International Journal of Religion
2024
Volume: 5| Number 11 | pp. 4316 – 4324
ISSN: 2633-352X (Print) | ISSN: 2633-3538 (Online)
ijor.co.uk
DOI: https://doi.org/10.61707/5ytxj483

Digital Readiness in Emerging Markets: The Role of Digital Skills and Connectivity in Driving Digital Economy

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Abstract

This study examines the impact of digital skills and internet access on the participation of citizens in the Republic of Kosovo in the digital economy. Data were collected using structured questionnaires from 326 respondents across various regions of Kosovo. Given the data structure, the study employed logistic regression analysis to investigate the relationship between digital skills, internet access and engagement in digital economic activities. The results indicate a significant positive relationship between internet access and digital skills with engagement in the digital economy. Specifically, individuals with higher digital skills and better internet access demonstrate higher levels of participation in digital economic activities. Furthermore, the study identifies demographic factors such as age and profession that significantly influence digital engagement, highlighting the need for targeted policy interventions to close the digital gap. These findings suggest that improving digital infrastructure and developing skills, especially to elders and rural living are crucial for enhancing engagement in digital economic activities. These insights provide a valuable overview of the current situation and reveal that even in emerging countries, access to the internet might be high. Moreover, can serve as guidance for policymakers aiming to foster a robust digital economy in Kosovo.

Keywords: *Digital skills, Internet access, Digital economy, Digital divide.*

INTRODUCTION

Adapting to technological advancement by accessing the digital resources and enhancing the ability to use them have become critical determinants of a country's economic progress. Countries around the world are struggling to keep up with the digital age, in one side recognizing how crucial it is for their economies and in the other facing constraints like the lack of digital skills in their society. The Republic of Kosovo, is no exception in this regard, as it strives to transition its economy from traditional to digital one. Considering this, it confronts a fundamental question: to what extent do its citizens possess the necessary access and digital skills to actively participate in the digital transformation reshaping industries, institutions and everyday life?

The potential of digital economy to transform Kosovo's economic landscape is high, as it may foster innovation, increase productivity and enable global connectivity. The digital economy can enhance job creation, stimulate entrepreneurship and catalyse economic growth (ECLAC 2021) helping to soften some of the current economic problems the country is facing. Currently, Kosovo has not yet set specific goals to equip its citizens with digital skills. In contrast, the European Commission has defined the Digital Skills Indicator (DSI) to track the goal of equipping 80% of European citizens with basic digital skills by 2030 (Vuorikari et al. 2022). According to the statistical office of the European Union, Eurostat, approximately 53.92% of European citizens in the EU 27 have basic digital skills, while 26.46% possess digital skills beyond the basic level (Eurostat, n.d).

The Statistics Agency of Kosovo (ASK) reports significant improvements in households in Kosovo who had access to the Internet from home. In 2017, 88.8% of families had internet access at home, rising to 97.9% by

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2022. This steady increase indicates a positive trend in internet usage among families. Additionally, the percentage of families uncertain about their internet access status decreased from 0.4% in 2017 to 0.3% in 2022, reflecting improved internet awareness and accessibility (ASK, 2022). While, in 2023, 98.6% of households in Kosovo had internet access with the highest usage among those aged 16-24 (21.5%). Internet usage was slightly higher among women (51.7%) compared to men (48.3%). Mobile phones were the primary devices used for internet access by 94.8% of individuals (ASK, 2023). However, regarding the purpose of the Internet usage, as of the yar 2020, 26% of the Kosovar citizens use it to get information from the app's website, 9.4% to download or print the official form and 5.3% to submit completed forms online (ASK, 2020). As we see the data offer by official are incomplete, leaving room for further research in the field.

This research aims, primarily to investigate the relationship between access to digital technologies and digital skills and how those variables impact the ability of Kosovar citizens to engage in the digital economy. Moreover, we aim to unveil the digital divide in Kosovar society. Specifically, it aims to test the following hypothesis:

H1: Individuals with access to digital technologies and proficient digital skills will demonstrate higher levels of engagement in digital economy activities.

The significance of this research is substantial, particularly for nations aspiring to cultivate a robust digital economy. It can illuminate the potential economic advantages of investing in digital infrastructure and education, aiding policymakers in allocating resources strategically. Furthermore, this study might uncover variances in access to digital skills across various demographic groups or geographical areas within Kosovo. These findings are crucial for governmental interventions to address the digital divide, ensuring equal opportunities for all citizens to capitalize on the digital era.

The rest of this paper is organized as follows: section 2 provides a comprehensive overview of pertinent literature. Section 3 describes the data employed in this study and the specific empirical model utilized. Section 4 presents the descriptive and empirical findings derived from the study. Lastly, Section 5 encompasses the conclusions drawn from the research.

