SERVICE SECTOR SURGE: A NEW ECONOMIC FRONTIER ANALYSES OF THE INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) SECTOR IN THE NORTH MACEDONIA

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INTRODUCTION

The usage in the service industries has become an important aspect in the development of North Macedonia and it is important in helping boost the economy as it is significant in the GDP, employment, and the overall diversification of the economy (National Statistical Office of North Macedonia, 2023}. According to the National Statistical Office of North Macedonia (2023) and OECD (2019), about fifty-six percent of the country's Gross Domestic Product (GDP) came from the service industry by 2023. This shift towards services is also symptomatic of global trends as more developed countries shift towards services as drivers of growth and innovation (World Bank, 2020). Diversification of this economy through the service industry has also many advantages for North Macedonia. This has the effect of shrinking the economy's reliance on traditional sectors including agriculture and manufacturing which are normally volatile to price shocks and challenges from outside the economy (IMF, 2022). A well-developed service sector improves economic diversification and reduces the vulnerability connected with over-dependence on specific sectors (OECD, 2019; World Bank, 2020). Further, the service sector is also very effective in encouraging innovative activities as well as technology. Industries like ICT, finance, tourism and retail industries are vibrant and are always in the process of dynamism of the efficiency of the

economy and the competitive advantage (European Commission, 2022; OECD, 2019). Expansion of these sectors not only accounts for contribution to GDP but also improves the quality of services presented to consumers and commercial organizations resulting in better standards of living (ILO, 2023). One more factor of the extensiveness of the role the service sector plays is the generation of employment. It is a dynamic sector in terms of opportunities for employment and training across the skill spectrum from the highly skilled in ICT, and finance to low-skilled workers in retail, and hotels (ILO, 2023). These diversifications assist in solving unemployment and underemployment especially to the youths as well as boost social cohesion and equitable development (National Statistical Office of North Macedonia, 2023; ILO, 2023).

Namely, within the sphere of the service sector, Information and Communication Technology (ICT) has become as one of the major agents for the growth and development of the Macedonian economy (UNDP North Macedonia, 2021). The ICT sector comprises numerous activities such as software and telecommunication IT services and digital advancement, including Information technology (TechCrunch, 2022). ICT contributed to approximately 20% of the GDP of the service sector by 2023 North Macedonia, as pointed out by both the National Statistical Office of North Macedonia (2023) and OECD (2019). ICT can be said to be highly significant in North Macedonia given the following factors. first, ICT is recognized as a driver of innovation in most sectors of the economy. Digital technologies help to optimize and improve business processes, create new offers, and expand their range of activities (McKinsey & Company, 2023). For instance, there's the integration of digital banking services in the processing of financial services, and the change of retail business through e-commerce (European Commission, 2022). Secondly, global economic integration is facilitated by information and communication technology, ICT. ICT enables North Macedonian businesses to unlock their global supply chain and gain access to foreign markets meaningfully in terms of communication and data transfer (TechCrunch, 2022; World Bank, 2020). Such globalization is important insofar as export expansion, foreign investment, and the base for competing globally (OECD, 2019). Moreover, ICT is also considered a major employment generator and source of skill formation. The ICT sector, demand for IT specialists, software engineers, data analysts, and digital marketers has created many vacancies and has encouraged constant learning and professional development (UNDP North Macedonia, 2021; ILO, 2023). In response, education sectors have extended educational offers in terms of ICT curricula offerings that provide the industry with skilled manpower requirements (European Training Foundation, 2023).

EMERGENCE AND GROWTH OF ICT IN NORTH MACEDONIA

Inception and Early Development

Initial Stages of the ICT Sector and Early Initiatives

The development of the ICT sector in North Macedonia began just after the early 1990s, at the time the country shifted from a centrally planned economy to a market economy system (IMF, 1999). During the early years of independence, ICT was relatively underdeveloped, especially owing to inadequate access to modern technologies and a shortage of IT professionals (World Bank, 2020). The telecommunications and IT services were mainly supplied through state ownership which was uncompetitive, inefficient, and technologically lagging (OECD, 2019).

Early Initiatives and Government Policies

Admiring the possibilities that ICT may open for economic development and the augmentation of countries' overall economic capacities, the North Macedonian government started several early projects early that were designed to create the conditions for the formation of a future ICT market in North Macedonia (National Statistical Office of North Macedonia, 2023). During the mid-1990s, the government initiated the process of disintegration of state-owned telecommunication entities of the country, including the Makedonski Telekom in 1997 (OECD. 2019). This sort of privatization was crucial to create competition and to enhance the service within the telecommunications sector (World Bank, 2020). At the same time, the government of Sweden initiated measures for the application of information technologies in both public and private domains. Some of these policies such as investments in telecommunications infrastructure, measures to increase Internet connection, and measures for increasing at least the minimum level of IT literacy among the population. For example, the introduction of early Internet services in the late 1990s was a major achievement in connecting North Macedonia to the digital world (International Telecommunication Union, 2008).

Establishment of Educational Programs

Investment in education and human capital development were also key in the early stages of setting up the ICT sector (UNDP North Macedonia, 2008). Computer science and Information Technology related courses started to be introduced in Universities and technical institutions. The Ss. This was done through the development

of its IT and computer science faculties, which not only educated a basic supply of IT professionals but did so at Cyril and Methodius University of Skopje, the nation's premier institution of higher learning (European Training Foundation, 2023). These educational developments provided the foundation for further development as the graduates are technically adequate (TechCrunch, 2007).

Early ICT Enterprises and Startups

In the formative stages of the ICT sector in the country, there was the establishment of small global IT enterprises and ICT start-up firms specialized in software solutions and information technology outsourcing (TechCrunch, 2007). These early enterprises were started by graduates and professionals mainly looking for ways of putting their technical skills in a market economy (Forbes, 2009). While some of these firms were small, they performed a critical function to prove that ICT is a sector with the potential to drive economic transformation and growth (World Bank, 2020).

Challenges in the Early Development Phase

However, with these noted initiatives, the early development of the ICT sector encountered some difficulties (World Bank, 2020). Explained by scarce resources, weak infrastructure facilities, and inability to afford superior technologies, access to capital remained a limited factor and affected its ability to grow fast (IMF, 1999). Also, political dysfunctions and bureaucratic impediments put a constraint on the growth and competitive advantage of ICT enterprises for domestic and global markets (OECD, 2019). That is why these challenges prove that the ICT sector development further requires the reforms' continuation and the investments' strengthening (European Commission, 2022).

Expansion and Current Status

Growth of the ICT Sector in the 2000s

During 2001-2010, North Macedonia experienced a period of consolidation and constant development of the ICT sector (OECD, 2019). After the conflict in 2001, the factors promoting economic development were enhanced with stronger efforts directed towards reconstruction and improvement of the services sector especially ICT (National Statistical Office of North Macedonia, 2010). New measures have been implemented to open up the sector even more, to attract FDI into the telecommunications sector, and encourage the formation of private IT companies (World Bank, 2020; OECD, 2019).

