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DIGITALIZATION PRIORITIES IN AZERBAIJAN: CHALLENGES AND PERSPECTIVES



Project Approval Form

Appendix #1

Group Project Topic: Digitalization Priorities in Azerbaijan: Challenges and Perspectives

- Students' Names/Surnames:** 1. **Arzumanlı Orkhan**
2. **Rashad Kazimzade**
3. **Blessing Mudede**

Professional Supervisor: **İlkin Dashdamirli**

Name, Surname

A handwritten signature in black ink, appearing to read 'İlkin Dashdamirli'.

Signature

Professional Supervisor's contact details

Email: İlkin.Dashdamirli@mincom.gov.az

Phone number: +994505297270

Approved

by Academic

Supervisor: **Jevhun Mammadbayli**

Name, Surname

A handwritten signature in black ink, appearing to read 'Jevhun Mammadbayli'.

Signature

Date:17/03/2025

DD/MM/YY

ADA UNIVERSITY

Program: M.A. in Public Administration

Student's Names: Orkhan Arzumanli

Rashad Kazimzada

Blessing Mudede

APPROVED:

Faculty Supervisor: Dr. Jeyhun Mammadbayli

Organization Supervisor: Ilkin Dashdamirli

Dean of the School: Azer Babayev

STATEMENT OF AUTHENTICITY

We have read ADA's policy on plagiarism and certify that, to the best of my knowledge, the content of this paper, entitled "Digitalization Priorities in Azerbaijan: Challenges and Perspectives" is all our own work and does not contain any unacknowledged work.

Signed: Orkhan Arzumanli

Signed: Rashad Kazimzada

Signed: Blessing Mudede

ABSTRACT

This research study aims to explore the digitalization priorities in Azerbaijan, with a goal to advance the country's digital infrastructure, economic well-being and governance as key drivers in building sustainability, resilience and boosting economic growth due to diversification and

minimizing over reliance on the oil sector in Azerbaijan. Some key areas of concern are the improvements in the systems of innovation, digital infrastructure, enhancing e-governance and boosting tech literacy. The strategic vision of digital transformation succumbs to different challenges such as digital illiteracy, underdeveloped infrastructure in some places, security threats and regulatory barriers. In this research, we thoroughly examined the strategic digitalization framework and initiatives put in place by the administrators and we offer long-term solutions to the identified gaps.

Key words: digital infrastructure, digital transformation, digitalization

TABLE OF CONTENTS

Table of Contents

STATEMENT OF AUTHENTICITY

iv

ABSTRACT

v

TABLE OF CONTENTS

vi

CHAPTER 1 INTRODUCTION

1

1.1 BACKGROUND AND CONTEXT	1
1.2 Research Questions, Objectives and Limitations.	3
1.2.1 Research Objectives	3
1.2.2 Research Limitation	4
1.3 METHODOLOGY	4
1.3.1 Data Validity and Reliability	6
CHAPTER 2: PROBLEM DESCRIPTION	8
2.1 Technology- Organization -Environment TOE Framework	10
2.2 Diffusion of Innovation Theory (DOI)	12
2.3 A Comparison of ICT Indicators: Azerbaijan and Regional Countries.	13
2.3.1 Secured Internet Server per 1 million people (World Bank Data)	14
2.3.2 Research and development expenditure as a percentage of GDP. (World Bank Data)	15
2.3.3 Faults Resolution Period for Fixed Broadband Service.	16
2.3.4 Number of Internet service providers (ISP)	17
2.3.5 International bandwidth usage	18
2.3.6 Mobile cellular subscriptions per 100 people	20
2.3.7 Economic Capacity and Digitalization: Global Digitalization Index and Nominal GDP per capita.	20
2.3.8 Internet Traffic Cost Ranking by Countries in 2025	22
2.4 Other Challenges related to the Core Problem.	25
CHAPTER 3: POLICY ALTERNATIVES	29
3.1 Upgrading Digital Infrastructure	29
3.2 Improve Regulatory Framework	32
3.3 Increasing fintech ecosystem and leveraging blockchain technology.	35
CHAPTER 4: EVALUATION OF POLICY OPTIONS	39