LITERATURE REVIEW

The Concept of Digital Skills

The concept of digital skills has undergone significant transformation over the past few decades, transitioning from technical competencies in the 1980s and 1990s to a more comprehensive set of abilities required for navigating the modern digital landscape (Gui, Fasol and Carradore, 2017). Early definitions focused on operating computer equipment, but the advent of the Internet and the vast amount of available information has expanded the scope to include information consumption and critical evaluation skills (Aviram and Eshet-Alkalai, 2006). Despite extensive research, a universally accepted indicator for measuring digital skills remains elusive due to diverse research objectives and the multifaceted nature of digital skills (Dalloshi and Kyqyku, 2023). The same stands also for digital economy (Watanabe et al., 2018)

Literature demonstrate that digital skills are essential drivers of innovation and economic growth (Davydenko, Kolomytseva and Kolesnikova, 2020; Balcerzak and Pietrzak ,2017; Xia, Baghaie and Sajadi, 2024; Goyal, 2021). Davydenko et al. (2020) and Balcerzak and Pietrzak (2017) emphasize the transformative power of digitization, which reshapes business models and markets. Moreover, they list the key innovation drivers in the digital era, such as personalized customer experiences, servitization of goods and organizational restructuring to enhance employee engagement. The underscore of the importance of technological innovation and the digital economy for sustainable economic development is also pointed out by Ding et al. (2022). Their findings suggest that the digital economy enhances economic quality and exhibits notable spatial spill over effects, advocating for strategic digitization efforts to reduce regional disparities. Upgrading the digital workspace is also identified as a crucial factor for fostering innovation (Dery, Sebastian and Meulen, 2017). However, it also poses challenges including job displacement, business closures, increased digital crime and social disruptions (Katz, 2017).

Literature shows that socio-economic factors play a significant role in shaping digital literacy and contributing to the digital divide. Urbancikova et al. (2017) identify age, education, income and family structure as pivotal

factors influencing digital literacy in Slovakia. Conversely, Mubarak et al. (2020) demonstrate that higher income and education levels correlate positively with ICT diffusion across 191 countries, highlighting poverty as a critical factor in the global digital divide. Comparative analyses by Afonasova et al. (2019) reveal significant disparities between Russia and EU countries in terms of internet access and high-tech exports, indicating areas for improvement in innovation. Additionally, regional studies by Balcerzak and Pietrzak (2017) highlight the need for tailored strategies to address the unique challenges faced by Visegrad countries. Recently, the COVID-19 pandemic has exacerbated these disparities, underscoring the need for policies that promote digital equality and societal inclusion (Boğa and Aldanmaz, 2021).

The significance of digital skills is most clearly demonstrated during the COVID-19 pandemic, as highlighted by numerous authors and reports (Pawlicka, Tomaszewska & Krause, 2022; Carrabregu-Vokshi et al., 2023; Götz et al., 2021). This period underscored the crucial role of digital skills, as a significant number of workers and students were compelled to transition to remote work and learning, necessitating proficiency in technology use. In practice, digital skills have become indispensable in various other domains, such as healthcare, online shopping for groceries and education. Consequently, access to online platforms and the ability to engage in remote work are closely intertwined with digital skills (Hecker, Spaulding and Kuehn, 2021)

The Concept of Digital Economy

Capturing the digital economy is relay hard. It is even more hard to distinguish it from traditional economy (Mondekar, 2017; Irtyshcheva, 2021). Its definition is widely and the activities that represent it are numerous. However, researches use different metrics to capture it. In this regard, Xia et al. (2024) found that digital economy typically includes activities such as e-commerce, digital marketing, digital financial services, digital content production, software, computer games, cloud services and other. Additionally, Abdulkarim et al. (2023) emphasize that existing definitions of the digital economy commonly emphasize the use of telecommunication and technology. However, they vary in terms of the extent and composition of their social, economic and governmental impacts. Generally, these definitions tend to focus predominantly on economic impacts, often relegating considerations of social wellbeing and governance. Those authors show that in many scientific papers the digital economy is trying to capture economic, social and governmental activities that help improve human life, reliant on or enhanced by the use of Information and Communication Technologies (ICT). But, is it possible to do that, considering the huge impact on technology in today's economy? However, capturing digital economy using different indexes crated by international and well-known organizations is commonly in literature. Afonasova et al. (2019) to compare Russia's digital economy and society with those of EU countries, examine components such as the ICT Development Index, Global Innovation Index (GII), Network Readiness Index, share of households with internet and high technology exports. The same indexes and in the same context are used also by Grigorescu et al. (2020). In the other side, there are also other methods used to capture digital economy, such as Zhanga & Li's (2023) approach. These researchers measure the digital economy by evaluating both digital industrialization and industry digitalization. Digital industrialization encompasses core digital economy sectors like product manufacturing, services, technology applications and digital drivers. Industry digitalization, on the other hand, involves integrating digital technologies into traditional industries. Moreover, DESI is an index widely used to capture digital economy (Török , 2024; Dalloshi and Kyqyku, 2023).