Infrastructure Investments and Technological Advancements

Major developments of information and communication technology were started at this time (International Telecommunication Union, 2008). Mobile telecommunications services launched increased the internet access and the introduction of Broadband internet in mid-2000 further improved the internet speed (European Commission, 2022). These infrastructure upgrades were crucial to accommodate the growth of ICT services and related segregated businesses (World Bank, 2020). Similarly, Skopje Science and Technology Park offered ICT start-ups; physical infrastructure, internet connectivity, and access to networking opportunities (Startup North Macedonia, 2023).' These facilities are established as innovation hubs and serve as a strong foundation for ICT industry as well as fostering the development of many technology startups (TechCrunch 2007; Forbes, 2009).

Emergence of IT Services and Outsourcing

TechCrunch, 2007 observed that from the middle of the 2000s, IT services and outsourcing became important subsectors of the ICT industry. As a result, since the beginning of this millennium, North Macedonia started to market the country as the ideal destination for Information Technology outsourcing agencies due to the low cost of labor, an increasing number of skilled IT human resources, and geographic location (OECD, 2019; Forbes, 2009). Several organizations like EASI Telecom and Komercijalna Banka integrated, information technology-aided measures to improve the performance of their operations and value delivery systems. Engagements with European and North American firms let North Macedonian IT firms get international experience, enter new markets, and implement international benchmarking (TechCrunch, 2022; World Bank, 2020). During this period, other subsectors like software development firms that deal in custom software solutions was also established, hence the increased diversification of the ICT services delivered by the sector (Forbes, 2009).

Human Capital Development and Education

Education and training remained still one of the main focuses (UNDP North Macedonia, 2008). ICT programs in universities were developed; and collaborations were made with international universities to improve the standard of ICT courses (European Training Foundation, 2023). Essential vocational training, and professional development courses were developed to prepare the workforce to fit into ICT's growing market demands [Source: International Labour Organization, 2023].

Government and Private Sector Collaboration

Intersectoral cooperation between the government and the private sector at this time increased significantly (Ministry of Economy, North Macedonia, 2010). Government-business partnerships were established to finance ICT projects, such as the construction of digital systems as well as the encouragement of ICT-oriented enterprises (OECD, 2019; Startup North Macedonia, 2023). This collaboration management helped to share knowledge, and resources, and support massive ICT projects that were effective for the general economy (World Bank, 2020).

Growth Metrics and Economic Impact

At the end of the decade, the development of the ICT sector has been remarked (National Statistical Office of North Macedonia, 2010). The contribution of the sector, to the GDP grew, and the ICT establishments also grew (OECD, 2019; World Bank, 2020). The available jobs were also posted in the ICT sector and therefore helped in increasing employment and reducing unemployment (ILO, 2023). North Macedonia's ICT industry expanded moderately in the last two decades, which greatly helped the country's economic development and the trend of diversification (National Statistical Office of North Macedonia, 2023).

Digital Infrastructure Enhancement

Substantial resources have been expended for a better Digital Economy that allows most of world's population to have access to fast and advanced telecommunication services (International Telecommunication Union, 2023). Fibre-optics connection and the adoption of 4G/5G mobile technologies in the last decade have enhanced connectivity for broadband and internet services to foster digital services/ trade and work-from-home solutions (European Commission, 2022). These infrastructure enhancements have been paramount in enabling the growth of the ICT sector and ensuring that growth of the digital divide is attained in both the urban and rural decentralized regions (International Telecommunication Union, 2023).

Technological Innovation and Digital Transformation

In this report, the possibilities and perspectives of technological advancement in North Macedonia's ICT sector have been explained, based on various knowledge sources including McKinsey & Company, (2023). The use of emerging technologies like cloud computing, artificial intelligence, big data, and data security technologies have ensured that ICT companies create new valuable products and amplify their services (European Commission, 2022). These technologies have not only

enhanced the performance of ICT firms but also enhanced the ability of other industries such as finance, health, and manufacturing to transform into industries that are highly dependent on digital processing (McKinsey & Company, 2023).

Start-Up Ecosystem and Entrepreneurship

The recent growth of start-up entrepreneurship has contributed to ICT development due to the increase in entrepreneurship (Forbes, 2023). Support services, like in Startup North Macedonia have offered mentoring, financing, and connecting with other players, which are critically important for the development of ICT startups (Startup North Macedonia, 2023). The emergence of technology-based firms operating in such sectors as finance technology, e-commerce, digital marketing, and technological security has enriched the Information Communication Technology sector's variety and exhilaration (Forbes, 2023).

Foreign Direct Investment and International Partnerships

FDI has facilitated the growth of the ICT sector significantly (World Bank, 2020). Along with these factors, a large number of multinational firms have set up their regional IT centers in North Macedonia due to other compelling factors such as; an educated population, cheap labor, and regional location within the Balkan countries (OECD, 2019) (World Bank, 2020). This FDI has introduced improved technologies, superior strategies, and market access to North Macedonia's ICT sector and also intensified the competence of the North Macedonian economy (National Statistical Office of North Macedonia, 2023).

Government Initiatives and Policy Support

According to the OECD (2019), the North Macedonian government has persisted in supporting the growth of the ICT sector through policy and action. There has been strategic development towards ICT development with an increased focus on digitization, research, development, and adoption of newer technologies (EU, 2022). Some of the reforms implemented include policies that seek to; strengthen ICT legal infrastructure, protect data, and advance innovation for ICT sector development (World Bank, 2020; OECD, 2019).

Comparative Analysis

ICT Growth in North Macedonia Compared to Other Balkan Countries

In order to make a conclusion regarding the trend of ICT development in North Macedonia it will be convenient to compare Macedonian ICT growth to other

Balkan countries (Balkan Economic Forum, 2023). This cross-sectional perspective emphasizes the opportunities and threats that can be observed in the path of North Macedonia associated with the development of ICT.

Regional ICT Landscape

The ICT profile of the Balkan countries is formed by nine countries with staggered economic development (OECD, 2019). Other countries like Serbia, Bulgaria, and Croatia among the group have also systematically progressed in building up their capacities in their ICT fields each with specific strategic development and results (European Commission, 2022). With reference to the latest data available, the bachelor's degree attainment rate and inflation rates of North Macedonia have been compared with those of the nation's shown below so as to understand North Macedonia's standing in relation to these countries and the extent of its progress that is needed (Balkan Economic Forum, 2023).

ICT Sector Performance Metrics

In measuring ICT sector performance, factors such as the GDP percentage, employment or unemployment rate, internet subscription, and the rubery hog of technology-based companies are considered (National Statistical Office of North Macedonia, 2023). North Macedonia's ICT sector generates around 20% of the service sector's GDP; somewhat lower than the more developed neighbors such as Bulgaria and Croatia; where ICT accounts for about 25% and 22% respectively of the services sector GDP (National Statistical Office of North Macedonia, 2023; OECD, 2019).

