UDC: 338.121:004(497-15)
Professional paper

EXPLORING CHALLENGES AND BARRIERS TO ICT ADOPTION AND THEIR SIGNIFICANCE IN THE WESTERN BALKAN ECONOMIES

Filloreta BRAHIMI[1], Mimoza MALOKU[2]

[1]*Filloreta Brahimi PhD Candidate, Faculty of Economics, University of Gdansk, Poland (Tel: 0038349334431; e-mail: filloretamaxhuni@gmail.com)*
[2]*Mimoza Maloku AAB College, Faculty of Psychology mimoza.maloku@universitetiaab.com*
Corresponding author: filloretamaxhuni@gmail.com

Abstract

The ICT industry in the Western Balkans presents a highly advanced and favorable sector with substantial potential to positively influence economic development. This sector has demonstrated great potential in creating new employment opportunities for young entrepreneurs, thereby positively impacting the region's export levels. Economic growth models emphasize the role of technology in maintaining productivity and economic development. This paper presents a literature review highlighting the impact of ICT on productivity within the Western Balkans (WB) and the structural convergence of the region. Utilizing secondary data and analyses from various scholars, this review explores different indicators for each country in the Western Balkans: Albania, Bosnia and Herzegovina, Kosovo, Macedonia, Montenegro, and Serbia. The initial conclusion indicates that while the Western Balkans exhibit a tendency towards productivity convergence among themselves and towards the EU, this progress lags behind the pace of GDP per capita convergence. The impact of ICT development in the region is significant both at the firm level and in terms of overall economic growth, yet it remains behind other regions. Promoting incentives for ICT businesses and fostering innovation is crucial to enhancing the region's economic competitiveness.

Keywords: ICT, Technological advancements, Economic development, Economic growth, Convergence

1. Introduction

Information and Communication Technology (ICT) refers to an economic system based primarily on digital technologies, including the Internet, mobile devices, computing, and other emerging technologies. The digital economy, facilitated by ICT tools, involves the production, distribution, and consumption of goods and services. ICT plays a fundamental role in transforming traditional business models, stimulating innovation, and shaping new economic activities. This transformation fosters connectivity and fundamentally changes how businesses operate and interact with consumers. Digitization has a profound effect on various sectors, promoting efficiency, innovation, and global connectivity.

https://doi.org/10.62792/ut.evision.v11.i21-22.p2710

Economic convergence has garnered significant interest among economists, with ICT's role in shaping this convergence receiving increased attention. Economic convergence refers to the phenomenon whereby less prosperous nations experience a more rapid rate of economic growth than wealthier countries (Barro & Sala-i-Martin, 1992). This literature review aims to provide an overview of key studies and findings on how ICT affects economic convergence, particularly in the Western Balkans—a region marked by historical complexity and geopolitical dynamics undergoing transformative economic changes.

The countries in this region are striving for integration into the European framework, making economic convergence a critical theme. This paper explores the complex process of economic convergence in the Western Balkans, including Kosovo—a country emerging from a turbulent history to shape its economic destiny. The late 20th-century conflicts and political changes

posed unique challenges for the Western Balkans, complicating their path to stability, development, and convergence with Europe's stable economies (Bonomi & Uvalić, 2019).
This journey has involved political reforms, institutional restructuring, and significantly, the integration of ICT as a catalyst for economic growth. This paper examines the dynamics of economic convergence in the Western Balkans, highlighting the unique challenges and opportunities facing these countries. By exploring ICT's role in driving economic development, we contribute to understanding how the region is navigating convergence complexities, paving the way for sustainable growth and European economic integration (Kostoska & Hristoski, 2017).
Economic catch-up processes in EU Member States in the Central and Eastern European (CEE) region have generally progressed more rapidly than in the Western Balkans. The Yugoslav wars of the 1990s caused significant damage, delaying the economic transition process in many Western Balkan economies by nearly a decade. Despite this delay, Western Balkan countries have made notable progress towards EU membership, moving closer to alignment with EU-28 Member States (Siljak & Nagy, 2018).
This paper reviews relevant literature to provide insights into the region and individual countries. During the EU-Western Balkan Summit on October 6, 2021, the European Union and six Western Balkan economies agreed to enhance cooperation in research, innovation, and education. This agreement underscores the long-term goal of EU membership and aims to promote scientific excellence and educational reform in Albania, Bosnia and Herzegovina, Kosovo, North Macedonia, Montenegro, and Serbia. The strategy includes increasing investment in research and education, fostering knowledge-based societies, and evidence-based policymaking, transforming national research and innovation ecosystems, and enhancing education and training quality. All six economies are expected to associate with the EU's R&D Programme Horizon Europe (Radovanovic et al., 2023).

