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The role of digital skill in mitigating digital divide: evidences from Asia-Pacific region

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Abstract

Purpose – This paper aims to make a modest attempt to classify the Asia-Pacific countries in terms of the access to information and communication technology (ICT) to unearth the prevalence of digital divide (if any) in the Asia-Pacific region. In addition to that, this paper also examines the role played by the digital skill in bridging the digital divide in the context of Asia–Pacific countries.

Design/methodology/approach – Secondary data on 43 Asia-Pacific countries for the period from 2012 to 2017 was collected from International Telecommunication Union (ITU) database and World Development Indicators, World Bank. *K*-means clustering technique was applied to explore the natural grouping of the Asia-Pacific countries based on ICT access. The role of digital/ICT skill in narrowing the access-based digital divide was investigated using panel data regression technique.

Findings – Clustering of countries suggested a significant difference amongst the Asia-Pacific countries in terms of ICT access, signifying the prevalence of access based digital divide. Digital skill played pivotal role in promoting ICT access and thereby reducing the digital divide during the period of the study. Per capita income level, level of education, openness of the economy and urbanisation were observed to be the determining factors in reducing the digital divide during the period of study in the Asia-Pacific region.

Originality/value – The study makes an unique attempt to explore the role of digital/ICT skill in tapering the access-based digital divide in the context of Asia-Pacific region.

Keywords ICT, Digital divide, Digital skill, ICT access

Paper type Research paper

1. Introduction

Continuous development in information and communication technology (ICT) has brought about dramatic changes in human lives, society and economy as a whole in last few decades. ICT is considered to be the major driving force behind the growth and development of the modern economy in the context of present information age. The power of the digital economy rests in its spill-over effect which accelerates economic growth, potentiality of declining non-accelerant inflation rate of unemployment, balancing inflation and unemployment in short run, fostering the innovation of quality products and services, allowing the economy to operate at full capacity by moderating the business cycle and controlling the corruption (L'Hoest, 2001; Kamel, 2005; Atkinson and McKay, 2007; Howard *et al.*, 2010; Saxena, 2018). Therefore, development of ICT is one of the significant prerequisites for human progress, economic growth and development. Because of the pervasiveness across the different sectors in the economy and human lives, improvement over time that reduces cost and boosts

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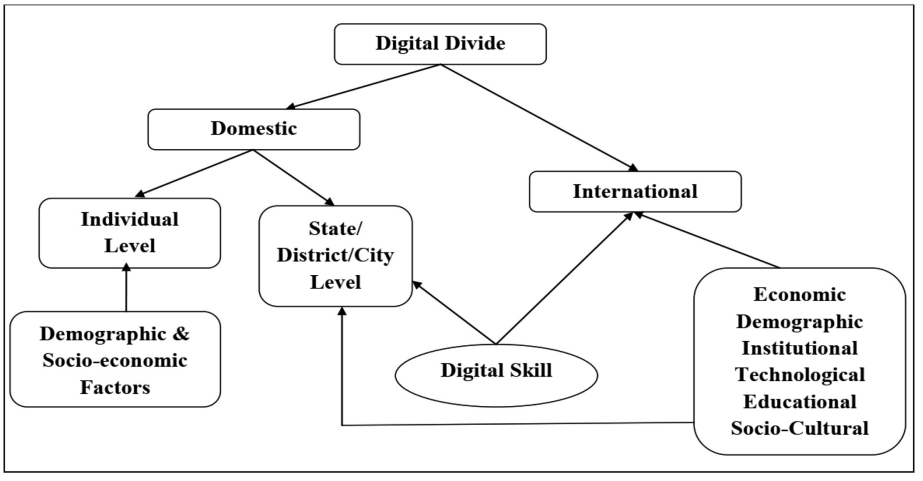
performance and innovation spill over, ICT has truly become a general purpose technology (Bresnahan and Trajtenberg, 1995). In addition, the network effect (spill over of the benefits of investment made by an individual in ICT to its network members) and knowledge enrichment effect (access to knowledge over internet irrespective of time, place, resources and social status) makes the ICT revolution more powerful, democratic and self-sustaining in nature (Vu, 2017). Therefore, digital technology can really be the engine of growth and development through inclusion, efficiency and innovation (World Bank, 2016). The benefits of ICT can be harnessed almost in every sphere of socio-economic development such as education, health, employment, environment etc. In fact, the ICT is considered as the means of implementation of the various sustainable development goals (SDGs) (Aikins, 2019).