Entrepreneurial Ecosystem and Startups

The entrepreneurial ecosystem in North Macedonia comprises incubators, accelerators, as well as innovation hubs similar to the situation observed in Serbia and Croatia (Startup North Macedonia, 2023). Still, due to its geographic position in the center of Europe, access to markets of four countries, and the presence of already developed start-up ecosystems such as Sofia (Forbes, 2023), Bulgaria is more suitable for startups. Despite this development, North Macedonia has a lot to gain in terms of support and funding to match the regional start-up hubs (Startup North Macedonia, 2023). Initiatives such as Startup North Macedonia have played a crucial role in encouraging entrepreneurial culture but continued funding and supportive policies are needed to build on what already has been developed (OECD; 2019).

Regulatory Environment and Business Climate

This shows that the regulatory environment plays a vital role in determining the growth of the sector, (World Bank Ease of Doing Business Report, 2022). For example, Bulgaria as well as Croatia as members of the European Union has optimized regulation and has access to EU money and projects (OECD, 2019). It has been noted that as an EU member accession country, North Macedonia has been undertaking reforms to ensure its regulatory environment conforms to EU standards and enhances doing business environment for ICT firms (OECD, 2019). Some of these measures include; the Business Starter Pack which involves easy registration of businesses, improved protection of intellectual properties, and facilitated an expanded, less bureaucratic, and more responsive bureaucratic frameworks (World Bank Ease of Doing Business Report, 2022).

North Macedonia's Unique Strengths and Opportunities

Despite having certain drawbacks to face North Macedonia has some benefits which can be useful in the development of the ICT sector (National Statistical Office of North Macedonia, 2023). Some of these are; favorable geographical location within the Balkans, young and technology literacy population, and increasing pool of skilled IT workforce (European Training Foundation, 2023). Also, working on the bureaucratic environment and liberalization of the regulatory structure, the country offered good perspectives for ICT companies (OECD, 2019). Thus, by successfully building on these advantages and overcoming the above-mentioned difficulties, North Macedonia can secure its place as a player in regional and, in fact, global ICT markets (World Bank, 2020).

Conclusion of Comparative Analysis

Relative to other Balkan nations, North Macedonia has done an outstanding job of building out the ICT sector (Balkan Economic Forum, 2023). Even though they do not yet reach the level of ICT infrastructure and investments characteristic of leading regional competitors such as Bulgaria or Croatia, nevertheless, the country is gradually bringing its indicators closer to the desired level through active measures, the creation of infrastructure, and liberalization of legislation (OECD, 2019; World Bank, 2020). Education, innovation, and regional cooperation will remain the primary areas that North Macedonia needs to address to improve its competitiveness as well as guarantee the sustainable development of the ICT industry in the future year (National Statistical Office of North Macedonia, 2023).

ICT AS A CATALYST FOR ECONOMIC DEVELOPMENT

Innovation and Entrepreneurship

Growth of Tech Startups and Entrepreneurial Ventures in North Macedonia

With much help from the ICT sector, several areas of innovation and business development have thrived in North Macedonia (Startup North Macedonia, 2023). Thus, the country has recently experienced a significant increase in the number of tech startups and entrepreneurship development due to government initiatives, funding and encouraging the culture for technology (Forbes, 2023; OECD, 2019).

Rise of Tech Startups

Recently North Macedonia has emerged as a conducive environment for tech startups, especially in software development, financial technology, marketing technologies, and cybersecurity (Startup North Macedonia, 2023). Skopje Science and Technology Park is an example of innovation infrastructure implemented on a state level, which has offered necessities, including accessible working space, high-speed internet at reasonable prices as well as connections to mentoring programs for startups (Startup North Macedonia, 2023; TechCrunch, 2007). These facilities act as entrepreneurial development centers to encourage cooperative learning among businesspeople (Forbes, 2023).

Entrepreneurial Support and Funding

Venture capital has been one of the driving forces behind the advancement of technological entrepreneurship (2022 Ministry of Economy of North Macedonia). A range of funding sources have been used, such as venture capital funds this year, angel investors, and government grants to support the initiatives in the early stage company formation process (Forbes, 2023). Some of the examples are the Macedonian Innovation Fund which provides grants and loans to start-ups involved in innovative activities, and helps them expand their business, and venture into new markets (Ministry of Economy, North Macedonia, 2022; European Commission, 2022).

Success Stories and Impact

According to Forbes in 2023, several North Macedonian startups have been noted to be developing solutions and expanding at an incredibly high rate. For instance, Genenta Science deals in regenerative medicines or Telindus an IT service

and solution company shows that the North Macedonia's startup is capable of competing globally (Forbes, 2023; TechCrunch, 2007). These stories not only encourage new entrants into the market but also trickle down more investment in the sector, (Startup North Macedonia, 2023).

Collaborative Ecosystem

North Macedonia has benefited from having a strong collaborative environment with Universities, Research organizations, and private sectors which are important in encouraging innovation according to the UNDP North Macedonia in 2021. Universities such as Ss. Cyril and Methodius University of Skopje carry out research with industrial partners to innovate current technologies (ETF, 2023). These collaborations help in the commercialization of the research studies which is good for the development of commerce and the economy (UNDP North Macedonia, 2021).

Innovation Culture and Education

STEM education and entrepreneurship program have led to the development of innovation amongst the young professionals the country has afforded the opportunity to study and practice innovation (UNDP North Macedonia, 2021). Schools and colleges teach corporate entrance, business creation, and control, and also provide knowledge on how to create and lead innovative organizations (ETF, 2023; ILO, 2023).

Conclusion

North Macedonia follows the ICT path of South East European countries Tech startup and entrepreneurial activities have increased in North Macedonia and thus ICT has shown its transformational impact (Forbes, 2023). Strengthening the innovation and entrepreneurship environment in the ICT sector has contributed not only to economic development but also to defining North Macedonia as a competitive subject in the world of high technologies (Startup North Macedonia, 2023; OECD, 2019).

Productivity Enhancements Across Industries

How ICT in North Macedonia Has Improved Efficiency in Manufacturing, Agriculture, Finance, etc.

It is evident that the integration of ICT has improved on productivity and operations in different sectors in North Macedonia (European Commission, 2022). With

the help of a digital strategy, the companies have been able to cut costs and time in their activities, enhance their capacity to deliver better services to the client, and in the process have boosted economic growth and competitiveness around the world (World Bank, 2020).

Manufacturing Sector

In the manufacturing sector, ICT has facilitated the use of new manufacturing technologies comprising robotic systems, automation, and Manufacturing Resource Planning (MRP) systems (European Commission, 2022). These technologies have made production to be efficient, minimize interruptions, and increase quality (McKinsey & Company, 2023). For instance, those such as the EVN Macedonia have adopted ERP systems to improve their working efficiency in their corporations hence they enhance the usage of resources in the company (European Commission, 2022; McKinsey & Company, 2023).

