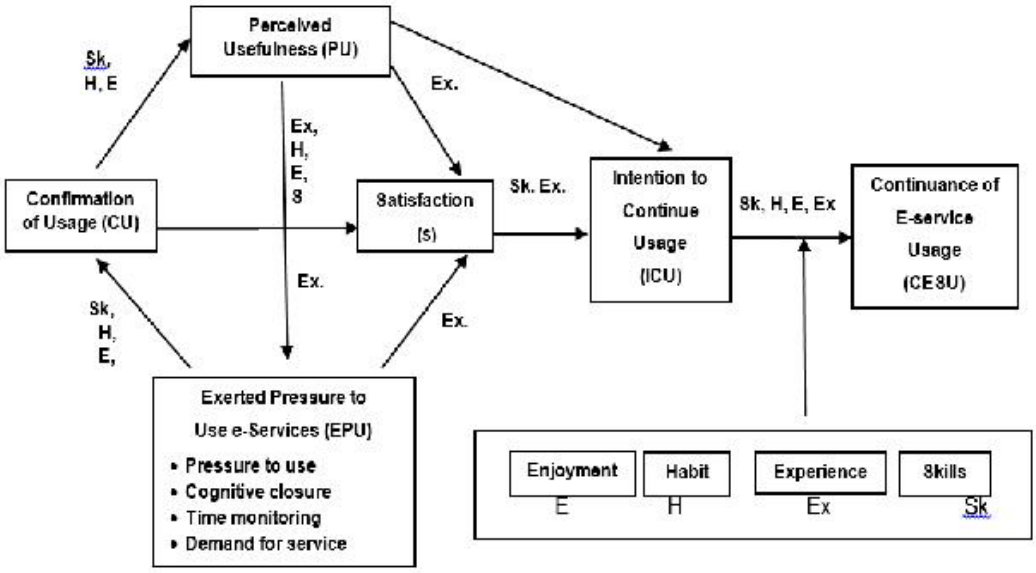


**Figure 1:** The conceptual model

## 2.1 Operationalization of the Constructs

Based on the constructs of the conceptual model, relationships were hypothesized.

Confirmation of use refers to a situation whereby users approve and consent of using the technology either after being satisfied, found usefulness or being pressurized to use the technology. From this understanding three hypotheses namely H1, H2 and H3 were derived.

H1: Exerted pressure to use e-services influence confirmation for continuance usage
H2: Satisfaction of e-services influence confirmation for continuance usage
H3: Perceived usefulness influence confirmation for continuance usage

Exerted pressure refers to sources of stress when users want to meet deadlines in accomplishing their tasks. During Covid-19 peak many organizations abruptly closed and remained to work virtually leaving employees and customers with no other option but to use e-services. From this construct, the forth and fifth hypotheses were derived.

H4: Exerted pressure to use e-services influence satisfaction for its continuance usage
H5: Exerted pressure to use e-services influence perceived usefulness for its continuance usage

Perceived usefulness also known as performance expectancy could be looked at as the users salient beliefs that using e-services will enhance their job performance or completion of tasks. From this construct H6 and H7 were derived.

H6: Perceived usefulness of e-services influence satisfaction for its continuance usage
H7: Users' perceived usefulness of e-services influences their intention for continuance usage

On the other hand, satisfaction refers to the judgment that a service provided a pleasurable level of consumption-related fulfilment by meeting the desired needs of the user. From this construct, the eighth hypothesis (H8) was theorized.

H8: Satisfaction influences intention for continuance usage of e-services

The last independent construct used in the conceptual model is the intention to use e-services. Intention to use refers to the users' option or choice for continuing using the technology after getting satisfied that it will help them when doing their work. From this understanding hypothesis H9 was developed.

H9: Intention for continuance usage influences actual usage of e-services

# 3 Methodology

The population for this study was the people using SARs e-filling system. By the fact that all government and established private entities' employees in South Africa mandatorily do file for tax returns, the population of the study was therefore employees in government departments and parastatals in Tshwane municipality, Gauteng province. Statistically the number of employees who were falling along this category were 4000 to 5000. Hence, by using the Krejcie and Morgan (1970) tool to determine the sample size (s) for finite population the sample size for the study remained 350 to 380 participants. Due to Covid-19 restrictions of movement, the study leveraged the online questionnaires uploaded on survey monkey for data collection. Organizations for data collections were purposively selected based on available contacts in that organizations and the participants were randomly selected.