Digital or ICT skills are often considered to be at the heart of ICT revolution (Servon and Kaestner, 2008; Aikins, 2019). Without the spread of digital skills, transformation into a digital economy will remain as a remote possibility. Digital skill is no longer a luxury, rather it has become a necessary life skill like reading and writing in the present knowledge society (World Bank, 2016; Montoya, 2018).The necessity of digital skill is so important that it has been considered as the intrinsic part of the SDG 4 [1]. In fact, SDG Target 4.4 [2] and Target Indicator 4.4.1 [3] in particular emphasizes the role of digital skill in the present context. The relevance and the power of the ICT and ICT skill has again came into the focus in the context of the current Covid-19 pandemic. People who were reluctant to use the digital technologies earlier are now forced to use the same to carry out day-to-day normal activities (Guitton, 2020). Therefore, the Covid-19 pandemic has brought about attitudinal and behavioural changes in human beings towards ICT.

2. Conceptual framework

However, with the rapid growth and development of ICT, the risk of digital divide (DD) also emerges between the haves and have-nots at the individual, national and international levels (Lee *et al.*, 2017). Initially, in early 1990s, DD referred to the gap between those who have access to ICT and those who do not (Dewan and Riggins, 2005). In the DD literature, researchers are also often concerned about two forms of disparities, i.e. within (domestic DD) and between (international DD) the countries (Cuervo and Menéndez, 2006). This study deals with the second category, i.e. international DD in the context of Asia-Pacific countries. Figure 1 briefly



Source(s): Author's own representation

Figure 1. Conceptual framework of the role of digital skill in narrowing international DD

highlights the conceptual framework of DD and the role to be played by digital skill in mitigating access-based DD. In demand-supply perspective, ICT access can be considered as a supply side factor and ICT/digital skill is demand side factor. The article sheds light on the process of narrowing the access-based DD (supply) by promoting digital skill (demand).

3. Review of literature

The international DD studies have shown that such disparity mainly arises due to the socio-economic disparities existing between the countries. Countries with higher income and education level exhibit better ICT access (Dewan *et al.*, 2005; Vicente and López, 2008).

Several researchers have investigated the nature and causes of increasing DD across the globe (Chinn and Fairlie, 2007; Yartey, 2008; Shchetinin and Baptiste, 2008; Cruz-Jesus *et al.*, 2012; Nishijima *et al.*, 2017; Buys *et al.*, 2009) and Asian countries in particular (Wong, 2002; Kiiski and Pohjola, 2002; Quibria *et al.*, 2003; Ono, 2005; Gillian and Suarez, 2005; Dewan *et al.*, 2005; Murthy and Nath, 2009; Nipo *et al.*, 2014; Maji and Laha, 2020). The outcome of the majority of the studies with respect to Asian countries uniformly outlined the existence of sharp DD amongst the Asian countries. Singapore, South Korea, Hong Kong, Taiwan and Japan made a notable progress in terms of ICT use and access, whereas the other Asian countries are lagging far behind in this regard. On the other hand, the performance of Asia as a whole in ICT diffusion was found to be poor in comparison to Organisation for Economic Co-operation and Development (OECD) and other Non-Asian groups (Wong, 2002). Various demographic, institutional, economic, investments, educational, infrastructural and international trade related issues were identified as the key factors in explaining DD in the Asian region. In recent past, the studies carried out by Pachis (2018), Cruz-Jesus (2018), Aikins (2019), Fang *et al.* (2019), Otioma *et al.* (2019), Song *et al.* (2020) and Huxhold *et al.* (2020) revealed that income level, level of education, digital literacy, cost of Internet, economic freedom, privatisation, population age, gender, access to electricity, rural income, working age population, urbanisation and foreign investment were the principal factors in explaining DD.

