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The Effects of ICT Development on Firm-Level Technology absorption: The role of IT Usage

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Abstract

The purpose of this study is to investigate the effects of Information and Communication Technology (ICT) development on technology diffusion and firm's capacity to absorb new technologies. The study analyses the relationship between ICT development measured by mobile broadband subscriptions, broadband internet, percentage of internet users and mobile-cellular telephone subscriptions on one hand and firm-level technology absorption on the other by examining the mediating role played by Information Technology (IT) usage by businesses and governments. A quantitative approach based on Partial Least Squares (PLS) Structural Equation Modelling (SEM) is employed to analyse country-level data across 134 countries for the year 2016 from both developing and developed countries. Analysis of the results presents evidence of ICT development having a significant role in shaping technology absorption by firms and that this direct relationship is also positively mediated by IT usage. The study provides implications for research, practice, and policy.

Keywords: ICT Development, Technology Absorption, IT Usage, PLS-SEM.

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1.0 Introduction

The purpose of this study is to investigate the effects of Information and Communication Technology (ICT) development on firms' capacity to absorb new technologies by examining the mediating role of Information Technology (IT) usage. National governments are endowed with different resource strengths that can be harnessed to spur economic development. Though there is a digital divide between Africa and the rest of the world in the area of technology utilisation, availability of platforms for e-commerce, virtual collaboration and export capacity development (Oluwatobi, Efobi, Olurinola, & Alege, 2015; Pick & Nishida, 2015), the technological absorption by firms in these countries is crucial to national economic developments.

Indeed, whilst technology advancement has increased firms' access to broadband networks, the diffusion of more advanced digital tools and applications is still on the downside though these differ significantly across countries (McKinsey Global Institute, 2018). The adoption and use of emerging technologies are widely recognized as contributing to economic development. This is due to the fact that the adoption of ICTs worldwide by firms can cause changes in countries' economic performance due to the unique features presented by the technologies and these can change the way firms do business and increase the firm's human and social capital (Lechman, 2014).

Absorptive capacity is a limit to the rate or quantity of scientific or technological information that a firm can absorb (Cohen & Levinthal, 1990). It is the ability of a firm to recognize the value of new, external information, assimilate it, and apply it to commercial ends. Technology absorption meanwhile, is a "costly learning activity that a firm can employ to integrate and commercialize knowledge and technology that is new to the firm but not new to the world" (Goldberg, Branstetter, Goddard, & Kuriakose, 2010). There are extensive benefits that are derived from technological absorption by firms. However, for small firms in developing countries that are largely reliant on poor and obsolete technologies (Lin & Chang, 2015) technological absorption is more poignant for the purposes of survival and competitive advantage. In as much as the opportunities for technological absorption are abound for firms, there exist threats for absorption or non-absorption. Therefore, the ability of a firm to assess these threats and anticipated opportunities before the absorption is an essential consideration (Du Preeza & Pistorius, 2002).

Whilst IS scholars have relied on the dominant logic of economic rationality (which focuses on how managers assess factors affecting IT diffusion and relate them to their expected economic returns) to explain how or why some IT-related innovations diffuse widely than others (Barrett, Heracleous, & Walsham, 2013; Fichman, 2004), less research has been conducted to explore the wider role of the ICT development of countries and how this impacts on the technological diffusion at the firm level.

Several factors have been explored as facilitators or inhibitors of technology diffusion at the individual level (Brancheau & Wetherbe, 1990), at the organizational unit level, and firm-level (Cavusoglu, Hu, Li, & Ma, 2010; Lei, 2016; Cooper & Zmud, 1990). For instance, at the individual level, the level of skills and knowledge gained over the course of the individual's cumulative involvement in innovation activities (Fichman 1992) and the user preferences based on psychological predispositions to physical characteristics of IT (Venkatesh, Morris, Davis, & Davis, 2003) has been cited. At the firm level IS research has largely ignored the role of a country's level of ICT development as the bottom-line upon which both individual and firm-level absorption and/or diffusion of technology may be induced. Apart from these, whilst ICT usage by individuals, business and Government is also precipitated on a country's level of ICT development, the role IT usage plays on the level of technological absorption of firms has been ignored.