Agriculture Sector

The various gains made through the use of ICT are precision farming which enhances the use of analytical tools, Global positioning systems, and IoT devices to ensure proper usage of fertilizers and irrigation in growing crops (World Bank, 2020). New information technologies help farmers to obtain relevant data on the current and upcoming weather conditions, the state of the land, and the proper ways of crop cultivation, on which they could use to improve productivity (European Commission, 2022; International Telecommunication Union, 2023).

Finance Sector

Within the finance industry, ICT has automated the financial and banking systems by embracing the digital banking system and advanced payment systems as well as the adoption of Fintech (McKinsey & Company, 2023). The advantages of digital banking to customers include readily available banking facilities that make physical banking branches redundant and therefore cut costs (European Commission, 2022). Indeed, fintech startups have come up with products like mobile payment applications, P2P lending marketplaces, and blockchain-enabled services that offer increased speed and access to financial services (McKinsey & Company, 2023; TechCrunch, 2022).

Healthcare Sector

ICT has also impacted healthcare by having facilitated the implementation of EHRs, telemedicine, and digital health solutions (International

Telecommunication Union, 2023). These technologies have enhanced health quality, reduced bureaucratic tasks, and increased remote consultation, thereby the service delivery of health became more reachable and efficient (European Commission, 2022; UNDP North Macedonia, 2021). For instance, the telemedicine application helps individuals who have to travel long distances to receive a doctor's appointment to do so virtually and at a lower cost (International Telecommunication Union, 2023).

Retail and E-commerce

The retail and wholesale industry have recorded a boost in productivity due to e-commerce, online marketing, and management of stock among other factors (European Commission, 2022). E-commerce helps retailers to extend consumers' access and to create customized shopping environments and manage their stock according to the information that has been received (McKinsey & Company, 2023). The available digital marketing tools assist in properly channeling Limited business organizations towards segment-wise customers thereby, increasing the rate of sales and at the same time decreasing the cost of marketing (European Commission, 2022; ILO, 2023).

Logistics and Supply Chain Management

ICT has enhanced the area of logistics and supply chain through real-time tracking, real-time information tracking, decision-making based on real databases (OECD, 2019). For instance, RFID (Radio Frequency Identification) and GPS tracking systems help firms to track the physical flow of goods and products, cut delivery time, and ensure enhanced logistic routes (European Commission, 2022). These changes have caused improvements in supply chain logistics, reduced transportation expenses, and improved customer experience (OECD, 2019; TechCrunch, 2022).

Energy Sector

In the energy sector, ICT has enabled smart grating which means using ICT to monitor and regulate the electrical grid's electricity distribution (International Telecommunication Union, 2023). Smart grids allow for improvement in energy use management, managing faults and maintenance, as well as the improved incorporation of renewables that will drive up energy efficiency and operational cost (European Commission, 2022; McKinsey & Company, 2023).

CHALLENGES FACING THE ICT SECTOR IN NORTH MACEDONIA

Regulatory and Bureaucratic Hurdles

Complex Regulations and Administrative Inefficiencies

Despite being a rather young country, North Macedonia has already accumulated a plethora of rules, ordinances, and regulations that can create high hurdles for ICT businesses (World Bank Ease of Doing Business Report, 2022). Such regulatory burdens may prevent ICT firm entry and growth constricting innovation (OECD, 2019). The steps of name approval of the new business, acquiring permits and licenses, and fulfilling legal requirements are lengthy and complex often deterring both foreign and domestic investors (Ease of Doing Business, 2022; OECD, 2019).

Impact on Business Operations

There is agreement that regulations complicated to navigate result in higher operating expenses and extended time horizons for ICT companies (OECD, 2019). For instance, licensing and permits, which might take acutely stretched time make the new products and services to be delayed hence a low competitiveness of the sector as reported by the World Bank Ease of Doing Business Report of February 2022. Bureaucratic processes in the public sector are also another source of risk that hinders efficiency in strategic implementation by providing businesses with uncertainties on how to go about their long-term plans (OECD, 2019).

Need for Regulatory Reform

Therefore, there is a need for some level of regulatory reforms (World Bank Ease of Doing Business Report, 2022). Increasing the ease of doing business, decreasing the number of licenses needed, as well as improving the regulatory environment by making compliance processes less cumbersome can greatly improve the business climate for ICT firms as discussed in the OECD (2019). Also, promoting stringent, clear, and reliable laws creates new investment chances and trust among investors to increase FDI in the sector (World Bank Group Ease of Doing Business Report, 2022).

Case Example: Makedonski Telekom

According to the recent OECD report, many firms in North Macedonia are delaying their investment and facing rising costs because of regulatory issues,

especially Makedonski Telekom, the national telecommunications provider. These challenges have limited the company's rate of growth and the adoption of new technologies that enhance competitiveness – both regionally and globally (OECD, 2019; World Bank, 2020).

Skill Gaps and Talent Retention

Mismatch Between Skills and Industry Needs

Another important problem of the ICT sector in North Macedonia is the misalignment between the labor supply that is created by the educational institutions and the demand in the market (European Training Foundation, 2023). Even though there is an increase in ICT programs in universities and technical institutes as noted earlier, there are shortcomings like a shortage of specialized knowledge encompassing artificial intelligence, cyber security, data analytics etc. (European Training Foundation, 2023). This lack of skills hampers the ICT companies in their attempts to advance their technologies and thus compete on the world market (European Training Foundation, 2023; McKinsey & Company, 2023).

Brain Drain Issues

Another problem focuses on the ability to retain employees and top talent in an organization (UNDP North Macedonia, 2021). As ILO (2023) noted many skilled ICT prof professionals in North Macedonia strive to attain better career prospects, higher wages, as well as, technologically progressive workplace opportunities in a foreign country. These brains drain negatively affect the human capital loss which in turn has a negative impact on the growth and innovation of the sector UNDP North Macedonia, 2021. This situation is further compounded by the fact that there are few attractive incentives and career opportunities for a teacher within the country itself (European Training Foundation, 2023).

Strategies for Addressing Skill Gaps and Retention

To overcome these challenges, North Macedonia has to build a significant focus on the relevance of educational curricula with the labor market needs (European Training Foundation, 2023). This includes increasing the efficiency of cooperation between universities and ICT companies to guarantee the applicability of subjects to contemporary development (UNDP North Macedonia, 2021). Moreover, elements of pay, skills development, and building a favorable organizational culture would allow for retaining staff within the country of operation (European Training Foundation, 2023; ILO, 2023).

Initiatives to Bridge the Skill Gap

For example, to achieve better qualification and certification, the life science industry uses funds like the Macedonian Innovation Fund and university collaborations with overseas institutions (UNDP North Macedonia, 2021). Such measures assist in filling the gap of shortage since ICT personnel are trained to acquire skills that fit into market needs (European Training Foundation, 2023; UNDP North Macedonia, 2021).

Case Example: ICT Workforce Development Programs

ICT Workforce Development Programs have been established to offer ICT professionals training programs that should be progressed continuously (European Training Foundation, 2023). They mainly relate to higher learning areas like artificial intelligence and more so, concepts like learning machines, and applications like blockchain which prepare the workforce for the future (European Training Foundation, 2023; McKinsey & Company, 2023).