However, there are scanty of literature in unearthing the role of digital skill (along with other important factors) to explain the DD amongst Asia-Pacific countries. Asia-Pacific region is of great importance as 60% of the world population resides in this region and this region contributes approximately 30% of the gross domestic product (GDP) of the world. Hoang (2018) carried out a study to investigate the socio-political determinants of DD in the Asia-Pacific region by considering variables such as global peace index, human development index and freedom status. Consideration of only socio-political factors without consideration of other important economic and demographic factors is a major limitation of the study. Further, the study was a cross-sectional investigation based on a small sample of 24 Asia-Pacific countries, and hence generalisation based on such a small sample can be misleading. In another study, Maji and Laha (2020) assessed the state of the digital economy in the Asia-Pacific region. The findings of the study revealed the prevalence of DD in the region, which can be narrowed by strengthening the digital skill. However, measurement of the digital skill was done by considering education-related variables (i.e. mean years of schooling, secondary gross enrolment ratio and tertiary gross enrolment ratio). Considering education parameters as a proxy of digital skill can be often misleading as it is very much possible that a highly educated person is unable to use digital technologies due to the lack of appropriate digital skills.

In this prelude, the present study tries to look into the presence of DD amongst the Asia-Pacific countries. Efforts are also made to explore the regional variation in this regard by classifying the countries based on their commonalities in terms of ICT access. Moreover, the study also unearths the role played by the digital skill in narrowing the international digital inequality in the Asia-Pacific region.

4. Data sources and methodology

4.1 Data sources

This study mainly follows an analytical framework. ICT access and ICT skill-related data on 43 Asia-Pacific countries for the period from 2012 to 2017 were compiled from the database of International Telecommunication Union (ITU) [4]. The selection of the time period was entirely based on the availability of the relevant data. In fact, unavailability of the data is one of the major issues in the digital economy research. For the purpose of the study, ICT access is used as a proxy for the access-based DD. As per the ITU methodology, ICT access is a composite factor comprising of fixed-telephone subscriptions per 100 inhabitants, mobile-cellular telephone subscriptions per 100 inhabitants and international Internet bandwidth (bit/second) per Internet user and percentage of households with a computer. These factors actually indicate the supply dimension in the context of the digital economy. Therefore, if a country performs poorly in these parameters of ICT access, then it signifies the prevalence of access based DD and vice versa.

Measurement of digital skill is a tricky exercise as there is limited availability of secondary sources of data. In ITU methodology, ICT skill is measured by the mean years of schooling, secondary gross enrolment ratio and tertiary gross enrolment ratio. However, if the SDG indicator 4.4.1 is followed, it can be observed that the digital skill is to be assessed based on the skills such as the ability to move a file or folder in a PC, ability to copy and paste, ability to send e-mails with attachments, ability of using excel formula, ability of connecting and installing additional devices to PC (such as modem, camera), ability to find, download, install and configure software, ability to prepare presentations in electronic forms such as power point presentations, ability to transfer files between PCs and other devices and ability to write computer programmes. However, secondary data based on these parameters on Asia-Pacific countries are not available. The ITU method of assessing ICT skill *vis-à-vis* digital skill is completely inconsistent with the SDG indicator 4.4.1. In fact, the factors which are considered in producing ICT skill (mean years of schooling, secondary gross enrolment ratio and tertiary gross enrolment ratio) are the indicator of level of education in a country in true sense. Therefore, the data on ICT skill is used as a proxy of level of education for the purpose of this study. It is true that the use of the digital or ICT devices cannot be performed without adequate digital skill. So, it would be right to assume that if a person is using the digital devices to perform day-to-day works then that person is digitally skilled. Following this logic, the ICT use data as published by ITU (which is a composite factor of percentage of individuals using the Internet, fixed-broadband subscriptions per 100 inhabitants and active mobile-broadband subscriptions per 100 inhabitants) was considered as the surrogate of digital skill. It signifies that higher the value of ICT use, greater is the digital skill prevalent amongst the people in the country and vice-versa.

Education level, per capita national income, urbanisation, credit to private sector, openness of the economy and population were considered as control variables while exploring the implications of digital skill in mitigating the DD. The effects of all the control variables and the instrumental variable are theoretically expected to be positive on the ICT access. The detailed description of the variables used in the study is presented in Table 1.

4.2 K*-means clustering*

In this study, natural grouping of the Asia-Pacific countries based on ICT access is performed using non-hierarchical (e.g. *k*-means clustering) clustering method. In order to understand the relative positions of the countries in terms of ICT access based DD, *k* is assumed to be two (high and low).