2. Methodology

The method used for this research is the qualitative method, which means that in our research we have not generated data, but we have made a description of the existing data based on those that have been published. When we are dealing with qualitative research, the review of the literature and the acquisition of data must be done from sites that are official and considered reliable. This section outlines the systematic literature review and secondary data analysis methods used in this study (Aysan & Nanaeva, 2022; Aysan & Ünal, 2021; Rohman et al., 2021; Kayani et al., 2019). The research primarily relies on reviewing existing scientific literature and analyzing secondary data to examine ICT's role in economic convergence in the Western Balkans. By reviewing a broad range of scholarly works, this literature review identifies gaps and builds on existing research. Additionally, data from previously published literature and the World Bank Database reinforce the validity and reliability of our conclusions. This methodological approach aims to provide valuable insights into the importance of ICT for economic development in the región. In this research, the database source is derived from Google Scholar, which has been used to report a wide variety of journal and conference proceedings through Google Chrome.The research procedure has gone through three stages to reach a conclusion.
The first phase was the collection of materials, so first a variety of articles were chosen since our focus of the study was on challenges and barriers to ICT adoption and their significance in the Western Balkan economies. This was done through the selection of research that contained keywords from our research.
The next phase, in this case, the *second phase* of the research, included a descriptive review: In this phase, the most detailed selection of relevant researches is made, taking into account that

they are research of the last years, approximately the last 7 years, and of the countries that they belonged to in the Western Balkans. Papers that were not focused on this aspect were eliminated from our collected literature. After this stage of division, the number of articles received was reduced to the number that we considered the most important to examine in our research.
The last phase, the third in a row, includes the analysis of those articles selected and discussed in this research, which have just been presented and discussed here.

3. ICT and Economic Growth

Numerous researchers have explored the connection between ICT and economic growth. Romer (1990) highlighted the significance of technological advancements, including ICT, in driving long-term economic expansion. Acemoglu and Robinson (2002) emphasized the role of inclusive institutions, fostered by technological progress, in promoting sustained economic development and convergence. The Solow model (1956) predicts that among economies with similar characteristics, income will tend to converge from less developed to more developed economies. This convergence model suggests that if developing countries meet certain conditions such as political and economic stability, good governance, and a favorable business environment, they can expedite their development process and catch up to developed countries (Meksi & Xhaja, 2014). Neoclassical economists of the 1950s and 1960s recognized the critical role of technology in enabling long-term per capita growth.
Moore's Law describes the extraordinary rate of technological progress, encompassing more than just processing power. Some experts estimate improvements up to a billion-fold in-memory storage and a ten-thousand-fold increase in communication speed (Kessler, 2017). The impact of ICT on economic growth is often examined through total factor productivity, which measures output increases while holding capital and labor inputs constant. Growth accounting frequently uses the Solow residual to quantify technological contributions, representing unexplained growth after accounting for inputs. Biagi (2013) notes that the Solow residual can be attributed to several ICT mechanisms, including the efficient dissemination of information (e.g., cell phones and texting), reduced transaction costs (e.g., online banking), and improved organizational efficiency and productivity (e.g., enterprise software). This organizational efficiency significantly impacts both ICT-producing and ICT-using firms.
Studies by Benczes and Szent-Ivanyi (2015) confirmed the convergence of EU countries in 2004 and 2014, excluding Croatia and Luxembourg, by dividing them into old and new member states. Chapsa et al. (2015) also confirmed convergence by analyzing the incomes of old EU member states from 1955 to 2013, excluding Luxembourg. These findings highlight the conditional convergence of the EU-14. Another study by Colak (2015) analyzed the convergence of 33 countries (CEE-10 and SEE-8) towards the EU-15, indicating absolute conditional beta convergence for all groups separately.