Participants were only sent a link that could lead them to the questionnaire. Overall, 450 links were sent out to the probable participants and of these 366 were answered and returned making a response rate of 81.3%. Out of the answered questionnaires, 354 were usable as the rest had incomplete data and were discarded. After capturing all the answered questionnaires, the filled survey monkey forms were exported to the Statistical package for Social Scientists (SPSS vs 25) for data analysis. Structural Equation Modeling (SEM) was employed for data analysis and testing of the hypothesis.

Before analysis the constructs as demonstrated in Figure 1 were coded as follows; exerted pressure to use e-services (EPU), cognitive closure (CC), time monitoring and deadlines (TMD), demand for service delivery (DSD), satisfaction (S), confirmation of use (CU), perceived usefulness (PU), intention for continuance usage (ICU), and the continuance e-service usage (CESU).

# 4 Analysis and Presentation of Results

This section presents the findings of the study.

## 4.1 Descriptive Analysis

Descriptive analysis was used to indicate how respondents answered the questions relating to e-filing continuance usage after COVID-19. Results are as demonstrated in Table 1. The range values represents how far the respondents' answers vary from the mean and from the results, the range statistics gave an indication of the possible existence of outliers in the dataset. On the other hand, a high standard deviation shows a high diversion from the mean whereas a low standard deviation shows the closeness to the mean.

| | Range | Minimum | Maximum | Mean | | Std. Deviation | Variance |
|---|---|---|---|---|---|---|---|
| | Statistic | Statistic | Statistic | Statistic | Std. Error | Statistic | Statistic |
| EPU | 3.40 | 1.60 | 5.00 | 2.790 | .045 | .847 | .717 |
| CC | 3.80 | 1.20 | 5.00 | 2.503 | .047 | .893 | .798 |
| TMD | 3.25 | 1.75 | 5.00 | 2.918 | .037 | .693 | .480 |
| DSD | 3.60 | 1.40 | 5.00 | 2.369 | .046 | .857 | .735 |
| S | 3.20 | 1.80 | 5.00 | 3.257 | .026 | .482 | .232 |
| CU | 3.10 | 1.60 | 5.00 | 2.277 | .039 | .711 | .553 |
| PU | 3.00 | 2.00 | 5.00 | 3.203 | .019 | .376 | .141 |
| ICU | 3.40 | 1.60 | 5.00 | 2.698 | .040 | .756 | .571 |
| CESU | 2.80 | 2.20 | 5.00 | 3.199 | .018 | .347 | .121 |
| Valid N (listwise) | | | | | | | |

**Table 1:** Descriptive statistics : The central tendency and Distribution of the dataset for each construct

As demonstrated in Table 1, satisfaction of users (S) has the highest mean value of 3.257 and a relatively low standard deviation of .482 whereas the demand for services had the lowest mean value of 2.369 and a higher standard deviation of .857. These findings are agreement with those of researchers (Bhattacherjee, 2001; Rahi & Ghani, 2019) who noted that users will continue to use a technological innovation if they are satisfied with its performance. In this case it implies for users to find e-services as useful, they have to be satisfied with the nature of the services provided. These are also demonstrated graphically by a box whisker plot as illustrated by Figure 2.