4.3 Panel regression analysis

Subsequently, effort was also made to unearth the effect of the digital skill in mitigating the DD. In doing so, panel data regression technique was employed as this method is efficient

Table 1.
Description of the variables used in the study and the sources

Abbreviation	Variable description	Source
ACS	ICT access: $\left[\left(\text{Fixed telephone subscriptions per 100 inhabitants} \times \frac{1}{5}\right) + \left(\text{Mobile cellular telephone subscriptions per 100 inhabitants} \times \frac{1}{5}\right) + \left(\text{International internet bandwidth bits per second per internet user} \times \frac{1}{5}\right) + \left(\text{Percentage of households with a computer} \times \frac{1}{5}\right) + \left(\text{Percentage of households with intenet access} \times \frac{1}{5}\right)\right]$	ITU database
DIGSK	Digital skill: $\left[\left(\text{Percentage of individuals using the internet} \times \frac{1}{3}\right) + \left(\text{Fixed broadband subscriptions per 100 inhabitants} \times \frac{1}{3}\right) + \left(\text{Active mobile broadband subscriptions per 100 inhabitants} \times \frac{1}{3}\right)\right]$	
EDU	Education: $\left[\left(\text{Composite of mean years of schooling} \times \frac{1}{3}\right) + \left(\text{Secondary gross enrolment ratio} \times \frac{1}{3}\right) + \left(\text{Tertiary gross enrolment ratio} \times \frac{1}{3}\right)\right]$	
GNI	Gross national income (per capita)	World Development Indicators, World Bank
POP	Natural logarithm of total population in a country	
URBAN	Urban population as a percentage of total population	
PVTCRD	Domestic credit to private sector as a percentage of GDP	
OPEN	Merchandise trade (import and export) as a percentage	

Source(s): Author's own compilation

enough to take care of heterogeneity of the time series and the cross sections. The following empirical specification was used in the study.

$$ACS_{it} = \alpha + \beta_1 DIGSK_{it} + \beta_2 EDU_{it} + \beta_3 GNI_{it} + \beta_4 POP_{it} + \beta_5 URBAN_{it} + \beta_6 PVT\_CRD_{it} + \beta_7 OPEN_{it} + u_{it}$$

Where ACS is the dependent variable, α is the intercept term, $\beta's$ are the vectors of parameters to be estimated, DIGSK, EDU, GNI, POP, URBAN, PVTCRD and OPEN are the independent variables and u_{it} represents the error term.

Before employing the panel data regression method, it is imperative to check whether the panel data regression method is applicable or not. It is ensured by using the Breusch–Pagan (BP) test. The outcome of the BP test can be used to test the suitability of constant coefficient model (CCM) in a pooled ordinary least square framework. However, if the outcome of the BP test is suggestive of the non-applicability of constant coefficient model (CCM), then either random effects model (REM) or fixed effect model (FEM) can be chosen under the panel data regression framework. The underlying distinction between REM and FEM is that FEM allows the intercept to vary with cross-sections but the intercept remain constant over varying time periods, whereas β values remain the same across cross-sections and time series. Popularly, Hausman specification testis employed to select either FEM or REM.

5. Results and discussion

5.1 Cross country experiences of DD

Table 2, outlines the relative positions of different Asia-Pacific countries in terms of ICT access over 2012 to 2017. As pointed out earlier, higher value of ICT access indicates low DD and vice versa.