4.1 Upgrading Digital Infrastructure.	39
4.2 Improving Regulatory Framework.	42
4.3 Increasing Fintech Ecosystem and Leveraging Blockchain Technology.	46
CHAPTER 5: RECOMMENDATIONS	50
APPENDIX	53
Bibliography	57

LIST OF ABBREVIATIONS

International Telecommunication Union (ITU)

Gross Domestic Product (GDP)

Sustainable Development Goals (SDG)

Gulf Information Technology Exhibition (GITEX)

General Data Protection Regulation (GDPR)

Organization for Economic Co-operation and Development (OECD)

Global Digitalization Index (GDI)

Technology Organization Environment (TOE)

Diffusion of Innovation (DOI)

Azerbaijan Service and Assessment Network (ASAN)

Research and Development (R&D)

Internet Service Provider (ISP)

Business Continuity and Disaster Recovery (BCDR)

CHAPTER 1 INTRODUCTION

1.1 BACKGROUND AND CONTEXT

The digitalization initiative has a fundamental role in governance, defining the economic frameworks, participation, and engagement from the society¹ Castell (2011). Across the whole world, efforts by various governments are to accentuate digital transformation in a way to ensure sustainable economic development, boost efficiency and foster innovation² Mazzucato (2018). According to the World Bank in 2023, Azerbaijan's economic development in the South Caucasus region was depicted to be fast paced, embracing digital transformation as its cornerstone of its prospects. On February 2, 2021, the government of Azerbaijan introduced "Azerbaijan 2030: National Priorities for Socio-Economic Development" which underscores the enhancement of e-government, digital infrastructure development and the proliferation of digital economy.

Digitalization of economies remarkably increases the level of their competitiveness in the international market, changing business processes making it possible to find new sources of innovation, developing and identifying the capacity for exploration and creativity to decrease time to market. With regards to social welfare, digital transformation results in accessibility of public services, resources, information, social participation and engagement with an overall effect of the standard of living as inequalities are addressed. According to Bilan et al (2019) the maturity of the ICT industry is positively correlated with GDP per capita growth, but the extent of economic benefits varies by country due to their different levels of ICT development³. In Frontrunner countries, for example, a one-point increase in GDI score produces 5.4 times the economic value than a one-point increase in Starter countries. Also, one-US-dollar investment in digital

¹ Castells, M., 2011. *The rise of the network society*. John Wiley & Sons.

² Mazzucato, M., 2018. Mission-oriented innovation policies: challenges and opportunities. *Industrial and Corporate Change*, 27(5), pp.803-815.

³ Bilan, Y., Mishchuk, H., Samoliuk, N. and Grishnova, O., 2019. ICT and economic growth: Links and possibilities of engaging. *Intellectual Economics*, 13(1), pp.93-104.

transformation brings an 8.3-US-dollar return in a country's digital economy, based on the findings of the Huawei's Global Digitalization Index (GDI)⁴ announced at GITEX Dubai 2024.

In order not to miss these opportunities, more than 170 countries have released national strategies for digital transformation. For the long-term, sustainable and rapid development of our country, the successful relationship between the society, business and state triad Azerbaijan prepared its own 2030 socio-economic development agenda. Azerbaijan's Agenda 2030 places great emphasis on digital transformation and technological advancement to accelerate national development. By creating a strong innovative ecosystem, developing a human capital-based economy, and implementing advanced digital solutions, the country is trying to be well positioned to increase its global competitiveness. As technological advancements continue, Azerbaijan aims to become a regional leader in digital innovation, digitalization, and high-tech exports, ensuring sustainable economic progress and social well-being.

Despite these efforts, substantial impediments still exist drawing back these efforts in the full attainment of Azerbaijani's digitalization capacity. According to the International Telecommunication Union (ITU) (2023), Azerbaijan has a moderate rate of progression in ICT development relative to regional counterparts such as Kazakhstan and Türkiye. The United Nations (2022) postulated that variations in the level of digital literacy negatively impact adoption of e-government services, cybersecurity threats and a lower rate of broadband penetration and widespread use between the developed cities and underdeveloped cities. To achieve this full potential in digitalization, it requires not only infrastructure but some consideration on the regulations and policies as well as societal readiness. The roadmap of the paper is that it first analyses problems with defined goals set by the government and then provide three solutions to better achieve them. At the end the best policy is taken based on certain criteria set to differentiate and prioritize them.