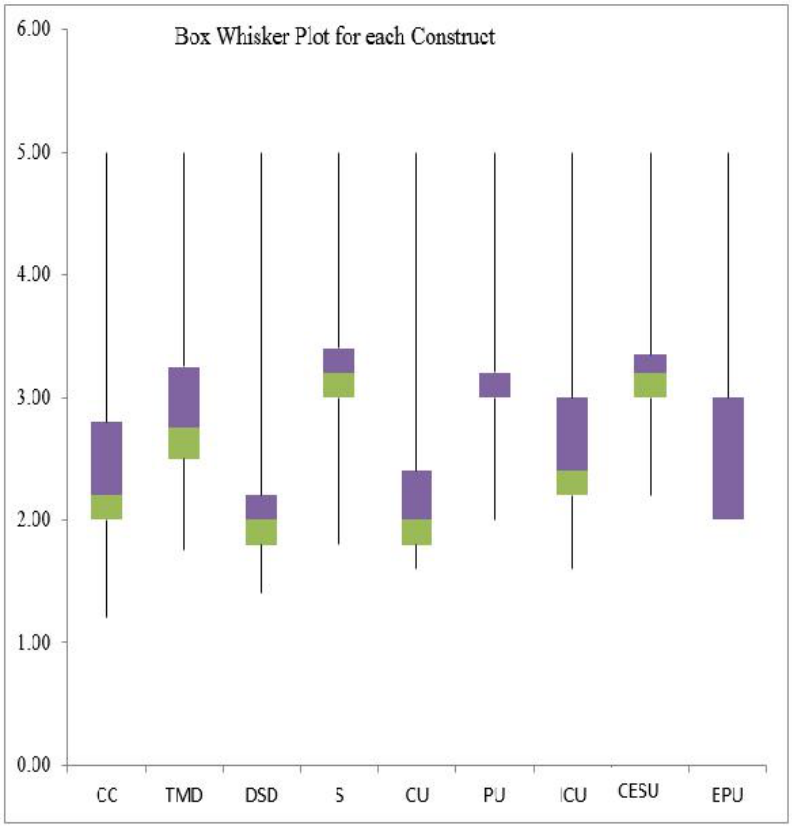


**Figure 2:** Box Whisker plot for the constructs

The boxes of the whisker plots signifies the perceptions of the participants. As demonstrated in Figure 2, taller boxes like in the case of plots for CC, TMD, ICU and EPU implies that participants had varying perceptions and opinions about e-services continuance usage when measure on these parameters against cognitive closure (CC), time monitoring and deadlines (TMD), intention to continue use e-services (ICU) and exerted pressure to use e-services (EPU). On the other hand, constructs DSD, S, PU and CESU shows relatively short box whisker plots which implies that participants had a good level of agreement on the asked questions about continuance usage of e-service.

## 4.2 Structural Equation Modelling

Structural equation modelling (SEM) and confirmatory factor analysis (CFA) were used to test the model's fitness to the data. Fit indices including chi square ($\chi 2$), comparative fit index (CFI), Root mean square error of approximation (RMSEA), and goodness of fit index (GFI) were used for model modification before the final structural model was deduced from the measurement model to test the hypotheses. The testing of the hypotheses is as illustrated in Table 2 which indicates that of the nine tested hypotheses, seven were accepted while the two were rejected.

| Hypothesis | | Path | | Estimate | S.E. | C.R. | P | Comment |
|---|---|---|---|---|---|---|---|---|
| H1 | CU | < ---- | EPU | .668 | .080 | 8.395 | *** | Hypothesis Accepted |
| H2 | PU | < ---- | CU | .312 | .107 | 2.914 | .004 | Hypothesis Accepted |
| H3 | S | < ---- | CU | -.074 | .052 | -1.416 | .157 | Hypothesis Rejected |
| H4 | EPU | < ---- | PU | 1.183 | .436 | 2.710 | .007 | Hypothesis Accepted |
| H5 | S | < ---- | EPU | .086 | .054 | 1.585 | .113 | Hypothesis Rejected |
| H6 | S | < ---- | PU | .099 | .061 | 3.637 | .002 | Hypothesis Accepted |
| H7 | ICU | < ---- | PU | .182 | .260 | 1.987 | .045 | Hypothesis Accepted |
| H8 | ICU | < ---- | S | 1.530 | 1.499 | 2.021 | .030 | Hypothesis Accepted |
| H9 | CESU | < ---- | ICU | .240 | .044 | 5.484 | *** | Hypothesis Accepted |

**Table 2:** Extracted summary of the standardized significance levels of constructs

From the results demonstrated in Table 2 those relationships whose critical ration CR is greater or equal to ± 1.96 have their hypotheses (H1, H2, H4, H6, H7, H8, and H9) accepted. On the other hand, H3 and H5 were rejected. Among the accepted hypotheses, the influence of exerted pressure to use e-services on confirmation of use was found to be the most significant with a critical ratio of 8.395 followed by that of intention to continue usage of e-services with a critical ration of 5.484. As also indicated by previous researchers Bhattacherjee (2001); Rahi and Ghani (2019) perceived usefulness leads to satisfaction.

# 5 Discussion and Conclusions

The Covid-19 crisis accelerated the use of e-services in both public and private enterprises implying for continuance usage of e-services employees from both sectors need to be kept abreast with the changes. The pandemic renewed and anchored the role of e-government as at the height of the pandemic, organizations reduced the number of their employees and argued their customers to use solutions with limited or no human interaction. By so doing both the organizations and their customers stretched to use the digital services amidst all challenges though at the safety of their homes. Organizations on the other hand, continued to operate in spite of contact restrictions and other confinement measures. This study sought to answer the question whether this stretch of use of e-services will continue after the end of the Covid-19 pandemic and if so how best can organizations be prepared and how can they be guided to equip their employees with the needed skills for their betterment and to those of their nations. The developed model for e-services continuance usage will act as a guideline for organizations and their employees on the continuance usage of e-services after the Covid-19 pandemic.