To understand these vital issues, we examine the effects of ICT development on firm-level technological absorption whilst considering the mediating role played by the overall IT Usage of a country. The specific research questions that we address in this study are:

RQ1: What is the relationship between ICT development and firm-level technological absorption of a country?

RQ: What is the mediating role of IT usage of a country on its ICT development and firm-level technological absorption?

Using the theory of absorptive capacity as the guiding theoretical lens and grounding the discussion in ICT development, technology absorption and IT usage literature, we investigate the impacts of ICT development on firm-level technology absorption of countries. To do this, we test our hypotheses using secondary data from 134 countries. Furthermore, ICT development is measured by indicators such as mobile broadband subscriptions per 100 inhabitants, mobile broadband internet subscriptions per 100 inhabitants, fixed broadband internet subscriptions per 100 inhabitants, percentage of internet users and mobile-cellular telephone subscriptions per 100 inhabitants. The rest of the paper is organized as follows. First, we draw on the literature on ICT development and absorptive capacity of firms as well as the literature on IT usage to hypothesize the relationship of ICT development, IT usage and firm-level technology absorption. The research methodology detailing the hypothesis, data and models is presented. Thereafter, using data from 134 countries (see Appendix 1 for the list of countries), we test the formulated hypotheses. Finally, we end the discussion with a set of implications for research and practice emerging out of this study.

2.0 Theory and Hypothesis

2.1 Absorptive capacity theory

To understand how firms acknowledge the value of new and external information, ingest and utilize it in commercial ends, Cohen & Levinthal (1990) developed the absorptive capacity theory. They defined absorptive capacity as "a firm's ability to recognize the value of new information, assimilate and apply it to commercial ends" (Cohen & Levinthal, 1990, p.1). The ability of a firm to absorb new external knowledge greatly depends on earlier related knowledge and a variety of background (Cohen & Levinthal, 1990). In addition, a firm's investiture into its research and development (R&D) efforts are key to their model of growth of absorptive capacity. Therefore, absorptive capacity should be viewed as cumulative, that is, it is easier for a firm to invest in its absorptive capacity on a regular basis than investing at a specific time (Cohen & Levinthal, 1990). It is worth noting that, even though conceptually, this theory is similar to information processing theory, it is suitable for application at the firm level rather than the individual level (Cohen & Levinthal, 1990). Several researchers have extended this theory after it was developed by Cohen & Levinthal (1990). Quite notably, Zahra & George (2002) broadened this theory by arguing that, Cohen & Levinthal, (1990) placed too much emphasis on firm's investment in their R&D departments in other to develop absorptive capacity rather than looking into how other areas within a firm can be explored to develop a firm's absorptive capacity. They, therefore, defined four clear-cut dimensions to absorptive capacity, that is, acquisition, assimilation, transformation and exploitation. To them, absorptive capacity should be viewed as "a set of organizational routines and processes by which firms acquire, assimilate, transform and exploit knowledge to produce a dynamic organizational capability" (Zahra & George, 2002, p.3). Furthermore, they expanded the concept of absorptive capacity to include two absorptive capabilities, that is, potential absorptive and realized absorptive capacity.