Country	2012	2017	%Change	Country	2012	2017	%Change
Armenia	5.55	6.52	17.5	Maldives	5.75	6.22	8.2
Azerbaijan	5.83	6.62	13.6	Mongolia	4.78	4.74	−0.8
Bahrain	7.64	8.14	6.5	Myanmar	1.72	3.48	102.3
Bangladesh	2.42	3.05	26.0	Nepal	2.44	3.62	48.4
Bhutan	3.13	3.09	−1.3	Oman	6.28	7.32	16.6
Brunei Darussalam	7.22	7.47	3.5	Pakistan	2.95	3.34	13.2
Cambodia	3.7	4.16	12.4	Palestine	4.67	3.35	−28.3
China	4.78	5.58	16.7	Philippines	4.17	4.87	16.8
Cyprus	7.02	7.86	12.0	Qatar	7.8	7.9	1.3
Georgia	5.61	6.26	11.6	Russia	7.01	7.23	3.1
India	2.89	3.6	24.6	Saudi Arabia	6.8	7.21	6.0
Indonesia	4.19	4.85	15.8	Singapore	8.53	8.61	0.9
Iran	5.11	6.74	31.9	South Korea	8.91	8.85	−0.7
Israel	8.21	8.17	−0.5	Sri Lanka	3.86	4.66	20.7
Japan	8.26	8.8	6.5	Syria	4.47	4.58	2.5
Jordan	5.43	6.03	11.0	Thailand	4.71	5.48	16.3
Kazakhstan	6.73	7.55	12.2	Turkey	5.66	6.3	11.3
Kyrgyzstan	4.01	4.54	13.2	UAE	7.39	8.11	9.7
Lao PDR	2.93	3.47	18.4	Uzbekistan	2.78	5.24	88.5
Lebanon	6.29	6.92	10.0	Timor-Leste	–	3.84	–
Afghanistan	–	2.56	–	*Average*	*5.49*	*6.22*	–
Kuwait	–	7.12	–	*Maximum*	*8.91*	*8.85*	–
Malaysia	6.59	6.93	5.2	*Minimum*	*1.72*	*3.05*	–

Source(s): Author's own compilation

Table 2. Changing scenario of the state of DD in terms of ICT access (2012 and 2017)

The analysis of Table 2 clearly indicates that there exists a sharp contrast in ICT access amongst the countries in the Asia-Pacific region during the period of study indicating prevalence of ICT access based DD. The range of ICT access value during 2012 and 2017 were found to be 1.72–8.91 and 3.05–8.85, respectively. The ICT access for some of the countries such as South Korea, Japan, Singapore, Israel, Qatar, Bahrain and UAE were found to be very high during both 2012 and 2017, whereas the same was observed to be very dismal with respect to Myanmar, Bangladesh, Nepal, Uzbekistan and India during 2012 and for Afghanistan, Bangladesh, Bhutan, Pakistan and Palestine during 2017. The ICT access dimension improved in case of 35 out of the 40 countries (for 3 countries data was not available for 2012) during the study period. It is reflected in the increase of minimum value in the ICT access range (1.72 to 3.05) over the period of time. Interestingly, the ICT access reduced marginally for two high ICT access countries such as South Korea and Israel. The ICT access also declined with respect to Palestine, Bhutan and Mongolia during the period of study. Notable improvement in the ICT access dimension was observed in case of countries like Uzbekistan, Myanmar, Iran, Nepal, Bangladesh and India. The improvement was found be very marginal for the top-ranking countries over the period of study (signifying saturation), whereas moderate or high improvement was noticed for the countries which were having low or moderate ICT access during 2012.

In Table 3, an effort has been made to explore the natural grouping of the select Asia-Pacific countries with respect to the ICT access and digital skill during 2012–2017. In doing so, first, the countries were classified into two clusters (low and high) with respect to the two dimensions, and subsequently these countries were placed in any of the four possible combinations as depicted in Table 3. It is evident that Bangladesh, Bhutan, Cambodia, China, India, Indonesia, Iran, Jordan, Kyrgyzstan, Lao PDR, Mongolia, Myanmar, Nepal, Pakistan, Palestine, Philippines, Sri Lanka, Syria, Thailand and Uzbekistan were clustered as low digital skill and low ICT access countries during 2012, whereas countries such as Bahrain, Cyprus, Israel, Japan, Kazakhstan, Oman, Qatar, Russia, Saudi Arabia, Singapore, South Korea and UAE were found to be in the high digital skill and high ICT access quadrant during

Table 3.
Clustering of Asia-Pacific countries during 2012 and 2017 in terms of ICT access and digital skill