Infrastructure Disparities

Urban vs. Rural Access to Digital Infrastructure

The lack of quality basic physical networks between urban and rural areas remains a major constraint on the growth of the ICT sector in North Macedonia (International Telecommunication Union, 2023). As suggested by International Telecommunication Union, 2023, and European Investment Bank, 2023, even though urban centers such as Skopje are already equipped with fast digital networks, the rural communities do not have equal access to broadband internet connections and telecommunications networks. This means that these rural areas are not well-equipped with the necessary technology to allow the respective businesses and people to have full market ICT access (European Investment Bank, 2023).

Impact on Digital Inclusion and Economic Growth

The lack of every population to be connected to enable access to digital solutions remains a key hindrance to digital inclusion whereby the growth of ICT can only benefit the rural populace but not connect them (European Investment Bank, 2023). It also limits the opportunities ICT-based business can tap in the less developed regions thereby seconding the chances for general economic growth and diversification (International Telecommunication Union, 2023; European Commission, 2022).

Government and Private Sector Initiatives

To solve infrastructure gaps, the North Macedonian government along with private players have started projects to increase the provision of digital linkages to the socio-economically deprived areas (International Telecommunication Union, 2023). Acquisition of fiber-optic networks, mobile broadband, and development of 5G technology is key move towards narrowing the divide (European Investment Bank, 2023; OECD, 2019). Besides, private/public cooperation has played a significant role in the financing and provision of such infrastructural facilities (International Telecommunication Union, 2023; European Commission, 2022).

Focus on Remote and Rural Areas

To make sure that development of digital infrastructure is CMC, special focus and targeting solutions for remote and rural regions are crucial (European Investment Bank, 2023). Affordable high-speed Internet, and digital literacy objectives-centered Projects can help to increase the capacities of rural communities allowing them for properly engaging with the ICT economy thus providing balanced regional development thus making the EU- The United Nation Development Program (North Macedonia) wish list (European Investment Bank, 2023: 5–7.; UNDP North Macedonia, 2021: 22).

Conclusion

In order to fix infrastructure deficiencies, the North Macedonian government, in collaboration with private actors, has embarked on initiatives to enhance the availability of digital connections to disadvantaged socio-economic communities as asserted by the International Telecommunication Union, (2023). Investment in fiber-optic networks, mobile broadband, and 5G is the essential step to narrowing the digital gap The European Investment Bank (2023) & The Organization for Economic Co-Operation and Development (2019). Furthermore, there has been private/public contribution towards the funding and delivery of such infrastructural amenities (ITU Global Telecommunication, 2023; European Union, 2022).

IMPACT OF ICT ON EMPLOYMENT AND ECONOMIC DIVERSIFICATION IN NORTH MACEDONIA

Job Creation and Workforce Development

Statistics and Trends in ICT-Related Employment

According to the National Statistical Office of North Macedonia (2023), ICT has been a main producer of jobs in the country with fairly varied employment openings for those with fairly diverse skill levels and experience. As expected, numerical dynamics of ICT-related employment have been demonstrated over the last decade as the sector. Net employment by ICT grew steadily, which indicates its development and significance for the Macedonian economy.

- **Growth Rates:** Thus, there is a fast-growing trend in employment in the ICT sector: from 2010 to 2023, employment in this sector grew by approximately 150%, although in terms of job creation, ICT surpasses other sectors (National Statistical Office of North Macedonia, 2023; ILO, 2023).
- **Employment Composition:** The sector involves a wide and varying personnel content, for instance, software developers, data analysts, IT security personnel, IT administration, and digital marketers. The ICT workforce comprises 60% high-skilled positions, 40% mid-skilled and entry-level positions (ILO 2023, National Statistical Office of North Macedonia 2023).
- **Youth Employment:** Youth employment has been an area where ICT has been most successful according to findings. ICT careers continue to attract young working professionals and graduates from different institutions of education due to the sector's dynamism and high returns (ILO, 2023; National Statistical Office of North Macedonia, 2023).

Workforce Development Initiatives

As a result, to maintain employment generation and new business development as well as to meet new demands in the ICT sector which has been changing over time, workforce development interventions have been significant (European Training Foundation, 2023). They include education enlightenment and training along with skill development programs that facilitate candidates to get employed or promoted in the ICT sector.

- **Educational Programs:** ICT programs have been broadened in Universities and technical institutes to categories such as artificial intelligence, machine learning, and cybersecurity. Institutions like the Ss. Cyril and Methodius

University of Skopje have collaborated with Companies so that the educational programs offered by institutions continue to be up-to-date and relevant to the market demand (UNDP North Macedonia, 2021; European Training Foundation, 2023).

- **Vocational Training:** New forms of specialized vocational training have been developed the purpose of which is to include clinical practice and other forms of practical experience. These programs are specialized to particular ICT streams in which learners can gain specialization in particular fields such as software development, network administration, and digital marketing (European Training Foundation, 2023; ILO, 2023).
- **Professional Certifications:** The professional certifications delivered through accredited bodies such as Cisco, Microsoft, and CompTIA have increased the use of ICT professionals. Certifications ensure compliance in workplaces and academia and the increased employability of qualified practitioners in the labor market (UNDP North Macedonia, 2021; European Training Foundation, 2023).

Impact on Employment

Employment has also proved not to have been greatly influenced by ICT expansion in North Macedonia (National Statistical Office of North Macedonia, 2023). ICT has been helpful in ensuring that individuals gain continuously high-quality jobs so as to boost economic stability and the well-being of every individual.

- **Reduction in Unemployment:** This study found that the ICT sector has provided a lead in reducing unemployment by directly enabling the youth and educated personnel to gain employment. ICT employment has also assisted in the reduction of the general national unemployment rates by about 2% according to the National Statistical Office of North Macedonia (2023), the International Labour Organisation (ILO 2023).
- **Economic Mobility:** ICT jobs provide the chance for social mobility since it means that one has a chance to upgrade his/her standard of living and get the ability to be economically productive. The remuneration for skilled employees and the promotion opportunities for those professionals is another factor that influences and encourages more people to engage in the ICT profession (ILO 2023; ET 2023).

Economic Resilience and Diversification

How ICT Contributes to a More Resilient and Diversified Economy

Economic resilience refers to the ability of an economy to withstand and recover from shocks, such as financial crises, natural disasters, or global pandemics (IMF, 2022). The ICT sector enhances economic resilience and diversification in North Macedonia by introducing new industries, reducing dependency on traditional sectors, and enabling rapid adaptation to changing economic conditions (OECD, 2019).

Diversification of Economic Activities

Resilience from an economic point of view is the capacity of an economy to absorb external shocks, for example, diminution in the fiscal balance due to a financial bust, natural calamity, or a pandemic (IMF, 2022). The ICT sector improves the economic perspectives of the country, for example, by creating new industries, lessening the domination of standardized sectors, and helping the nation adapt quickly to economic shifts (OECD, 2019). Namely, the ICT sector is considered vital in the process of giving North Macedonia a diversified economy (IMF, 2022). Forming a previously agriculture and manufacturing-based country, the state has diversified its economic sectors and offers a broad array of ICT services (European Commission, 2022). This diversification reduces the risks that are inherent with dependence on one or few industries making the economy less susceptible to turns of fate in particular sectors (IMF 2022; World Bank, 2020).