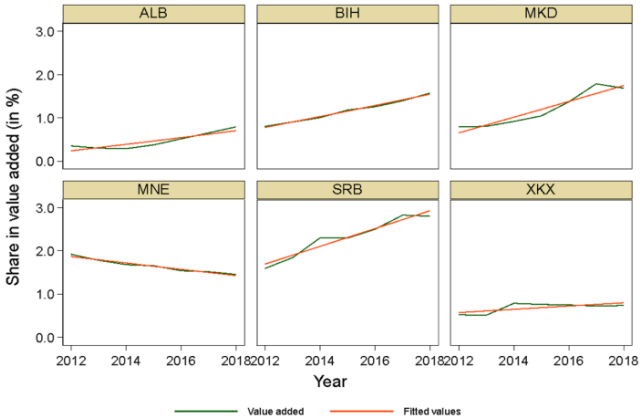

Figure 1. Contribution of the IT sector's value added to the GDP of Western Balkan economies.
Source: Matusiak et al (2022)

An in-depth examination of value chains highlights both challenges and opportunities in the Western Balkan economies, particularly within the ICT sector. According to a study by Radovanovic et al. (2023), the share of IT value-added in GDP remains relatively low across all six economies—Albania, Bosnia and Herzegovina, Kosovo, North Macedonia, Montenegro, and Serbia. Despite this, there was an increase in IT value-added and IT-related employment between 2012 and 2018, except in Montenegro. These economies play significant roles in global ICT value chains, with about 80% of the ICT sector's content being domestic. However, the low share of IT exports among the Western Balkan countries indicates a substantial potential for increased regional cooperation (Radovanovic, Gerussi, Reid, & Jevremovic, 2023).

The Western Balkan nations face numerous economic obstacles. In recent years, these countries have exhibited weak economic growth trajectories, with even the most optimistic scenarios showing low or negative growth rates. Poverty and unemployment levels remain high, and governments struggle with various difficulties in addressing these issues effectively. These challenges are illustrated in Figure 1, which shows the disparity in living standards between the Western Balkans and other European regions (European Commission, 2009).

A comparison of GDP per capita, adjusted for purchasing power parity (PPP), reveals significant disparities between the Western Balkans and EU countries. This gap is indicative of the region's lagging economic status and underscores the urgent need for policy interventions and investments aimed at boosting economic growth and convergence with the rest of Europe (IMF, 2018).

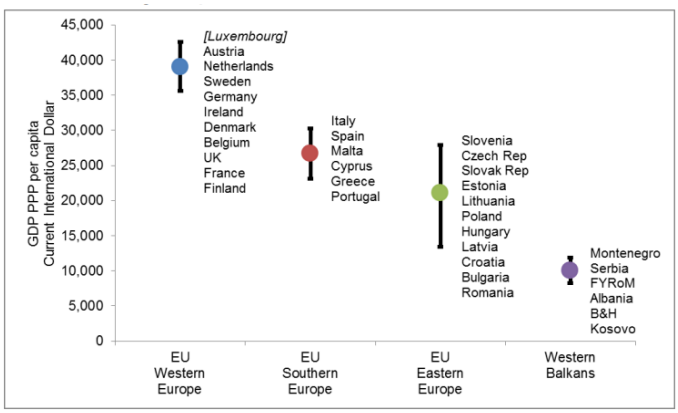

Figure 2. GDP PPP per capita Courrent International
Source: World Economic Outlook, IMF, October 2018.

Regional Disparities and ICT Adoption

In the context of economic development, the relationship between regional disparities and the adoption of Information and Communication Technology (ICT) is critical. As societies increasingly embrace digitalization, understanding how various regions engage with and utilize ICT is essential for shaping economic trajectories. The intricate relationship between technology adoption and regional disparities underscores the need for comprehensive research and analysis. This study explores the complex connections between regional economic variations and ICT integration, shedding light on the challenges, opportunities, and transformative potential that arise at the intersection of technology and regional development. Through a thorough investigation of these themes, we aim to contribute to a nuanced understanding of the evolving dynamics driving economic growth in an era characterized by rapid technological advancements (Ördögh&Tibor,2023).