⁴ <https://www.huawei.com/en/gdi>

1.2 Research Questions, Objectives and Limitations.

This research will respond to the following questions:

- a) What are the major obstacles encountered by Azerbaijan in its digital transformation efforts?
- b) In what ways can Azerbaijan capitalize on digital tools to proliferate public services and enhance e-governance
- c) How does digitalization impact economic growth and diversification in Azerbaijan

1.2.1 Research Objectives

This research will:

- a) Examine the barriers and challenges faced in the digitalization process in Azerbaijan
- b) Assess the potential and capabilities of digital tools in promoting efficiency in public service delivery in Azerbaijan
- c) Analyze the contribution of digital transformation initiatives in boosting economic growth and promoting diversification in Azerbaijan.
- d) Provide a policy recommendation to enhance cybersecurity, economic digitalization and boosting digital inclusion.

1.2.2 Research Limitation

- a) Access to real-time data- some institutions and digital platforms limit the scope of analysis by restricting access to their data.
- b) Complex legal and ethical considerations, such as obtaining consent when using digital data
- c) Unwillingness and Unresponsiveness by other experts we intend to interview.

1.3 METHODOLOGY

This project is of paramount importance as it unpacks the challenges and barriers in the digitalization process, also in assessing the potential and capabilities of digital tools in promoting efficiency in public service delivery, together with the contribution of digital transformation initiatives in boosting economic growth and promoting diversification in Azerbaijan. In this chapter, we focused on the methods and techniques used to gather data to enable the attainment of

research objectives. Research is undertaken to facilitate an understanding of the subject matter through the collection, analysis and interpretation of data⁵ Rosnow and Rosenthal (2008). According to Parahoo (2006) a research design frames a plan, representing how, when and where the data is collected, analyzed and interpreted, which will help in formulating a solid strategy which directs the researchers in addressing the research problem⁶.

For the purposes of this research, a combination of qualitative and quantitative data collection methods was used to examine the digitalization priorities in Azerbaijan, the challenges and perspectives, which is a descriptive research design. The amalgamation of quantitative and qualitative data collection tools promote triangulation which ensures validity and reliability⁷ Plano Clark (2011). It includes qualitative data collection methods such as semi-structure in-depth interviews as primary data. Secondary data collection method is the quantitative tools applied to this research together with qualitative methods to give a comprehensive insight into data collection, also implied to harness cross validation to ensure reliability, validity and credibility of the data findings. A descriptive research design used is the most suitable for this research project as it is more direct, allowing research to collect data from respondents through interviews, survey and focus groups as well as capitalizing on existing data as secondary sources Mugenda (1999). This will also help in mapping the digital economy of Azerbaijan at the present time, highlighting the technologies being utilized, the stakeholders highly involved and the key adopters.

The key stakeholders are the heads of departments in IT, IT professionals, and business leaders. From these stakeholders, interviews were conducted to attain a clear overview of the current state, challenges in the digital economy and to help in formulating the project policy alternatives. The sampling approach utilized was purposive sampling to select interviewees because it gives flexibility to research to select knowledgeable experts in a particular field, ensuring that the

⁵ Rosnow, R. L., Rosenthal, R. (2008). *Beginning behavior research: a conceptual primer* (6th edition), Upper Saddle River, NJ: Prentice Hall.

⁶ Parahoo, K. (2006). *Nursing research principles, processes and issue* 2nd edition. London: Palgrave Macmillan.

⁷ Plano Clark, V.L., 2017. Mixed methods research. *The Journal of Positive Psychology*, 12(3), pp.305-306.

information to be gathered is reliable. These interviews were administered online and in person after seeking consent. The duration of all the interviews was 45-60 minutes, conducted in Azerbaijan and some in English language and audio recordings were kept for transcribing for the purpose of coding and analysis. The limitation of interviews was that some of the intended interviewees were unwilling and some were unresponsive.

Secondary data was gathered from the World Bank, International Telecommunication Union, Statistical Committee of Azerbaijan and governmental reports. Data from these sources provided comprehensive insights and was applied to compare Azerbaijan and other regional countries. The benefits associated with the use of secondary data are that it is readily accessible and reliable since it was collected from reputable sources.