Clusters	2012	2017
Low ICT access and low digital skill	Bangladesh, Bhutan, Cambodia, China, India, Indonesia, Iran, Jordan, Kyrgyzstan, Lao PDR, Mongolia, Myanmar, Nepal, Pakistan, Palestine, Philippines, Sri Lanka, Syria, Thailand and Uzbekistan (20)	Afghanistan, *Bangladesh, Bhutan, Cambodia, India, Indonesia, Kyrgyzstan, Lao PDR, Mongolia, Myanmar, Nepal, Pakistan, Palestine, Philippines, Sri Lanka, Syria,* Timor-Leste and *Uzbekistan* (18)
High ICT access and low digital skill	Armenia, Azerbaijan, Brunei Darussalam, Georgia, Lebanon, Malaysia, Maldives and Turkey (8)	*Armenia, Georgia* and Iran (3)
Low ICT access and high digital skill	(0)	China and Thailand (2)
High ICT access and high digital skill	Bahrain, Cyprus, Israel, Japan, Kazakhstan, Oman, Qatar, Russia, Saudi Arabia, Singapore, South Korea and UAE (12)	Azerbaijan, Brunei Darussalam, *Bahrain, Cyprus, Israel, Japan,* Jordan, *Kazakhstan,* Kuwait, Lebanon, Malaysia, Maldives, *Oman, Qatar, Russia, Saudi Arabia, Singapore, Korea (Rep.),* Turkey and UAE (20)

Note(s): Values in parenthesis indicates the number of countries
Countries marked by italic letters are found common in the same category for both the years
Source(s): Author's own compilation

the same period. A total of eight (Armenia, Azerbaijan, Brunei Darussalam, Georgia, Lebanon, Malaysia, Maldives and Turkey) countries were noticed to be falling under the high-low quadrant in 2012. Altogether, a total of 30 countries continue to be on the same quadrant in 2017 (countries marked by italic letters in Table 3) as compared to 2012, which suggests that majority of the countries maintained status quo in terms of the state of ICT access and digital skill during the period of study. Improvement in the ICT access enabled Iran to be shifted from low–low category to a high–low category in 2017. On the other hand, China and Thailand has shifted from low–low to low–high quadrant by improving the level of digital skill amongst the people during the study period. In the similar fashion, Azerbaijan, Brunei Darussalam, Lebanon Malaysia, Maldives and Turkey also have been able to augment the level of digital skills to shift from high–low to high–high category. Significant improvement in both access and digital skill helped Jordan to upgrade itself from a low–low to a high–high category country during 2017.

5.2 Role of digital skill in explaining DD

The role of digital skill in augmenting the ICT access *vis-à-vis* narrowing DD is analysed in Table 4 by using panel data regression framework. The value of $\overline{\chi}^2$ in the BP test was found statistically significant suggesting the application of panel data regression framework instead of constant coefficient model (CCM). Further, the χ^2 value as obtained from the Hausman test was observed to be statistically insignificant, which signifies that REM is applicable rather than FEM. The outcome of the REM as presented in Table 4 shows that the coefficient associated with the digital skill was found to be positive and statistically significant, which clearly underscores that the digital skill played an instrumental role in narrowing the DD in the Asia-Pacific region during the period of the study which is consistent with the findings of the studies carried out by Song *et al.* (2020) and Maji and Laha (2020). This finding is in tune with the theoretically accepted notion that unless and until the people are digitally skilled, the DD can never be mitigated. It is true that there are a number of other factors that drives the development of the digital access. However, without imparting adequate digital skill, bridging the existing DD will remain as distant dream as it is possible that an educated person with reasonably high level of income is unable to reap the advantages of the digital technologies only due to the lack of digital skill.

Outcome of various studies also exhibits that the level of education in a country is a significant determinant of the ICT access. The coefficient associated with the education was also found to be positive and statistically notable which conforms to the accepted theoretical

Variables	Coefficient	*Z*-value	*p*-value
DIGSK	0.199	8.40	0.000
EDU	0.035	2.15	0.041
GNI	0.757	5.60	0.000
POP	−0.040	−0.96	0.336
URBAN	0.019	3.25	0.001
PVTCRD	0.002	1.19	0.234
OPEN	0.003	2.11	0.035
Constant	−3.372	−2.47	0.014
$\overline{\chi}^2$ (BP test)	165.42	*p*-value	0.000
χ^2 (Hausman test)	14.62		0.312
Wald χ^2	687.88		0.000
Model	REM	*N*	184

Source(s): Author's own calculation

Table 4.
Result of panel data regression

conviction. With increased level of education on one hand, it becomes easier for the people to use various digital technologies, and one the other hand, the demand for the digital technologies gets augmented with the increase in the level of education. Moreover, education is a quintessential enabling factor that boosts the digital skill and thereby reduces digital inequality. The positive effect of education in reducing digital inequality is also well documented in the literature (Vicente and Lopez, 2008; Cuervo and Menéndez, 2006; Cruz-Jesus *et al.*, 2016; Agrawal and Asrani, 2018; Maji and Laha, 2020).