Gerguri-Rashiti (2015) examined the impact of ICT adoption on reducing regional economic disparities in Kosovo. The findings suggest that increased ICT penetration plays a vital role in mitigating regional gaps and fostering economic convergence. Innovation, often driven by advances in ICT, is a key driver of economic convergence. Aghion and Howitt (1992) proposed a model highlighting the role of innovation in reducing income disparities among countries. Their work suggests that economies embracing technological advancements, particularly ICT, tend to converge with more developed counterparts.

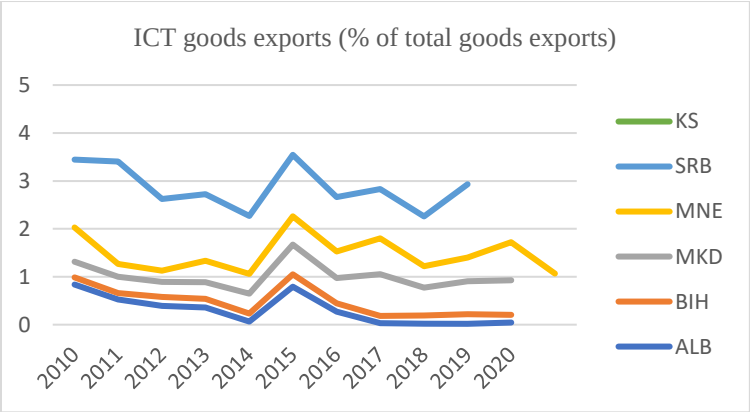

Figure 3. ICT goods exports (%of total exports)
Source: Author calculation World Bank Data

If we examine ICT export rates among Western Balkan countries (Fig. 3), Serbia's ICT sector demonstrates strong performance in export growth, surpassing other countries in the region. This indicates a high capacity for quality production in Serbia's ICT sector and highlights the country's focus on enhancing creativity and meeting diverse industry demands. The adoption of ICT in Serbia has significantly enhanced the country's global competitiveness. While countries like Albania, Bosnia and Herzegovina (BiH), Montenegro, North Macedonia, and Kosovo have emerging ICT sectors, Serbia stands out as the top performer in export earnings and value addition.

Serbia's success in the ICT sector can be attributed to several factors:

1. **Skilled Workforce**: Serbia has a highly educated workforce in ICT.
2. **Supportive Ecosystem**: Significant investments in IT hubs and business incubators support ICT companies and startups.
3. **Government Prioritization**: The Serbian government has recognized the importance of digitalization and prioritized it for development (Kleibrink et al., 2018).

Serbia's ICT exports have grown at an impressive rate, with an annual growth of over 20% in the last five years, as reported by the National Bank of Serbia (Lekić et al., 2021). These factors have attracted foreign investment and fostered innovation, highlighting Serbia's potential for further development in the digital economy (Denić & Petković, 2023).

ICT Sector Performance in Other Western Balkan Countries

Albania's ICT sector exports are growing at a rate of 9% annually, while in Bosnia and Herzegovina, the ICT sector contributes around 8.3% to GDP. North Macedonia and Kosovo are also making strides in developing their ICT sectors, though they have yet to reach the level of success needed to converge with more developed countries. Montenegro's ICT sector contributes around 5% to GDP and shows potential for growth. Kosovo and Bosnia and Herzegovina are making progress, but still face challenges compared to other Western Balkan countries (Kleibrink et al., 2018).

In Kosovo, government initiatives and investments have promoted ICT sector growth year after year, but challenges such as limited access to financing and a shortage of skilled professionals remain (Data-Driven Decision-Making is Driving Growth in Kosovo's ICT Sector, 2023). According to the Kosovo Agency of Statistics (2018) notable developments include increased internet access and usage among households. According to a 2018 survey by , 93.2% of respondents had home internet access, and 75.1% used mobile phones or smartphones to access the internet in the last three months of 2018. This indicates significant growth in internet connectivity and a shift towards mobile technology.