RESEARCH METHODOLOGY

Data and Sample

This research utilized quantitative methods to test the hypotheses. The primary data was gathered through a structured questionnaire, initially aiming to survey a minimum of 300 individuals. Ultimately, 326 questionnaires were collected. The target population consisted of Kosovar citizens, including various demographic groups across different regions of Kosovo considering that the objective was to obtain a representative sample of the population to ensure the findings could be generalized.

The questionnaire comprised 26 questions, both closed and open-ended, allowing respondents to provide their answers or opinions. The questions were designed to collect demographic information, data on access to information technology and respondents' self-assessment of their digital skills and how they were acquired.

The research was conducted over a period of less than three months. The questionnaire was distributed to participants via Google Forms as well as using face to face data collection in order to do not bias the sample. The collected data were subsequently processed and analyzed using the software for statistical data analysis.

Model and Variables Specification

Considering that our dependent variable is binary, taking the value of *0* for those who are not or less engaged in digital economy and *1* otherwise, we utilize the multiple logistic regression of the following form suggested by Ronald et al., (2007).

$$\pi = \frac{\exp\left(\beta_0+\beta_1 X_1+\beta_2 X_2+\cdots.+\beta_k X_k\right)}{1+\exp\left(\left(\beta_0+\beta_1 X_1+\beta_2 X_2+\cdots.+\beta_k X_k\right)\right.} \quad (1)$$

where:

π is the probability that the dependent variable Y equals 1 (i.e., $P(Y=1)$, β_0 is the intercept, $\beta_1, \ldots\ldots \beta_k$- are the coefficients for the independent variables $X_1, \ldots. X_k$.

The functional model, presented later in, aligns with the findings of Wicht, Reder and Lechner, (2021), who identified ICT use and socio-demographic characteristics as key determinants of an individual's ICT skills. To conduct the analysis and test the hypothesis, the necessary variables were first defined.

Table 1. Variable description

Variables	Description
DEA- Engagement in digital activities	This variable is constructed based on a composite digital engagements score calculated based on the average response on the following digital activities: Email, social media, Entertainment, Online Purchase (e-commerce), E-banking, Gig and Sharing Economy & Accommodation; working as Freelancer. Response options were: 1= Never; 2= Rarely; 3= Occasionally; 4= Sometimes; 5= Very often. If the composite score was less than or 3 it is coded as 0 and 1 otherwise.
A- Internet access and usage	This variable measures the frequency of internet usage among respondents. It captures the self-reported frequency with which individuals use the internet, ranging from "very often" to "not at all."
DS- Digital skills	This variable is a composite digital skills score calculated based on the average response on the following digital skills: How confident do you feel with your abilities to use digital technology? [I can easily search/browse for information on the Internet.] [I can distribute files and content using information technology.] [I can use online communication tools such as Google Meet, Zoom, etc.] [I have no problem applying online for any job] [I can easily buy products and services online] [I have no problem making payments through e-banking] [I have no problem obtaining official documents online] [I can create content (photos, videos, music) and share it on social media for marketing purposes] [I am able to perform detailed data analysis and draw conclusions] [I know how to protect myself from online scams (e.g., spam, identity theft, etc.)] The options to be chosen was: 1= Strongly disagree; 2= Disagree; 3= Neutral; 4= Agree; 5= Strongly agree. If the composite score was less than or 3 it is coded as 0 and 1 otherwise.
Gender	Male is coded as 0 and Female as 1
Age	Age is divided into two groups: those less than 35 years, coded as 0 and those 35 years or older, coded as 1.
Residence	Urban is coded as 0 and Rural as 1.
Education	Those with higher education is expected to have higher engagement in digital economy, therefore we use 0 for those with Bachelor or higher diploma, compared to those with secondary or less, coded as 1.
P -profession	This is a binary variable that distinguishes professions expected to use ICT more frequently than others: IT professionals, economists, architects and engineers, are coded as 1; all other professions are coded as 0.