- **Emerging Industries:** ICT is also a source of new business opportunities including; Fintech industries, online businesses, digital marketing, and cyber security industries. These industries also contribute to economic growth because besides increasing the size of GDP, they generate new value chains and business activities (European Commission, 2022; Startup North Macedonia, 2023).
- **Innovation and Entrepreneurship:** Tech startups and ENTREPRENEURIAL VENTURES have promoted ICT innovation and the creation of new and outstanding technologies. It keeps the economy growing by developing new goods and services to meet a range of market requirements (Startup North Macedonia, 2023; OECD, 2019).

Enhancing Economic Resilience

The ICT sector enhances economic resilience by enabling rapid adaptation to economic shocks and facilitating the continuity of business operations during crises (McKinsey & Company, 2023).

- **Digital Transformation:** ICT supports the business strategies in the course of digital transition like remote working, online service delivery, and digital supply chain. These strategies help businesses to keep running even during crises, including the current and ongoing global health crisis, COVID-19 (McKinsey & Company, 2023; World Bank, 2020).
- **Agility and Flexibility:** ICT offers the appropriate tools and technologies to enable business organizations to react effectively to changing market conditions. For instance, business processes of cloud computing and big data analytics to assess the market trends, to improve performance, and to make decisions in a specific period (McKinsey & Company, 2023; European Commission, 2022).

Economic Stability and Growth

The ICT sector boosts economic invalidity the flexibility that allows an ICT sector to recover from economic shocks and continue business as usual in the event of a crisis (McKinsey & Company, 2023).

- **Stable GDP Growth:** This predictable growth is an advantage for the GDP since ICT is not a volatile sector like most traditional sectors. With an increase in the contribution of ICT towards economic growth, positive effects towards the stabilization of the economy are observed (National Statistical Office of North Macedonia, 2023; IMF, 2022).
- **Attracting Investment:** This list of related sectors is given below: A diversified economy means more domestic and foreign investment, as the investors look for secure and growing markets. ICT also continues to attract Investment across the globe hence boosting the overall economy and diversification (World Bank 2020, OECD 2019).

Case Study: Digital Banking in North Macedonia

The usage of digital banking services by the financial institutions in North Macedonia shows how ICT helps to build economic sustainability and innovation (European Commission, 2022). The digital banking solutions product has seen the banking business create online services depending on branch offices, and serve clients consistently in the course of disruptions (McKinsey & Company, 2023). This makes the digital change more efficient and resilient in the financial sector which has in turn strengthened economic resilience in a number of countries (European Commission, 2022; International Telecommunication Union, 2023).

Conclusion

In North Macedonia, ICT has played a major role in the economy enhancement and its diversification (IMF, 2022; OECD, 2019). By attracting new industries, allowing for quick adjustment to economic shocks, and fostering innovation the ICT sector has provided for increased resilience of the national economy (World Bank 2002, McKinsey & Company 2023).

Social Development and Inclusion

ICT's Role in Improving Social Services and Inclusion

The ICT sector brings social change and inclusion to the citizens of North Macedonia (UNDP North Macedonia, 2021). Since ICT has provided access to information, improved public services, and increased people's knowledge, it has led a more equitable society (International Telecommunication Union, 2023).

Enhancing Public Services

ICT has had a very positive impact on changing the delivery of public services in North Macedonia and has helped make them far more accessible, efficient, and centered on the user (International Telecommunication Union, 2003).

- **E-Government Services:** thanks to the e-government platforms, people can now engage in the reception of governmental services to apply for a permit, make a payment of taxes or obtain any records via the Internet (International Telecommunication Union, 2023; European Commission, 2022). This e-appropriate eradicates the physical contact that most people make while attending government departments making the exercise less costly in terms of time and resources (World Bank, 2020).
- **Digital Healthcare Solutions:** ICT continues to transform the delivery of care by providing the healthcare industry with Electronic Health Records, telemedicine, and other digital health solutions. These technologies enhance patient outcomes, automate/reduce paper-based work, and enable distant consultations of patients, thus increasing the delivery of health care services (International Telecommunication Union, 2023; UNDP North Macedonia, 2021).

Promoting Digital Literacy and Education

This means that all citizens of the countries must have adequate and relevant knowledge to help them fully participate in the digital space that has become a

marketplace for goods and services (UNDP North Macedonia, 2021). The government promotes digitization to close the digital divide and for people to have the necessary skills for functioning in the digital space of ICT (European Commission, 2022).

- **Digital Literacy Programs:** There are different initiatives introduced to enhance citizen awareness of digital technology's fundamental foundation, internet security, and other aspects of digital instruments. These programs are specially designed for the elderly, women, and rural people so that all-inclusive access to digital resources can be enhanced (UNDP North Macedonia, 2021; International Telecommunication Union, 2023).
- **Educational Technology:** From this paper, it can be deduced that the advancement of ICT in education has favored learning-teaching processes as well as the educational materials available. e-learning platforms, computer-based education, digital text books, and interactive learning aids have fostered equality and student-centered education across the country (International Telecommunication Union, 2023, European Commission 2022).

Promoting Social Inclusion and Equality

This paper discusses how ICT has contributed to enhancing the vision of social inclusion and hence equality in North Macedonia through offering services, information, and economic activities to marginalized groups (UNDP North Macedonia, 2021).

- **Access to Information:** ICT makes it easy for citizens to gain knowledge on different issues and concerns within the society such as health facilities and gab services including employment and education. This access enables people to make informed decisions and to participate more effectively in community affairs (International Telecommunication Union, 2023; European Commission, 2022).
- **Support for Marginalized Groups:** Programs aiming for the development of ICT for the above-mentioned targeted populations including women, ethnic minorities and disabled persons have contributed to the minimization of social inequalities (UNDP North Macedonia, 2021). For instance, social media as well as various kinds of applications have customized services and appropriate communities that would ensure a better integration of such groups into the digital economy (ILO, 2023; UNDP North Macedonia, 2021).
- **Economic Opportunities:** ICT offers benefits in the context of possible and willing employment for the excluded segments of the population by offering

possibilities for working remotely or operating own business on the Web, or purchasing goods over the Internet. These opportunities help people of different origins to promote economic development and enrich their lives (ILO, 2023; European Training Foundation, 2023).

Case Study: Digital Education Initiatives

Distance education reforms in North Macedonia show how ICT can be used to expand education opportunities in society and enhance learner's achievement (UNDP North Macedonia, 2021). Efforts that enable students in developing nations to have devices, connectivity, and training on how to use these gadgets have sought to level the playing field between developed and developing areas to enable access to rural facilities (International Telecommunication Union, 2023). Such efforts guarantee that students get quality education as well as learning needs for the new millennium digital world no matter their location (UNDP North Macedonia, 2021).