The integration of Artificial Intelligence (AI) and Robotics into Small and Medium Enterprises (SMEs) in the Western Balkans has profound implications for both psychological adaptation and economic outcomes. According to Kuqi, Beka, and Brahimi (2024), the adoption of these advanced technologies can significantly enhance productivity and competitiveness in SMEs. However, the transition also requires substantial psychological adaptation among employees, who must adjust to new ways of working and collaborating with AI and robotic systems. This dual impact highlights the necessity for targeted training programs and supportive policies to facilitate a smooth transition and maximize the economic benefits. The study underscores the importance of understanding the interplay between technological adoption and human factors to fully leverage the potential of Industry 4.0/5.0 innovations in the region (Kuqi, Beka, & Brahimi, 2024).

To address the ICT skills gap, Kosovo has introduced ICT courses at all educational levels, aiming to equip students with the necessary skills for the digital era. Additionally, digital tools and platforms, such as "the Future Workplace" developed by Open Data Kosovo, have been launched to strengthen the ICT market. These developments are vital for the growth of Kosovo's ICT sector and contribute to the overall digital transformation of the country (Zeybek, 2022).

Gaps in the Literature

Influences economic convergence in the Western Balkans. While existing research has examined the overall impact of ICT on economic growth in a region, there is a need for more empirical studies that explore the nuanced effects at the regional and sectoral levels. Understanding these mechanisms is crucial for developing targeted policies and interventions that can harness ICT for regional development and economic integration (Radovanovic, Gerussi, Reid, & Jevremovic, 2023).

Another area requiring further investigation is the role of ICT in fostering innovation and technological advancement in the Western Balkans. Current studies often overlook how ICT adoption and utilization can lead to knowledge-sharing, increased productivity, and enhanced

competitiveness. More research is needed to understand how ICT can drive innovation ecosystems, support startups, and facilitate collaboration between industry and academia in the region (European Commission 2009; Jones 2020).

A significant gap in the literature is the limited focus on the relationship between ICT and inclusive growth in the Western Balkans. Although some studies have investigated the impact of ICT on specific sectors such as banking, agriculture, and human development, there is a lack of research on the broader implications of ICT on employment, income distribution, and poverty reduction (Smith, 2021). It is essential to explore how ICT can contribute to inclusive growth by creating job opportunities, improving access to education and healthcare, and reducing income disparity.

Addressing these gaps in the literature is vital for a comprehensive understanding of the potential of ICT in driving economic growth and development in the Western Balkans. Future research should focus on the specific mechanisms of ICT's influence on economic convergence, its role in fostering innovation, and the broader implications of ICT on inclusive growth. By filling these gaps, policymakers and stakeholders can develop effective strategies to leverage ICT for sustainable development in the region (Radovanovic et al., 2023; European Commission, 2009).

4. Conclusion

This study delves into the challenges and barriers associated with the adoption of Information and Communication Technology (ICT) and their impact on the economic development of the Western Balkans. Despite the ICT sector's potential to spur economic growth and generate employment opportunities, the region faces distinct hurdles that impede its realization of these advantages.

Research indicates that although the Western Balkans have progressed in ICT adoption and integration, there are still gaps in understanding the specific mechanisms by which ICT influences economic convergence and growth. These gaps include inadequate infrastructure, limited technological support, and deficient policies and regulations (Kleibrink et al., 2018). The sluggish uptake of ICTs in secondary schools in Western Balkans has socio-economic implications that require attention. Constrained access to infrastructure and technological support, alongside insufficient policies and regulations, act as notable obstacles to ICT adoption in Western Balkan economies.

These obstacles prevent businesses from fully leveraging ICT's potential for innovation, productivity, and competitiveness. Additionally, the scarcity of digital skills and knowledge among the population hinders the effective utilization of ICT tools. These challenges and barriers not only hinder economic development and convergence with Europe, but also breed social disparities and impede the region's competitiveness in the global digital economy.