Extant Information Systems (IS) research has adopted the absorptive capacity theory in undertaking studies in several IS domains. Among these are; supplier integration (Azadegan, Dooley, Carter, & Carter, 2008; Pihlajamaa, Kaipia, & Tanskanen, 2017; Schiele, Veldman, & Hüttinger, 2011), open innovation (Kokshagina, Le Masson, & Bories, 2017; Lau & Lo, 2015; Lewandowska, 2015), knowledge management (Corso, Martini, Pellegrini, Massa, & Testa, 2006; Hu, 2015), client integration (Johnsen & Ford, 2006; Liu, 2012) and inter-organizational fit (Lane & Lubatkin, 1998; Schildt, Keil, & Maula, 2012). Notwithstanding, research has largely ignored exploring the wider role of ICT development of countries and how this impact on technological diffusion at the firm level. For example, at the firm level, Atiase, & Botchie (2018) relying on 40 African countries investigated the effects of human capital, credit and electricity on firm's technology absorption in Africa. Findings from their study unveiled broad access to credit, electricity and effective human capital development as important requirements needed to aid technology absorption and diffusion among African firms. Similarly, findings from the study of Andrews, Nicoletti, & Timiliotis (2018) revealed that lack of ICT, poor assigning of workers to jobs and low managerial quality have adverse effects on technology absorption and diffusion. These studies, however failed to examine the role of a country's level of ICT development as the bottom-line upon which both individual and firm level absorption and/or diffusion of technology may be induced. In addition, the mediating role IT usage plays in firm's technology absorption has been largely ignored. Therefore, this study seeks to fill these gaps inherent in literature by relying on the foundations of the absorptive capacity theory.

2.2 Hypothesis Development

A considerable number of IS studies have highlighted the importance of employee training, top management support and technical support on IT usage at the firm level. This includes the studies of Alkhaldi, Yusof, & Aziz (2012), Irawan, Foster, & Tanner, (2018), Sun & Bhattacherjee (2011). For instance, findings from the study of Alkhaldi et al. (2012) on the effect of user training and support on employee usage of video-conferencing in organizations in Jordan revealed that user training and support greatly or directly influenced employee's usage of video conferencing in organizations. When employees are educated and trained on how to use IT applications, it increases their skillset and as a result, enhances overall performance (Lazarević & Lukić, 2016). We, therefore, extend these to postulate that, ICT development of a country positively influences IT usage. Thus, we argue that, when firms provide employees with access to ICTs, it propels them to learn how to use it. Thus, employees, therefore, seek education and training on how to use ICT applications. Previous studies have largely ignored the effect of ICT access and ICT use on IT usage within organizations. We, therefore, hypothesize that;

H_1: ICT development is positively associated with IT usage

IS research has largely ignored the effect of IT usage on firm-level technology absorption. Findings from the study of Cruz-González, López-Sáez, & Navas-López (2015) on formal liaison devices usage by firms and its influence on external knowledge acquisition revealed that the use of these devices had no effect on knowledge acquired from customers, universities and competitors and negatively moderates the relationship between the knowledge acquired from suppliers and the quality or originality of new products. Notwithstanding, the effect of IT usage on firm-level technology absorption has received no interest. We, therefore, argue that ICT usage by businesses and the Government is precipitated on a country's level of ICT development and as such, would influence firm-level technology absorption. We extend this to postulate that, IT usage is positively associated with firm-level technology absorption. Our second hypothesis is therefore stated as;

H₂: IT usage is positively associated with firm-level technology absorption

Previous studies have highlighted the importance human capital plays in the overall performance of a firm (Lazarević & Lukić, 2016; Mahmoud & Rosli, 2013; Chen & Thompson, 2016; Davidsson & Honig, 2003). Chen & Thompson (2016), refer human capital as the cognitive and non-cognitive skills of individual members of a firm that has been acquired through education and experience and adds to the overall performance of a firm. To Davidsson & Honig (2003), the concept of human capital refers to the skills, knowledge and problem-solving capabilities of individuals within a firm that arises as a result of education, training and experience which results in overall firm performance. In the field of IS research, Lazarević & Lukić (2016) indicates that employees are the most important resource to an organization in terms of their knowledge, skills and potentials and as such, are a crucial factor or element that determine ICT applications. Similarly, findings from the studies of Andrews et al. (2018), Atiase, & Botchie (2018) revealed that human capital is an important requirement needed to aid technology absorption and diffusion among firms. We, therefore, extend these studies to postulate that, ICT development positively influences firm-level technology absorption. Previous studies have largely focused on the effect of ICT skills on technology absorption with less emphasis being placed on the effect of ICT access on technology absorption. We, therefore, combined these two (i.e., ICT access and ICT skills) as indicators of ICT development to hypothesize that;

H₃: ICT development is positively associated with firm-level technology absorption