1.3.1 Data Validity and Reliability

Malhotra and Birks (2007) opine that, to ensure that the data being used in a research project is reliable and valid, the research instruments are subject to be tested before they are put into use⁸. Data collection tools meet the validity test when they give an accurate measurement of what they purport to represent⁹ Saunders et al (2009), these tools must therefore be consistent in their outcomes, free from errors and biases. To ensure that the outcomes are free from errors and biases, the researchers instilled confidence in the interviewees as they were promised to be anonymous. Interview questions were also tested and verified before the interview process.

This research paper roadmap consists of five chapters focusing on the different dimensions of the policy problem. In the first chapter, it highlights the background and context of the problem. Chapter 2 focuses on the problem description, discussing the primary causes of the problem in question, highlighting the existence of the problem with a view of the current and past policy measures. On chapter 3, there is an account of the policy alternatives, which seeks to redress the problems put forward in Chapter 2. In chapter 4, policy alternatives will be evaluated,

⁸ Malhotra, N., Birks, D. (2007). *Marketing Research*. An applied approach. London: Prentice Hill.

⁹ Saunders, M., Lewis, P., Thornhill, A. (2009). *Research Methods for Business Students* 5th edition, Harlow: Pearson Education.

recommendations and findings will be discussed in chapter5. In this chapter also, the best policy will be highlighted that will solve the policy problem.

CHAPTER 2: PROBLEM DESCRIPTION

Digitalization is considered a cornerstone in revolutionizing social, political and economic environments. The inception of digital economy is a result of the opportunity to increase the share of value created by digital technologies in the economy¹⁰ Ustiuzhanina (2017). Initiatives in the digital economy will help in promoting economic growth, domestic and international competitiveness and sustainability. The initiatives spelled out by the government of Azerbaijan “Azerbaijan 2030: National Priorities for Socio-Economic Development” which lays digital transformation as central and key enabler of the strategic destinies. Nevertheless, even with this ambitious plan, Azerbaijan is faced with inadequate digital infrastructure which remarkable hinder the capacity of fully attaining digitalization agenda of 2030.

This structural problem is strongly evidenced on various domains such as the secured internet servers per 1 million people, the Research and Development expenditure as a percentage of Gross Domestic Product (GDP), mobile cellular subscriptions per 100 people, international bandwidth usage, fault resolution period for fixed broadband service, the number of internet service providers as well as fixed broadband subscription per 100 people. These various imperfections if aggregated will hinder the achievement of the 2030 digital agenda.

Inadequate digital infrastructure poses an undesirable situation of lagging behind in the technological environment, creating a hurdle in the socio-economic environment, an obstacle in the delivery of public services, participation and engagement of citizens. To provide a measure and prove the existence of this policy problem, a comparative analysis with regional countries showed a digital gap in the vital infrastructural arena.

¹⁰ Ustiuzhanina, E.V., Sigarev, A.V., & Shein, R.A. (2017). Tsifrovaia revoliutsiia i fundamental'nye izmeneniia v ekonomicheskikh otnosheniiakh [Digital revolution and fundamental changes in economic relations]. In Vestnik Cheliabinskogo gosudarstvennogo universiteta [Bulletin of Chelyabinsk State University], 406(10), Ekonomicheskie nauki [Economic sciences], 58, 15–25.

Zuckerman (2020) described digital infrastructure as tools, structures and systems designed to enhance digital life, ensuring accessibility of digital spaces in a user-friendly manner¹¹. These structures, tools and systems play a vital part in our societies and the economy at large by generating revenues, fostering innovation, attracting investments both domestically and foreign, supporting economic growth, upholding and the conservation of cultural values and participation of citizens in the public sphere thus deliberate democracy. As such, it is indisputable that inadequate digital infrastructure leads to digital gaps and inequalities between the urban and marginalized areas as some groups face inaccessibility issues. These marginalized groups opportunities are going to be limited and economically, productivity will decrease, technological investments and job creation will be reduced.