4.1. Limitations and Recommendations: Current research often lacks a detailed examination of regional and sectoral impacts, leaving policymakers without the granular insights needed for effective intervention. Furthermore, the role of ICT in fostering innovation and technological advancement is underexplored, particularly regarding how it can drive knowledge-sharing, productivity, and competitiveness within the region.

Another critical gap is the limited focus on the relationship between ICT and inclusive growth. Although some studies have addressed ICT's impact on specific sectors, there is insufficient research on its broader implications for employment, income distribution, and poverty reduction. Addressing this gap is essential for leveraging ICT to achieve not only economic growth but also social equity and inclusion.

To enhance the economic competitiveness of the Western Balkans, it is crucial to promote policies and incentives that support ICT businesses and foster innovation. This includes investing in research and education, improving access to financing, and developing a skilled workforce capable of thriving in a digital economy. By addressing the identified gaps in the literature and implementing targeted strategies, the Western Balkans can better harness the transformative potential of ICT, paving the way for sustainable economic growth and closer integration with the European Union.

Future research should focus on:

1. Investigating the specific mechanisms of ICT's influence on economic convergence at both regional and sectoral levels.
2. Exploring the role of ICT in fostering innovation ecosystems, supporting startups, and facilitating industry-academia collaboration.
3. Examining the broader implications of ICT on inclusive growth, including its impact on employment, income distribution, and poverty reduction.

By addressing these areas, policymakers and stakeholders can develop more effective strategies to leverage ICT for the sustainable development of the Western Balkans, ultimately enhancing the region's economic and social landscape.

References

[1]. Aghion, P, and P. Howitt (1992): A Model of Growth through Creative Destruction, Econometrica, 60, 323-351

[2]. Acemoglu, D., & Robinson, J. A. (2002). The political economy of the Kuznets curve. Review of development economics, 6(2), 183-203.

[3]. Aysan, A.F., Nanaeva, Z. (2022), Fintech as a financial disruptor: A bibliometric analysis. FinTech, 1(4), 412-433

[4]. Aysan, A.F., Ünal, İ.M. (2021), Fintech and blockchain in Islamic finance: A bibliom bibliometric analysis. Efil Journal, 4(3), 21-37.

[5]. Ask. (n.d.). Agjencia e Statistikave të Kosovës. ASK. https://ask.rks-gov.net/

[6]. Benczes, I. & Szent-Ivanyi, B. (2015). The European economy in 2014: Fragile recovery and convergence. JCMS: Journal of Common Market Studies, 53, 162-180. https://doi.org/10.1111/jcms.12266.

[7]. Bonomi, M., & Uvalić, M. (2019, June 26). The economic development of the Western Balkans. , 36-58. https://doi.org/10.4324/9780429243349-3

[8]. European Commission. (2009). The Western Balkans in transition. Directorate-General for Economic and Financial Affairs. https://ec.europa.eu/economy_finance/publications/pages/publication15155_en.pdf

[9]. Federico Biagi, 2013. "ICT and Productivity: A Review of the Literature," JRC Working Papers on Digital Economy 2013-09, Joint Research Centre (Seville site).

[10]. Chapsa, X., Tsanana, E. & Katrakilidis, C. (2015). Growth and Convergence in the EU-15: More Evidence from the Cohesion Countries. Procedia Economics and Finance, 33, 55-63. https://doi.org/10.1016/S2212-5671(15)01693-7.

[11]. Colak, O. (2015). Convergence Revisited: Case of EU and Eastern Europe. Regional Science Inquiry, 7(1), 69-81.

[12]. Data-Driven Decision-Making is Driving Growth in Kosovo's ICT Sector. (2023, July 7). https://www.usaid.gov/kosovo/news/jul-10-2023-data-driven-decision-making-driving-growth-kosovos-ict-sector

[13]. Denić, N., & Petković, D. (2023, May 2). The Influence of the Teachers' Scientific Field on the Effects of the Application of ICT in Higher Education Institutions. https://scite.ai/reports/10.1007/s11277-023-10468-3

[14]. Economy, I I F F M. (2020, January 1). COMPREHENSIVE ANALYSIS OF THE ICT SECTOR IN KOSOVO

[15]. Gërguri-Rashiti, S., Ramadani, V., Abazi-Alili, H., Dana, L. P., & Ratten, V. (2017). ICT, innovation and firm performance: the transition economies context. Thunderbird International Business Review, 59(1), 93-102.