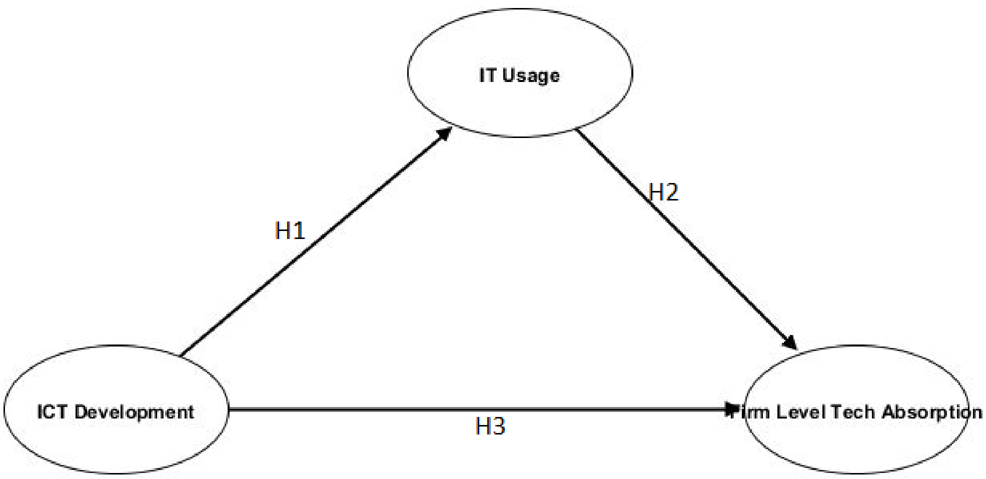

Figure 1: Research Model

3.0 Research Methodology

3.1 Data, Constructs, Variables, and Measures

To undertake this study, data was collected from several archival sources. To be specific, data sources included data from the International Telecommunication Union's Measuring the Information Society Report (ITU, 2017), The IT usage is extracted from the Network Readiness Index (NRI) the usage index which consists of pillars of government usage and business usage. This is drawn from the World Economic Forum (WEF) Global Information Technology Report (GITR) (Baller, Dutta, & Lanvin, 2016) and the technological absorption measured by Firm-level technology absorption determined by a Likert scale question that determines to what extent do businesses adopt new technology from 134 countries globally was also drawn from the NRI. The researchers relied on secondary data because the nature of the study demanded complete data from countries around the world and it was impossible for the authors to collect primary data on this scale as we were constrained by time and resources. Lastly, data was not readily available in a single source, therefore, gathering the data from these reliable sources was important. We only considered data for countries that were made available in all reports. The data points were examined across all the reports and that resulted in relying on 134 countries for the study. Finally, indicators with less than 5% of missing data were mean-replaced (Hair, Hult, Ringle, & Sarstedt, 2016). This study considered three latent constructs, that is, ICT development, ICT usage and Firm-level technology absorption as depicted in Figure 1. ICT development is measured by indicators such as mobile broadband subscriptions per 100 inhabitants, mobile broadband internet subscriptions per 100 inhabitants, fixed broadband internet subscriptions per 100 inhabitants, percentage of internet users and mobile-cellular telephone subscriptions per 100 inhabitants, IT usage is measured by business and government IT usage.

4.0 Data Analysis and Results

We used ADANCO to conduct our data analysis in examining the effects of Information and Communication Technology (ICT) development on technological diffusion and the firm's capacity to absorb new technologies. First, in analysing the results, an assessment of the measurement model was undertaken before an assessment of the structural model was carried out (Hair, Risher, Sarstedt, & Ringle, 2019). The measurement model was assessed for indicator reliability, internal consistency for reliability, convergent validity and discriminant validity by ensuring the application of the standard decision rules (Hair et al., 2019; Urbach & Ahlemann, 2010). Secondly, the structural model was assessed for the significance of the path coefficient between the model's latent variables, the goodness of fit and the effect size.