Before running the logistic regression, we test the reasonableness of Sample Size for Logistic Regression. In logistic regression, a common rule of thumb for determining if the sample size is adequate is to have at least 10

events per predictor variable (EPV) (Concato et al., 1995). This means that for each independent variable in the model, we should have at least 10 cases of the less frequent outcome (events).

Formula for calculating EPV is:

$$EVP = \frac{Number\ of events}{Number\ of\ Predictors} \quad (2)$$

We have 202 events (engagements in digital economy) out of 326 observations and 7 predictors, therefore the EPV=202/7≈28.9 indicates that the sample size is more than adequate for logistic regression. This is well above the commonly recommended minimum of 10 EPV, suggesting that our model is likely to provide stable and reliable estimates.

RESEARCH RESULTS

Descriptive Statistics

The research surveyed 326 participants, focusing on various demographic parameters including gender, age, residence and level of education. Given that literature shows important implication of demographic factors on the participation of citizens in digital economy, these data are important for our analysis and model specification. The gender distribution indicates a significant majority of male respondents with 66%, (n = 216) compared to female respondents with 34%, (n=110). The majority of respondents fall within the younger age groups, with 36% (n=116) aged 18-25 years and 37% (n=122) aged 26-35 years. A large proportion of respondents reside in urban areas, 69% of them (n=225), compared to 31% from rural areas (n=101). The respondents are generally well-educated, with 40% (n=132) holding a Bachelor's degree and 34% (n=112) having completed a Master's degree.

Table 2. Respondents demographic data, N=326

		N	Percent
Gender	Female	110	34%
	Male	216	66%
Age			
	18 - 25 years old	116	36%
	26 - 35 years old	122	37%
	36 - 45 years old	43	13%
	46 - 55 years old	31	10%
	56 - 65 years old	14	4%
Residence	Urban	225	69%
	Rural	101	31%
Education	High school or less	64	20%
	Bachelor's degree	132	40%
	Master's degree	112	34%
	Doctorate	18	6%

The functional form of the model employed to test the hypothesis that: Individuals with access to digital technologies and proficient digital skills will demonstrate higher levels of digital economy engagements, is:

Model 1: $logit(DEA_i) = a + \beta_1 DS_i + \beta_2 A_i + \beta_3 Gen_i + \beta_4 Age_i + \beta_5 Res_i + \beta_6 Edu_i + \beta_7 P_i + \varepsilon_i$ (3)

Model 2: $logit(DEA_i) = a + \beta_1 A_i + \beta_2 DSself_i + \beta_3 Gen_i + \beta_4 Age_i + \beta_5 Res_i + \beta_6 P_i + \varepsilon_i$ (4)

In the following table, we present two model results. The key difference between these models lies in how the digital skills variable is measured. The first model measures digital skills by capturing a broader range of variations. While, in the second model, digital skills are assessed based on the respondent's confidence in their ability to use digital technology.

In the following, the model goodness of fit tests results is presented.

Table 3. Goodness-of-Fit Tests

	Model 1	Model 2
Model Chi-Square [df]	68.48(7) ***	74.45(6) ***
Pearson Chi-square Test[df]	55.08(47)	59.30(56)
Hosmer-Lemeshow Test[df]	12.90(8)	2.72(8)
Area under ROC curve (AUC)	0.7526	0.7542

The notations *, ** and *** correspond to significance levels of 0.1, 0.05 and 0.01, respectively

The model chi-square statistics for both Model 1 and Model 2 are highly significant ($p < 0.001$), indicating that both models provide a good fit to the data and that the predictors collectively contribute to explaining the variance in engagement in the digital economy. Moreover, we run some other goodness of fit tests such as: the Pearson chi-square test that assesses the discrepancy between observed and expected frequencies; the Hosmer-Lemeshow test that evaluates the goodness-of-fit by comparing observed and predicted probabilities within deciles of risk and the AUC values to indicate the discriminative ability of the models. Results of these test are presented in the following.

Both Model 1 and Model 2 demonstrate good overall fit and predictive power for engagement in the digital economy. Model 2 shows slightly better goodness-of-fit according to the Hosmer-Lemeshow test and marginally better discriminative ability as indicated by the AUC. Therefore, both models are effective.