Nambisan (2017) opines that “digital infrastructure is a set of technological mechanisms, tools and systems put in place to aid in collaboration, effective communication and being an anchor in technological innovation and entrepreneurship¹². These tools are used across all the various sectors to contribute positively to public services delivery, participation and engagement of citizens and the proliferation of digital economy. These contributions by Nambisan clearly gave an overview that deficiencies in the digital infrastructure result in failure to preserve cultural values which can otherwise be promoted using digital tools. In this regard, due to lack of citizen participation, deliberate democracy will be undermined with undesirable effects on the legitimacy and trust in the governmental institutions.

2.1 Technology- Organization -Environment TOE Framework

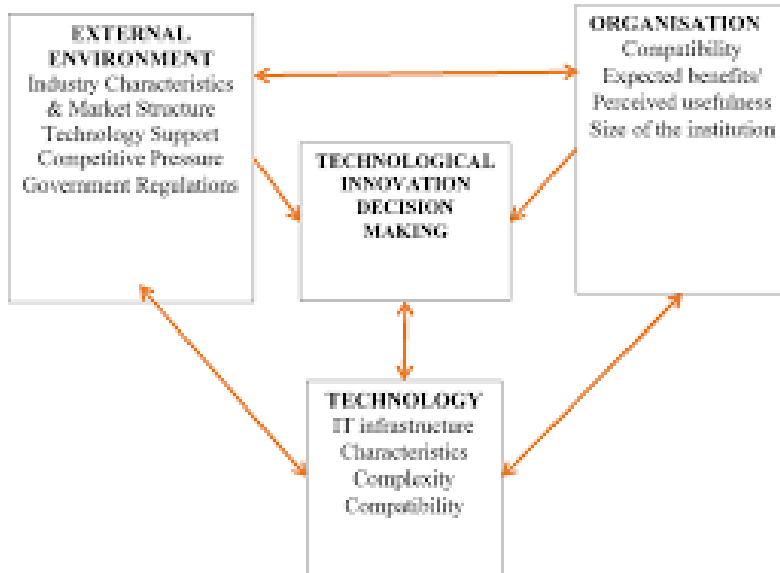
Tornatzky and Fleischer (1990) came up with a framework for organizational adoption. It highlights that, in decision making process there are three main factors that need to be considered such as environment, organization and technology which have an influence on organizational

¹¹ Zuckerman, E., 2020. What is digital public infrastructure? *The Center for Journalism and Liberty*.

¹² Nambisan, S., Lyytinen, K., Majchrzak, A. and Song, M., 2017. Digital innovation management. *MIS quarterly*, 41(1), pp.223-238.

adoption¹³. This framework helps in assessing digitalization adoption and implementation from the industrial and institutional lenses.

Figure-1 TOE Framework



Source: Tornatzky and Fleischer (1990)

The technological environment focuses on the technologies at their disposal and how it influences adoption. This sector considers ICT infrastructure, comparative advantage, cybersecurity tools, compatibility and ease with which it can be implemented. The organizational context dwells on the major elements of the organization such as financial capability, resource availability, culture, availability of expertise, managerial support systems and firm size. The task environment is the sphere where business operations are conducted and it involves interactions with some other players such as competitors, regulators and local authorities. DePietro et al (1990) was of the idea that the factors from the external environment will present opportunity and some constraints to the organization in technological innovation prospects¹⁴.

¹³ Tornatzky, L. G., & Fleischer, M. (1990). *The processes of technological innovation*. Lexington Books

¹⁴ DePietro, R., Wiarda, E., & Fleischer, M. (1990). *The Context for Change: Organization, Technology, and Environmental*. In Tornatzky, L. G., & Fleischer, M. (Eds.). *The Process of Technological Innovation*. (pp. 151-175). Lexington, MA: Lexington Books.