The onset of Covid-19 pandemic triggered a global political, economic and social re-calibration with many organizations worldwide opting to retain employees through online work for critical activities. The pandemic also triggered a need to decongest the work spaces. The reality across organizations and industries is for innovative ways of working remotely, outside traditional workspaces for their customers to receive products and services online. The need for e-services usage has been accelerated and the trend is more likely to continue rather than taking the return curve. The pandemic may cease to cause potential medical threats with time but the increasing changes in technology leading to the 4IR may still keep the technology usage bar high. The combination of these two phenomena will come with social and economic disruptions including loss of jobs especially the repetitive and non-skilled ones, collapse of businesses that may fail to cope up with changes, poverty and diseases, illnesses and starvation for those whose jobs will be replaced and/or considered to be non-essential, fear in the

population, decongestion and death, among others. Much as some organizations will boost from these changes due to reduced overheads, they are at the same time obliged to prepare their employees for these eventualities as unemployment and/or underemployment are considered to be among the major antecedents of poverty, inequality, high crime rates as well as political instability. This implies that the leverage of this study's model for continuance usage of e-services and other technologies is paramount for the 4IR preparedness that is expected "disrupt" markets, particularly labor.

## 5.1 Contribution of the Study

As alluded by researchers Rahi and Ghani (2019); Shaikh and Karjaluoto (2015) fewer studies have been conducted to inform continuance usage of e-services. This study is a step forward towards the contribution to the scarce literature of continuance usage of not only e-services but for all other technological innovations. Future researchers will replicate the model developed by this study to extend research of continuance usage. By so doing, this study will be making a significant theoretical contribution to the computing body of knowledge.

Worldwide the Covid-19 pandemic brought a sudden shift away from face-face-face interaction while conducting business and providing services including in the education domain. The fact is that many countries and organizations were not ready for this shift and the point to wonder is whether this dramatic adoption and use of e-services will continue to persist post-pandemic without causing digital divides among individuals, organizations and countries. This implies that, those governments and organizations that are ready to sustain this drive will need to leverage better models like the one developed in this study to ensure continuance usage. By leveraging this model, this study will be making a significant practical contribution to practice and management towards the use of technological innovations.

## 5.2 Recommendations

Many developing countries are faced with a challenge of poor infrastructure, in addition to lacks unreliable slow and intermittent internet. E-services usage requires faster internet especially for those organizations that use oracle-based databases. Slowness of the internet may frustrate users and hinders the smooth continuance usage. Hence, government has to support the citizens by setting up good infrastructure and reliable networks.

The advent of Covid-19 and the evolution of the 4IR has changed mankind in respect to what they do and how they do them including the time they will devote to work and leisure. This implies that employees at work will have to equip themselves with new skills in order to cope with new innovations. Governments and other private enterprises need support skills development in order to prepare for these new paradigms of work and to cope up with the disruption and uncertainty caused by the need to decongest work spaces, support business continuity and afford continuance of e-services usage.

Covid-19 pandemic and like any other major world events could mark an inflection point for rapid innovation in technology. Such could propel faster adoption of automation and AI brought up by the 4IR especially in work domains with high physical proximity. This implies that knowledge dissemination within and across countries as well as among communities is paramount in order to reduce the digital divide. Hence, future research should therefore include the analysis of moderating factors suggested by this study as such will assist in equipping skills and expertise to citizens needed for effective usage. More so, moderating effects are essential for determining effective usage especially with change in time.

Another point to note is that this study only used online survey questionnaires to collect quantitative dat. For ease of analysis this method eliminated unstructured questions where respondents could get a

chance to expound on their answers or explain their feeling and perceptions of the mandatory usage of e-services. This study therefore recommends that, future research should triangulate the methods and allow the use of qualitative questions to allow users a chance to explain their feeling towards the abrupt mandatory use of e-services .

Much as it is anticipated that a time will come when Covid-19 will be no more but the 4IR is here to stay and probably lead the world to higher level revolutions. This implies that government and policymakers need to support businesses by expanding and enhancing the digital infrastructure. Anecdote, even in advanced economies, a good number of citizens especially those in rural settings lack access to the internet. The 4IR path indicates that the future will have to embrace telecommuting that will require upskilling. This implies that there is a projected high growth in the share of working age population and such presents major policy and social challenges as the demand for labour will continue to lag behind the supply. Governments and businesses should therefore consider extending benefits and protections to independent workers and to all other employees needing to develop their skills and knowledge mid-career and also to support all endevours intended to create jobs and small businesses that favour the less skilled personnel.

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