Table 4. Regression results

Dependent variable	Model 1 DEA	Model 2 DEA
DS	1.566 (3.7) ***	
A	1.468 (2.94) ***	1.514 (3.11) ***
DS. Self		0.711 (4.43) ***
Gen	0.767 (2.7) *	0.675 (2.37) *
Age	0.004 (0.03)	0.158 (0.56)
Res.	-.046 (-0.17)	-.119 (-0.44)
Edu.	0.200 (0.59)	
P	1.095 (3.56) ***	0.875 (2.91) ***
Constant	-7.21 (-3.62) ***	-8.24 (-4.17) ***
Obs.	326	326

The notations *, ** and *** correspond to significance levels of 0.1, 0.05 and 0.01, respectively

The regression results for DS variable show that the coefficient of 1.566 implies that individuals with advanced digital skills are more likely to engage in the digital economy compared to those without such skills. Specifically, using the Odds Ratio=$e^{\text{coefficient}}$, we calculate that the odds of engaging in the digital economy are approximately 4.79 times higher for individuals with advanced digital skills. In the same vein, the model 2, that measure the digital skills with the confidence level expressed by responders, shows same results, indicating the stability of the models. Moreover, both models show a positive effect of internet access in the digital economy engagement. The coefficient of both models indicates that as the frequency of internet usage increases (from "Not at all" to "Many times a day"), the likelihood of engagement in the digital economy (DEA) increases. A p-value of 0.003 is highly significant, suggesting a strong relationship between A (access to internet) and DEA. So, for every one-unit increase in the frequency of internet usage the log-odds of engaging in the digital economy increase by approximately 1.468 for model 1 and 1.514 for model 2.

The demographic variables such as Gender, Age and Residence are commented in the following. Specifically, being female is associated with a higher likelihood of participating in digital economic activities. Being female increases the log-odds of engaging in the digital economy by approximately 0.767 compared to males. Moreover, the p-value of 0.007 suggests a very strong relationship between gender and DEA. These findings align with reports from ASK, which indicate that internet usage in Kosovo is slightly higher among women (51.7%) compared to men (48.3%) (ASK 2023), but are not supported by the literature in general.

Age is another determinant in participating in digital economy (Sandhu et al., (2013). It is supposed that younger people are more likely to engage in in digital economic activities due to better digital skills. However, the near-zero coefficient (0.004) indicates that age has no significant impact on the likelihood of engagement in the

digital economy in Kosovo. In the other side, the negative coefficient for residency (-0.046) suggests that residing in a rural area slightly decreases the likelihood of engaging in the digital economy compared to residing in an urban area.

Literature suggest that having better education increases the likelihood of engaging in digital economy. However, the variable for educations with positive coefficient of 0.200 indicates that higher education slightly increases the likelihood of engaging in the digital economy but the effect of education on DEA is not statistically significant. It might be that the effect of education is captured by the variable expressing profession. The coefficient of 1.056022 implies that being in a profession that extensively uses the digital economy increases the log-odds of engaging in the digital economy by 1.056 units compared to being in a profession that does not. To interpret this in terms of odds, we can exponentiate the coefficient of 1.095 equivalent to 2.99 odds ratio, means that individuals in professions that extensively use the digital economy are approximately 2.00 times more likely to engage in the digital economy compared to those in professions that do not. Our findings are in line with those of (Wicht, A., Reder, S., & Lechner, M. C., 2021) who suggests that hands-on experience with digital technologies play a crucial role in developing digital skills necessary for active participation in the digital economy.

CONCLUSIONS

This study represents a part of the analysis of the impact of digital skills and access in increasing the activities of the digital economy in an emerging market. Moreover, the applied methodology was designed to assess the socio-demographic variables on the activities of the digital economy. The regression analysis confirmed the hypothesis that individuals with better access to digital technologies and proficient digital skills are more engaged in digital economic activities. Moreover, the study reveals that those in certain professions (e.g., IT professionals, economists, architects) are more likely to engage in digital economic activities, highlighting the need for the incorporation of digital subjects in early education.

Our findings reveal one important fact, that while internet access is widespread in Kosovo, there are still significant disparities in digital skills among different population groups. Additionally, it is shown that those living in rural areas are less likely to participate in the digital economy, indicating the need for targeted digital skills training for this demographic group and the importance of continuous investment in digital education to ensure inclusive of all citizens.

The results have important policy implication, suggesting policymakers to undertake educational reforms and prioritize initiatives that enhance digital skills, particularly in rural areas and in the early education. By addressing these gaps, Kosovo can leverage the digital economy's potential to drive innovation, productivity and overall economic development.

We consider that other researchers interested in this field should consider to incorporate other relevant variables that might influence digital engagement in the economy, especially those variables that capture the overall economic development. Moreover, we suggest to include larger and more diverse samples to enhance the generalizability of the findings. While this study relies on self-reported data, which may be subject to biases, such inaccurate self-assessment of digital skills, future research could incorporate objective measures of digital skills and engagement.

In conclusion, study provides a comprehensive understanding of the factors influencing digital participation in Kosovo, offering a foundation for future research and policy development to support the country's digital transformation.

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