4.1. Assessment of the Measurement Model

In assessing the measurement model, we first assessed indicator reliability. To check for indicator reliability, reflective indicator loadings are monitored. Indicator loadings of 0.708 and above are recommended as they show that, the construct or latent variable explains more than 50% of the indicator's variance and thus, ensuring acceptable item reliability (Hair et al., 2019). Not all indicators loaded successfully on their assigned constructs when the model was first run. Specifically, mobile cellular telephone subscriptions did not load well on its assigned construct (i.e., ICT development). As a result, it was deleted and the model was rerun. Results are presented in figure 1. All other indicators loaded significantly on their corresponding latent variables as they exceeded the minimum threshold of 0.708 as shown in figure 1.

The second step after checking for indicator reliability is to assess internal consistency reliability using Cronbach's alpha. A high Cronbach's alpha value indicates that the scores of all indicators within a latent variable have the same range and meaning (Cronbach, 1951). The minimum threshold for Cronbach's alpha is 0.70 (Nunnally, 1978). All latent variables had a Cronbach's Alpha value of more than 0.70 as exhibited in Table 1. Although the Cronbach's alpha is a measure of internal consistency reliability, extant research has critiqued it for producing lower values than composite reliability. Specifically, Cronbach's alpha has been said to be a less precise measure of reliability, as the items are unweighted. Rho A has therefore been recommended by extant research as an alternative and an approximately exact measure of construct reliability (Dijkstra & Henseler, 2015). In this study, Rho A values exceeded a minimum of 0.7 as depicted in Table 1. The composite reliabilities also exceeded the minimum of 0.7 and were considered to be sufficient (Fornell & Larcker, 1981). This showed that there was enough internal consistency.

The third step involved an assessment of convergent validity of each construct measure. Convergent validity involves the "degree to which individual items reflecting a construct converge in comparison to items measuring different constructs" (Urbach & Ahlemann, 2010, p.19). The criterion used for measuring convergent validity is Fornell & Larcker (1981) average variance extracted (AVE). The threshold for AVE is 0.50 (Hair et al., 2019). This indicates that the latent variable or construct explains at least 50% of the variance of its items and therefore shows adequate convergent validity (Hair et al., 2019; Urbach & Ahlemann, 2010). All AVE's as depicted in Table 1 exceeded the minimum threshold of 0.50.