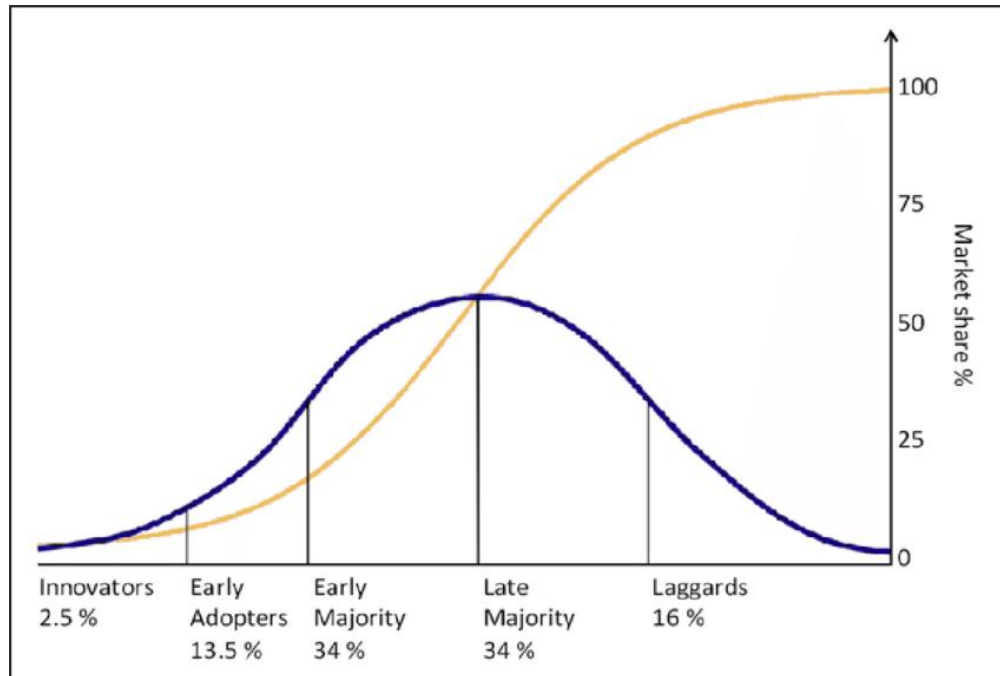
These three dimensions can be applied to Azerbaijan in examining the current digital infrastructure, technological preparedness, initiatives to scale digital literacy and funding. In the case of the task environment, an assessment of regulatory constraints, geopolitics, policy effectiveness can be done together with socio-economic factors such as public trust and societal preparedness. This framework better suits this research problem as it gives a holistic approach and a wider coverage of the technological, institutional and external conditions. The limiting factors can thus be critically evaluated such as inadequate infrastructure, lack of digital skills and regulatory constraints. Also, this framework helps in pointing towards the long-term solution that will enhance digital transformation, promoting e-governance, boosting innovation and digital tools adoption in Azerbaijan.

2.2 Diffusion of Innovation Theory (DOI)

The theory “Diffusion of Innovation” was propounded by Everett Roger, which explains the way technological innovations diffuse overtime in the social and organizational spaces. This theory posits that the adoption process and rate is not uniform and varies. The scope of this theory has a wider coverage in dimensions such as innovation, social systems, communication channels and time. The innovation dimension explains the new ways of public service delivery and communication platforms such as the fintech applications and electronic government platforms. The time component defines the stages through which individuals pass from the first moment their awareness is stimulated to the last stage of adoption. The channel of communication used also is assessed in this theory as it has a huge bearing on adoption. Typical channels of communication include workshops, mass media and peer networks. The last dimension being the social systems, which are largely defined by the cultural values, norms and leadership.

The theory categories adopters into five groups such as innovators, early adopters, early majority, late majority and laggards. This categorization is centered on the time taken to adopt an innovation. It considers comparative advantages from existing innovations, alignment to new and existing user needs and user friendliness. The diagram below represents five different categories.

Figure 2 Rogers Adopters Categories.



Source: Everett Rogers (1995)

This theory when applied to this research problem will unpack the ways in which digital initiatives are being adopted in Azerbaijan on various sectors of the economy as there is an ambitious strategic plan, noticeably the ASAN service. It will also provide a basis for demographic assessment in Azerbaijan focusing on age and locality. Moreover, a clear understanding of how citizens are positioned on the adoption curve will help in tailoring a policy recommendation to facilitate digital transformation.