Perhaps one of the most important factors that determine the state of ICT access is the level of income of the people in a country as it directly influences the budget constraints of the individuals (Dewan *et al.*, 2005). With the increase in the level of income, the purchasing power of the people enhances and the use of ICT becomes affordable for them. Therefore, the level of income exacerbates positive effect on the demand of the digital technologies and thereby reduces the DD. This finding is similar to the outcomes of the studies carried out by Quibria *et al.* (2003) and Mocnik and Sirec (2010). The significant and positive effect of income supports the economic demand theory, which propagates that higher income facilitates easy entry and process of saturation of the technology by the people in an economy (Nipo *et al.*, 2014).

Another demographic attribute, i.e. the proportion of urban population to total population, was also found to be affecting the ICT access favorably. It is natural that people in the urban area have more demand of the digital services because of better infrastructure, technological advancement and higher standard of living. Moreover, greater the urban population, there will be more need of information intensive products and services, and therefore digital economy is expected to get boosted (Dewan *et al.*, 2005). Therefore, if the proportion of urban population is higher, the ICT access is expected to flourish. The outcome of the study revealed that the effect of urban population was found to be positive and statistically notable during the period of study that is consistent with the findings of Cruz-Jesus (2018).

In a relatively more open economy, there exists greater competitiveness that in turn creates more opportunity for the digital access dimension to flourish. Greater openness allows the entry of the foreign firms and participation of the domestic firms in the process of globalisation. Moreover, such competition favourably affects the cost of digital technologies including devices and gadgets etc. that makes the digital technology affordable to the people leading to reduction of the digital inequality. Further, openness of the economy offers greater incentives to the entrepreneurs, innovators, providers of finance, customers and employee workers (Murthy and Nath, 2009). From the analysis of Table 4, it was also observed that openness of the economy was found to be exerting a significant positive effect on the access dimension of the digital economy that is consistent with the findings of the study carried out by Murthy and Nath (2009).

6. Conclusions and policy implications

Advancement in the ICT has transformed almost every sphere of human lives. As a matter of fact, development of ICT has become one of the prerequisites of socio-economic development of a country. This study made an effort to investigate into the presence of DD amongst the countries in the Asia-Pacific region. The outcome of the study revealed the existence of digital disparity amongst the Asia-Pacific countries. The state of ICT access was found to be satisfactory in some countries such as Bahrain, Cyprus, Israel, Japan, Qatar, Singapore, South Korea, UAE, Azerbaijan, Brunei Darussalam, Kazakhstan, Kuwait, Lebanon, Malaysia, Oman, Russia and Saudi Arabia, whereas large number of Asia-Pacific countries (Afghanistan, Bangladesh, Bhutan, Cambodia, India, Myanmar, Nepal, Pakistan, Palestine, Timor-Leste, Lao PDR, Indonesia, Philippines, Sri Lanka, Syria, Kyrgyzstan, Armenia, China, Georgia, Jordan, Maldives, Mongolia, Thailand, Turkey and Uzbekistan) were at the low or

moderate level of development in terms of ICT access. Such a contrasting picture speaks about the presence of access based DD in the region.

Attempt was also made to unearth the mitigating role to be played by the digital skill in narrowing the DD. The outcome of the study unequivocally reiterated that digital skill along with high level of education possess the potential to take care of such digital disparity. In addition, level of income, openness of the economy and degree of urbanisation were also observed to exert positive effect on the ICT access. Therefore, in the light of the findings of the study, it can be concluded that appropriate policy decisions must be taken by the Governments of the Asia-Pacific countries in broadening the ICT infrastructure on one hand and also augmenting the digital skill along with general level of education on the other hand to reap the fruits of digital revolution.

Notes

1. "Inclusive and quality education for all and promote lifelong learning".
2. "By 2030, substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship".
3. "Proportion of youth and adults with information and communications technology (ICT) skills, by type of skill".
4. ITU is a specialised United Nations agency entrusted with responsibility to promote and monitor the digital development across the various countries of the globe. Further, ITU is also responsible for developing the methodology and collect data to produce the data on SDG indicator 4.4.1 (Montoya, 2017).

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