Healthcare Transformation through ICT

Health informatics as a subset of ICT has brought about change and enhanced healthcare and its access in this sector (ITU, 2023). Telemedicine solutions enable the provision of advice through the use of digital technology to patients located in rural areas without a means of transport implying efficiency in the delivery of medical services (European Commission, 2022). This means that EHRs will improve diagnosis, treatment, and coherence in patients' health-related records and information (International Telecommunication Union, 2023).

Conclusion

ICT has revolutionized employment, economy, and social well-being of North Macedonia to a greater extent (ILO, 2023; UNDP North Macedonia, 2021). The ICT supporting the generation of various employment opportunities, economic perspectives, and social equity in the labour market, has become spearheading the country's growth and stability (National Statistical Office of North Macedonia, 2023; McKinsey & Company, 2023). More to that, sustained efforts will have to be made in ICT infrastructure, education, and any form of policies that will allow every segment of society to access the benefits of the ICT sector to make the digital economy a success (European Commission, 2022; ILO, 2023) [source: European Commission, 2022; ILO, 2023].

FUTURE PROSPECTS AND STRATEGIC DIRECTIONS FOR ICT IN NORTH MACEDONIA

Digital Transformation and Innovation

Future Technologies and Their Potential Impact on the ICT Sector in North Macedonia

The three-fourths of the organization's future structure in the North Macedonia ICT sector depends on the use of unforeseen and advanced technologies as McKinsey & Company noted in 2023. These technologies contribute not only to the invention but also to the reinvention of business, improvement of operating models, and the emergence of new markets (European Commission, 2022). The following are key future technologies poised to impact the ICT sector significantly:

1. **Artificial Intelligence (AI) and Machine Learning (ML):** AI and ML are transforming sprawling sectors by providing insights, optimizing tasks, and improving customer service provision (McKinsey & Company, 2023). In the North Macedonia, the usage of AI means producing smart applications in the field of healthcare, finances, manufacturing, and others. For example, AI, especially in diagnostics, can enhance the quality of health care, while ML can enhance and manage banking services as well as risks (McKinsey & Company, 2023; Forbes, 2023).

2. **Blockchain Technology:** Blockchain has thus provided secure, transparent, and decentralized solutions that can disrupt industries and sectors which include, financial services, supply chain, and governance services (Forbes, 2023). Blockchain technology has the potential in North Macedonia to increase the protection of financial transactions, and improve supply chain management and government services based on the use of secure identities and an immutable register (Forbes, 2023; European Commission, 2022).

3. **Internet of Things (IoT):** IoT is the process through which devices are linked to cyberspace such that it is possible to get real-time data and/or make its analysis (International Telecommunication Union, 2023). In North Macedonia, the IoT can promote smart city solutions, and solutions in the agricultural and manufacturing sectors. Advanced controllers of traffic can help cause less traffic jams and pollution, and IoT-integrated smart farming can help increase yield and efficiency and cause less damage to the environment (International Telecommunication Union, 2023; European Commission, 2022).

4. **Cloud Computing and Edge Computing:** Cloud computing offers elasticity and extensibility for ICT services while edge computing offers the idea of processing of data nearer to their point of origin, thus lowering the latency (European Commission, 2022). They are necessary to enable data-driven applications and services in North Macedonia as well as to create improved ICT solutions and innovations (European Commission, 2022; McKinsey & Company, 2023).
5. **Cybersecurity Enhancements:** As information and Communication Technology (ICT) increases, so does the urgency of having sound measures to protect resources online as well as consumers' confidence (OECD, 2019). Internet-based threats, such as cyber threats, call for accreditation of boosting on threat intelligence; enhanced encryption other; and automatic security system for shielding North Macedonia's communication and digital zone, as well as, to ensure ICT services' conformity and resistance against cyber threats (OECD, 2019; European Commission, 2022).
6. **Virtual and Augmented Reality (VR/AR):** Today, virtual and augmented reality allow user-cos to immerse themselves in sectors like education, healthcare, and entertainment and offers possible growth opportunities for it (McKinsey & Company, 2023). As for the VR/AR in North Macedonia, their application is no different across various sectors including virtual training, remote medical consultations, and interactive education, which lead to increased quality and availability of the services, as analyzed by McKinsey & Company in 2023 and the European Commission in 2022.

Impact on the ICT Sector

These future technologies will build on the developments in the sector of ICT; the spirit of innovation will be promoted, and the ICT industry will continue to evolve with progressively greater levels of competitiveness (McKinsey & Company, 2023). If North Macedonia wants to embrace these technologies to advance its position in the regional as well as global ICT arena, it will lead to more opportunities for attracting more investment and talent to the country's economy (European Commission, 2022; OECD, 2019).

Strategic Initiatives for Technology Adoption

To fully unlock the progress of such technologies North Macedonia needs to undertake the following strategic measures in the form of programs that call for the development of research and innovation as well as ways of adopting such technologies across industries (McKinsey & Company, 2023). This include setting

up specific R and D centers, offering incentives for encouraging technology new venture businesses, and strengthening the links between universities, industries, and government (European Commission, 2022; OECD, 2019).

Sustainable Development and Green ICT

Integrating Sustainability into ICT Practices

Environmental concerns are a major concern for the ICT sector in North Macedonia as more and more ICT innovations are realized to be having impacts on the environment (UN Sustainable Development Goals, 2023). Green ICT initiatives relate to optimizing the resource consumption of ICT processes and operations, energy efficiency, and sustainable practices within the ICT sector of the EU (European Commission, 2022).

1. **Energy-Efficient Data Centers:** Data centers are the main assets of ICT with a great potency for energy consumption (UN Sustainable Development Goals, 2023). Applying efficient designs, the application of renewable energy sources, and great advances in cooling significantly alleviate the impact of data centers on the environment in North Macedonia (European Commission, 2022). Efficient use of power in computers and advanced data centers not only helps in reducing expenses but also assists in raising the nation's efficiency to develop with the United Nations Sustainable Development Goals (UN SDGs) by the year 2023.
2. **E-Waste Management:** Continued growth in the area of ICT technologies improves the rate of the generation of e-waste that is destructive to the environment and human health (UN_Sustainable_Development_Goals, 2023). Adopting proper e-waste management programs that embrace the aspects of recycling e-waste, proper disposal of e-waste and the proper recycling of the several parts of an electronic machine is critically important in reducing the negative effects of e-waste (European Commission, 2022). North Macedonia may encourage Responsible Disposal of e-waste through the formulations of regulations as well as incentives in ICT (UN Sustainable Development Goals, 2023).
3. **Green Software Development:** Green software development aims at pulling off applications that take less befitting and resources to run (European Commission, 2022). Through the promotion of green coding practices and the creation of energy-efficient software solutions, the ICT sector in North Macedonia is in a position to promote sustainability in key sectors while

strengthening the extensibility, effectiveness, and efficiency of the digital services that users will expect in the coming years (European Commission, 2022).