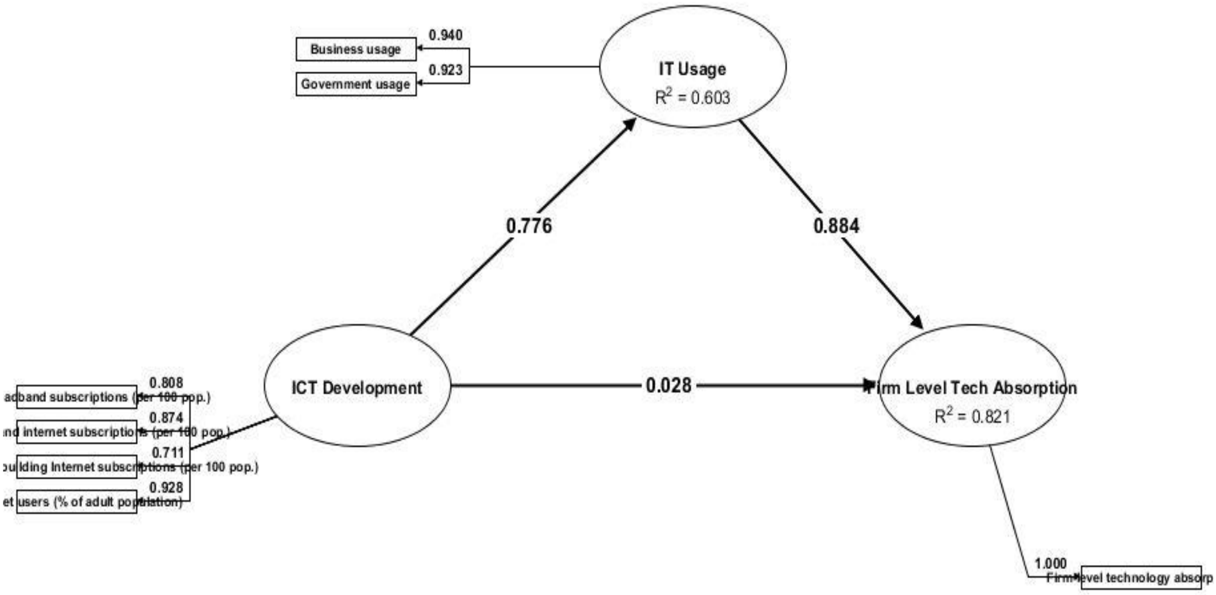

Figure 2. PLS Results

Construct	Dijkstra-Henseler's rho (ρ_A)	Jöreskog's rho (ρ_c)	Cronbach's alpha(α)	AVE
ICT Development	0.8744	0.9007	0.8518	0.6959
IT Usage	0.8564	0.9293	0.8483	0.8679
Firm-Level Tech Absorption	1.0000	1.0000		1.0000

Table 1. Construct reliability and validity

The fourth step assessed for discriminant validity. Two measures were used to assess discriminant validity. The first measure is the cross-loadings which are obtained by associating or correlating each latent variable score with all the other items (Chin, 1998). Where each indicator loading is higher for its construct than for any other construct and each of the constructs or latent variables loads highest with its indicators or assigned items, we generalize that, the indicators of the latent variable or construct are discriminant of each other. From Table 2, we can infer that the latent variables are discriminant of each other as they load higher on their assigned constructs than any other construct (s). The second measure of discriminant validity is the Fornell & Larcker (1981) criterion. They suggested that to achieve discriminant validity, a latent variable should share more variance with the indicators assigned to it than with any other latent variable. From Table 3, it can be seen that the various latent variables share more variance with their assigned indicators than with other latent variables. This has been highlighted in bold in Table 3.

Indicator	ICT Development	IT Usage	Firm-Level Tech Absorption
Mobile-broadband subscriptions (per 100 pop.)	0.8082	0.6217	0.5998
Fixed-broadband internet subscriptions (per 100 pop.)	0.8740	0.6941	0.6365
Fibre-to-the-home/building Internet subscriptions (per 100 pop.)	0.7106	0.5226	0.4233
Internet users (% of adult population)	0.9283	0.7307	0.6891
Business usage	0.7468	0.9398	0.9039
Government usage	0.6976	0.9234	0.7770
Firm-level technology absorption	0.7145	0.9057	1.0000

Table 2. Cross loadings

Construct	ICT Development	IT Usage	Firm-Level Tech Absorption
ICT Development	**0.6959**		
IT Usage	0.6028	**0.8679**	
Firm Level Tech Absorption	0.5105	0.8202	**1.0000**
Squared correlations; AVE in the diagonal.			

Table 3. Fornell Larcker criterion

4.2. Assessment of the Structural Model

After an assessment of the measurement model was carried out, the next step was to assess the structural model (Hair et al., 2019; Urbach & Ahlemann, 2010). Thus, we assessed the structural model for the significance of the path coefficient between the model's latent variables (Urbach & Ahlemann, 2010). This was done by running a bootstrapping procedure using 5000 re-samples in ADANCO to arrive at the direct and indirect effects. The bootstrapping procedure revealed t-values which were used to make the inference. Results are presented in Tables 4 and 5. Using a 95% confidence interval, a minimum critical value of 1.65 is recommended for a significance level of 10% (two-tailed) (Hair *et al.*, 2011).

Effects	Standard beta	Standard error	t-value	95%CI LL	95%CI UL
ICT Development -> IT Usage	0.7764	0.0335	23.1487	0.6844	0.8549
ICT Development -> Firm Level Tech Absorption	0.0285	0.0624	0.4564	-0.1640	0.1769
IT Usage -> Firm Level Tech Absorption	0.8836	0.0488	18.0911	0.7639	1.0238

Table 4: Hypothesis Testing for direct effects

Effect	Standard beta	Standard error	t-value	95% CI LL	95% CI UL
ICT Development -> Firm Level Tech Absorption	0.6860	0.0531	12.9088	0.5544	0.8651