[16]. IT_Barometer_2021-2022_STIKK. (n.d.).

[17]. Jones, A. (2020). Economic policies and integration challenges in Kosovo. Journal of Balkan Studies, 15(2), 134-156.
[18]. Kleibrink, A., Radovanović, N., Kroll, H., Horvat, D., Kutlača, D., & Živković, L. (2018, December 1). The Potential of ICT in Serbia: An Emerging Industry in the European Context. https://EconPapers.repec.org/RePEc:ipt:iptwpa:jrc114209
[19]. Kayani, F.N., Kayani, U.N. (2017), Inward foreign direct investment, resident patents, and economic growth: Cointegration, error correction model, and causality analyses for China. Journal of Economic and Management Perspectives, 11(4), 381-389.
[20]. Kessler, T., & Buck, C. (2017). How digitization affects mobility and the business models of automotive OEMs. Phantom Ex Machina: Digital Disruption's Role in Business Model Transformation, 107-118.
[21]. Kostoska, O., & Hristoski, I. (2017, December 22). ICTS AND INNOVATION FOR COMPETITIVENESS: EVIDENCE FOR WESTERN BALKANS VIS-À-VIS THE EUROPEAN UNION. Faculty of Economics University of Rijeka, 35(2), 487-518. https://doi.org/10.18045/zbefri.2017.2.487
[22]. Kuqi, M. M., Beka, D., & Brahimi, F. (2024). AI and Robotics on Small and Medium Enterprises (SMEs) in Western Balkans: Psychological Adaptation and Economic Outcomes. Automation, Robotics & Communications for Industry 4.0/5.0, 316.
[23]. Lekić, N., Carić, M., Soleša, D., Vapa-Tankosić, J., Rajaković-Mijailović, J., Bogetić, S., & Vučičević, M. (2021, December 28). Employees' Perceptions on the Relationship of Intellectual Capital and Business Performance of ICT Companies. https://scite.ai/reports/10.3390/su14010275
[24]. Meksi, E., & Xhaja, E. Income and structural convergence of Western Balkans to European Union. The European Journal of Comparative Economics, 14(1), 141-154.
[25]. Ördögh, Tibor. (2023). Digitalisation in the Western Balkans. Academic and Applied Research in Military and Public Management Science. 22. 91-107. 10.32565/aarms.2023.3.6.
[26]. Romer, P. M. (1990). Endogenous technological change. Journal of political Economy, 98(5, Part 2), S71-S102.
[27]. Radovanovic, N., Gerussi, E., Reid, A. and Jevremovic, A., Unlocking the potential for regional collaboration in the ICT domain in the Western Balkans, Publications Office of the European Union, Luxembourg, 2023, doi:10.2760/25755, JRC133944.
[28]. Rohman, P.S., Fianto, B.A., Shah, S.A.A., Kayani, U.N., Suprayogi, N., Supriani, I. (2021), A review on literature of Islamic microfinance from 2010-2020: Lesson for practitioners and future directions. Heliyon, 7(12), e08549.
[29]. Sala-i-Martin, X. (1994). Cross-sectional regressions and the empirics of economic growth. European Economic Review, 38(3-4), 739-747. https://doi.org/10.1016/0014-2921(94)90109-0.
[30]. Siljak, D. & Nagy, S. G. (2018). The effects of the crisis on the convergence process of the Western Balkan countries towards the European Union. Society and Economy, 40(1), 105-124.
[31]. Smith, B. (2021). Post-conflict economic development in the Western Balkans: A focus on Kosovo. International Journal of Development and Transition, 8(3), 201-219.
[32]. Xhaja, E., & Kordha Asc, E. (n.d.). *Assessing Ict Role to Economic Convergence of Albania and Western Balkans to European Union*.
[33]. Zeybek, G. (2022, July 19). Investigation of Pre-service Teachers' Readiness Levels for Online Learning and Engagement Levels in the Online Environment. https://scite.ai/reports/10.56059/jl4d.v9i2.538