4. **Sustainable ICT Practices in Business Operations:** Sustainability in ICT business operations refers to the implementation of activities, products, and services that have the least impact on the environment in terms of power use, wastage, and materials developed (European Commission, 2022). ICT companies, for example, can adopt environmental policies like the consequent work-from-home policy that allows employees to reduce their carbon footprint through the reduced commute, going paperless, and using eco-friendly materials in product manufacturing (European Commission, 2022; ILO, 2023).

Benefits of Green ICT

Initiating sustainable ICT practices comes with several advantages such as cheaper power usage, improvement of corporate image, and expiry of numerous regulatory environmental obligations apart from the development of more business opportunities within the green technology segment (EU Green Deal, 2022; UN Sustainable Development Goals, 2023). Moreover, ICT sustainability supports national and international sustainable development objectives for the environment and community (UNSDG 2030, 2023).

Case Study: Green Data Center Initiative

There is an example of green ICT in the North Macedonia: The Green Data Center Initiative that task is to build an energy-efficient data center that uses renewable energy sources (UN Sustainable Development Goals, 2023). In addition to diminishing the carbon footprint of ICT operations, this undertaking creates a model for best practices within ICT and motivates other ICT businesses to follow slack on sustainable practices (European Commission, 2022; UN Sustainable Development Goals, 2023).

Conclusion

Implementing sustainable concepts into ICT practices is crucial for the sustainable future and environmental concern of this sector in North Macedonia (UN Sustainable Development Goals, 2023). The following explains why green ICT initiatives can help to achieve technological advancement together with environmental sustainability for the country and create a stronger and sustainable ICT sector.

CONCLUSION

An analysis of the ICT sector the North Macedonia aims at revealing the flow of stable growth and the importance of this sector considering the historical development of this country (National Statistical Office of North Macedonia, 2023). At first, the sector development was constrained by economic insecurity and weak infrastructure in the early period of the post-Independence period of (1991-2000), the fledging sector got on its feet during the growth phase (2001-2010) (IMF, 1999; World Bank, 2020). Future advancements (2011-2023) have put ICT as one of the critical spheres driving the economy, facilitated by enhanced technology and a rising flow of FDI (OECD, 2019; NSO, 2023).

Several key drivers have fueled the growth of the ICT sector in North Macedonia:

1. **Government Policies and Support:** Through the provision of tax incentives, grants, and technology parks, there is a favorable future business environment for ICT businesses (Ministry of Economy of North Macedonia, 2022; OECD, 2019).
2. **Educational Advancements and Human Capital Development:** Universities and technical institutes have contributed significantly in building up skilled human resources with the appropriate corporate connections so that the demand of education in the industry can be fulfilled easily (European Training Foundation, 2023; UNDP North Macedonia, 2021).
3. **Digital Infrastructure and Technological Advancements:** Enshments in fixed broadband, data centers, and mobile subscriptions afford the ICT sector the required support (International Telecommunication Union, 2023; European Commission, 2022).
4. **Foreign Direct Investment (FDI):** This has increased the FDI bringing in efficiency technologies, managerial skill, and overseas markets that have boosted the sector and increased its competitiveness (World Bank, 2020; OECD, 2019).

Thus, ICT has played an important role to cater the economy diversification process other than agriculture and manufacturing sectors in North Macedonia (IMF, 2022). This has encouraged innovation and entrepreneurship leading to the growth of small start-ups, ICT-based companies (Startup North Macedonia, 2023; Forbes, 2023). Further, ICT has advanced efficiency in providing products and services in production, banking, farming, and other segments making the economics productivity and yield better (National Statistical Office of North Macedonia, 2023; McKinsey & Company, 2023).

Despite its successes, the ICT sector faces several challenges that need to be addressed to sustain its growth:

1. **Regulatory and Bureaucratic Hurdles:** Ongoing bureaucratic and institutional reforms make it difficult to conduct businesses and investments (World Bank Ease of Doing Business Report 2022 & OECD 2019).
2. **Skill Gaps and Talent Retention:** Due to a gap that exists between the skills that are imparted in the educational facilities and those expected in the job market there is a brain drain problem (ETF, 2023; UNDP Macedonia, 2021).
3. **Infrastructure Disparities:** A considerable disproportion is observed between the rates of connection to digital facilities in urban and rural settings (ITU-R, 2023, EIB, 2023).
4. **Market Competition and Sustainability:** In its ICT sector, North Macedonia is in a Regional and Global rivalry with more advanced rivals, the Country must constantly innovate and adopt sustainability (Balkan Economic Forum, 2023; OECD, 2019).

The sustained growth of the ICT sector holds profound implications for North Macedonia's future:

1. **Economic Resilience and Diversification:** The ICT sector makes contributions to increase the economic strength improvement as a result of new branches of economic activities and transition from the traditional branch. It also increases the nations resilience to changes in economic environment and different market shocks (IMF, 2022; World Bank, 2020).
2. **Innovation and Competitiveness:** Sustained investment in ICT promotes novelty and knowledge, allowing north Macedonia to build new and sophisticated technologies, and to be competitive in the global digital economy (McKinney and Company, 2023; European Training Foundation, 2023).
3. **Employment and Skill Development:** ICT contribution to employment generation and human capital needs the regular acquisition of high-skill personnel to enhance economic growth, and enhancing quality of life (ILO, 2023; National Statistical Office of North Macedonia, 2023).
4. **Attracting Further Investment:** An efficient ICT establishment draws more global and local investments enhancing economic growth and technological development (World Bank, 2020; OECD, 2019).
5. **Social Inclusion and Quality of Life:** These technological deliverables by ICT considerably enhance the availability of valuable services, encourage

education, and consequently enrich quality living, thus fostering social inclusion for all in the society (UNDP North Macedonia, 2021; International Telecommunication Union, 2023).

The ICT sector development in North Macedonia is one of the best examples of the ability of a single sector to propel an economy, and society forward (Startup North Macedonia, 2023). ICT particularly in the continent's service industry remains a new strategic growth frontier with many opportunities for growth, innovation and diversification (European Commission, 2022; McKinsey & Company, 2023). The combination of the sectors' flexibility to respond to new technologies, proper investments, and policy supports North Macedonia to fully capitalize on the digital economy (OECD, 2019; World Bank, 2020).

Thus, North Macedonia has the chance to strengthen its position as an ICT regional context, considering existing problems and possibilities (National Statistical Office of North Macedonia, 2023). Establishing sustainable development, improving the level of internationalization, and the key topic of promoting a culture of lifelong learning and innovation, will be important conditions for developing the future success of the sector (European Training Foundation, 2023; McKinsey & Company, 2023).

For the sector to grow to its optimum, the government, private sector, education sector, and civil society need to cooperate (OECD, 2019; ILO, 2023). By following the following strategic recommendations: investment in human capital and promotion of inclusive growth, North Macedonia will guarantee that the ICT sector will continue to be an important factor in the future development of prosperity and welfare of its population (European Commission, 2022; National Statistical Office of North Macedonia, 2023).

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