Table 5: Hypothesis Testing for Indirect Effects

Furthermore, the model's Goodness of Fit was assessed. The coefficient of determination (R^2) was used to assess the model's goodness of fit (Hair, Sarstedt, Hopkins, & Kuppelwieser, 2014). R squared ranges from 0-1, with higher values showing a greater explanatory power. As a guide, R^2 values of 0.25, 0.50 and 0.75 can be termed as weak, moderate and substantial respectively (Henseler et al., 2009; Hair et al., 2011). From Table 6, R squared values are presented in Table 6. With an R^2 of 60.3 for IT usage, it means that 60.3 per cent of the variance in IT usage can be explained by ICT development whilst 82.1 per cent of firm-level technological development can be explained by both ICT development and IT usage.

Construct	Coefficient of determination (R^2)	Adjusted R^2
IT Usage	0.6028	0.5993
Firm Level Tech Absorption	0.8206	0.8173

Table 6. R Squared

Lastly, the effect size of the model was assessed. The effect size shows how much an exogenous latent variable contributes to an endogenous latent variable's R^2 value (Cohen, 1988). The f^2 values between 0.020 and 0.150, between 0.150 and 0.350 and above 0.350 show that the exogenous latent variable or the independent construct has a small, medium or large effect on the dependent construct (Chin, 1998; Cohen, 1988; Gefen *et al*., 2000). Results are presented in Table 7.

Effect	Beta	Indirect effects	Total effect	Cohen's f^2
ICT Development -> IT Usage	0.7764		0.7764	1.5177
ICT Development -> Firm Level Tech Absorption	0.0285	0.6860	0.7145	0.0018
IT Usage -> Firm Level Tech Absorption	0.8836		0.8836	1.7280

Table 7. F squared.

5.0. Discussion

The study sets out to validate the stated hypothesis. From the analysis of results, all four hypotheses were supported. First, the hypothesis that the ICT development of a country is positively associated with its IT usage was supported. This is supported by Alkhaldi et al. (2012) who conducted a study on the effect of user training and support on employee usage of video-conferencing in organizations in Jordan. Findings from their study revealed that user training and support greatly or directly influenced employee's usage of video conferencing in organizations. Similarly, findings from the studies of Gallivan et al. (2005), Rouibah et al. (2009), Sun & Bhattacherjee (2011) revealed that employee training and support played a huge role on employee usage of technology. That is, when employees are well educated and trained on how to use certain IT applications, it increases their skillset and as a result, enhances overall performance and usage (Lazarević & Lukić, 2016). However, this study adds a dimension of ICT access to ICT development. Findings further revealed that, if employees have access to ICTs, they will be propelled to learn how to use it. They, therefore, seek education and training on how to use these ICT applications.

In addition, the second hypothesis of IT usage being positively associated with firm-level technology absorption was supported. Extant research has largely ignored the influence of IT usage on firms' technology absorption. This study, therefore, fills this gap with its current findings. Results from the study revealed that, when individuals are well educated and trained on how to use IT applications in a firm, efficiency and profitability are enhanced and as such, firms will continuously absorb technology to better their operations and enjoy some economies of scale. We further argue that ICT development will not guarantee technology diffusion at the firm level unless there is interfirm or intra firm use of technology The level of IT usage may also affect firm technology diffusion because firms will be compelled to adopt technology if they have to deal with governments in Business-to-Government B2G transactions, especially if a government is technologically advanced in its interactions with businesses

Furthermore, the hypothesis of ICT development being positively associated with firm-level technology absorption was supported. Previous research has largely explored the positive effect of ICT skills on firm-level technology absorption (Andrews et al., 2018; Atiase, & Botchie, 2018). This study, therefore, adds to the literature by revealing that, ICT access and ICT skills which measure ICT development positively influence firm-level technology absorption.

Finally, the study aimed to examine the mediating role of IT usage of a country on its ICT development and firm-level technology absorption. Results from this study revealed that IT usage positively mediates the relationship between ICT development and firm-level technology absorption. This has been widely ignored by extant research and as such, this finding adds to the limited literature on this area.

6.0 Conclusion, Limitations and Future Research

Our findings shed light on the effects of ICT Development on firm-level technology absorption whilst also examining the mediating role of IT Usage. This study concludes that ICT development of a country is positively associated with its IT usage. The study also holds that IT usage of a country is positively associated with firm-level technology absorption. In addition, ICT development is positively associated with firm-level technology absorption. Finally, IT usage positively mediates the relationship between ICT development and firm-level technology absorption.

Our study, reveals some key contributions. First, existing studies have largely ignored the role IT usage of a country plays in mediating the role between ICT development and firm-level technology absorption. This study fills this gap with its findings. In addition, extant research has largely ignored the influence of IT usage on firms' technology absorption. This study similarly adds to the body of knowledge with its findings. Furthermore, considerable studies have focused on the effect of ICT skills on firm-level technology absorption (Andrews et al., 2018; Atiase, & Botchie, 2018). This study expands these studies by adopting the ICT access, and ICT skills as indicators of ICT development to examine its combined effect on firm technology absorption.

For research, our study adds to the literature on firm technology absorption. From a practical viewpoint, our study makes two important contributions. It does this by first making it possible for practitioners and policymakers to understand the impact of ICT development, IT usage on firm-level technology absorption. This knowledge can inform practitioners to develop better mechanisms that promote employee training and support in a firm. Policymakers will also be informed on how to develop better laws to regulate the use of IT to ensure that the privacy of individuals is not compromised.

Our study is however limited by our reliance on secondary data obtained from different sources. This led to our reliance on the indices as formulated by the reporting agencies. We could have relied on primary data to ensure better control over the definition of the variables in the study, but this was not feasible for us to undertake such a large-scale cross-country data collection exercise considering the limited amount of resources and time at our disposal. Furthermore, data used for this study were only from the countries with commonly available data in all the sources. Therefore, we could not include some countries because their data was not commonly available in all the sources. However, discarding some of the countries did not make a significant difference in the results because PLS-SEM places minimal restrictions on sample size and residual distributions (Chin, 1998).

Appendix 1:

Albania, Algeria, Argentina, Armenia, Australia, Austria, Azerbaijan, Bahrain, Bangladesh, Belgium, Benin, Bhutan, Bolivia, Bosnia and Herzegovina, Botswana, Brazil, Bulgaria, Burundi, Cambodia, Cameroon, Canada, Cape Verde, Chad, Chile, China, Colombia, Costa Rica, Côte d'Ivoire, Croatia, Cyprus, Czech Republic, Denmark, Dominican Republic, Ecuador, Egypt, El Salvador, Estonia, Ethiopia, Finland, France, Gabon, Gambia, Georgia, Germany, Ghana, Greece, Guatemala, Guinea, Guyana, Haiti, Honduras, Hong Kong SAR, Hungary, Iceland, India, Indonesia, Iran, Islamic Rep., Ireland, Israel, Italy, Jamaica, Japan, Jordan, Kazakhstan, Kenya, Korea, Rep., Kuwait, Kyrgyz Republic, Lao PDR, Latvia, Lebanon, Lesotho, Lithuania, Luxembourg, Madagascar, Malawi, Malaysia, Mali, Malta, Mauritania, Mauritius, Mexico, Moldova, Mongolia, Montenegro, Morocco, Mozambique, Myanmar, Namibia, Nepal, Netherlands, New Zealand, Nicaragua, Nigeria, Norway, Oman, Pakistan, Panama, Paraguay, Peru, Philippines, Poland, Portugal, Qatar, Romania, Russian Federation, Rwanda, Saudi Arabia, Senegal, Serbia, Seychelles, Singapore, Slovak Republic, Slovenia, South Africa, Spain, Sri Lanka, Sweden, Switzerland, Tanzania, Thailand, Trinidad and Tobago, Tunisia, Turkey, Uganda, Ukraine, United Arab Emirates, United Kingdom, United States, Uruguay, Venezuela, Vietnam, Zambia, Zimbabwe

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