2.3 A Comparison of ICT Indicators: Azerbaijan and Regional Countries.

The lack of adequate digital infrastructure limits the capacity to attain full potential in the strategic 2030 digital transformation agenda. This impacts the use of e-government services, the expansion of digital economy, attempts to reduce digital illiteracy rate thereby negatively influencing competitiveness on the global space. Domestically, underserved and rural areas will be affected as services will be less accessible and red taps will still be experienced due to lack of digitalized services. A report from the Ministry of Digital Development and transport (April 2024) indicated that “74% of existing households and business in Azerbaijan have broadband internet”, which implies that a quarter of households and companies do not have broadband internet access. Regionally, Azerbaijan lags in some aspects of digital transformation such as secured internet

servers, research and development expenditures as a percentage of its gross domestic product (GDP), mobile cellular subscriptions per 100 people, international bandwidth usage, fault resolution period for fixed broadband service, the number of internet service providers as well as the fixed broadband subscription per 100 people.

2.3.1 Secured Internet Server per 1 million people (World Bank Data)

Countries	Secure Internet Servers (2023)	Interpretation
Armenia	1167	Relatively strong
Azerbaijan	550	Moderate (still low)
Georgia	5252	Significant adoption
Iran	6599	Very high adoption
Kazakhstan	5814	Significant adoption
Türkiye	9882	Very high
Turkmenistan	139	Extremely low
Uzbekistan	824	Relatively strong

Source: World Bank Data (2023)

Citizens need protection whenever they use internet to effect financial transactions and in all kinds of communication as it involves the use of personal information. This security is the foundation of trust in adopting e-government services and other digital platforms provided to the citizens. With regards to secured internet services per 1 million people, Azerbaijan has 5582 secured internet servers, a number which is relatively lower to regional leaders Türkiye with 843190 secured internet servers, signaling a gap in the digital infrastructure development and underdeveloped cybersecurity measures relatively. According to Van den Berg (2017), the internet needs to be secured as it has the greatest potential to cause harm in the form of fraud, hacking, cyber-terrorism and identity theft¹⁵. It is thus important to ensure security to promote easy adoption and trust in adopting digital initiatives.

¹⁵ Van den Berg, B. and Keymolen, E., 2017. Regulating security on the Internet: control versus trust. *International Review of Law, Computers & Technology*, 31(2), pp.188-205.

2.3.2 Research and development expenditure as a percentage of GDP. (World Bank Data)

Country	Research and Development as a percentage of GDP	Interpretation
Armenia	0.21	Significantly high
Azerbaijan	0.15	moderate
Georgia	0.24	Significantly high
Kazakhstan	0.12	low
Türkiye	1.40	Very high
Uzbekistan	0.16	moderate

Source: World Bank Data

This indicator is important as it shows how much is invested to research and development for the purposes of technological advancement, innovation and knowledge creation. Freimane and Balina (2016) pointed out that there is a positive relationship between a change in the expenditures for research and development and the level of ICT development¹⁶. Their findings indicated that a 10% increase in research and development expenditure will yield a 0.2% increase in the level of ICT development (*ceteris paribus*). Higher ratios proportional to the nation's gross domestic product indicates that significant spending is channeled to development of digital infrastructure. Regionally, Türkiye is in the lead, committing 1.40 % of its gross domestic product towards research and development which yields enhanced digital literacy, improved broadband and digital infrastructure.

2.3.3 Faults Resolution Period for Fixed Broadband Service.

Country	Faults Resolution Period for Fixed Broadband Service. (hours)	Interpretation
Armenia	13	Significantly high
Azerbaijan	8	moderate
Georgia	48	Significantly high

¹⁶ Freimane, R. and Bāliņa, S., 2016. Research and development expenditures and economic growth in the EU: A panel data analysis. *Economics*

Kazakhstan	4.63	low
Uzbekistan	4.7	moderate

Source: ITU International Telecommunication Union

This indicator reflects the duration taken to resolve customer faults reports for fixed broadband expressed in hours. According to reports from the International Telecommunication Union, it takes 8 hours to resolve customer faults, 13 hours in Armenia, 4.63 hours in Kazakhstan, 4.7 hours in Uzbekistan and 48 hours in Georgia. Bawany and Shamsi 2015 highlighted that ICT infrastructure is intended to improve efficiency and smooth flow in accessing e-government services, for example applying for driver’s license, paying for bills, registration of vehicles, passport registration, company registration and reporting criminal activities¹⁷. This however requires efficient and timely service delivery, fault free portals and systems, and quick fault resolution to enhance citizens experience in the use of e-government services. Shorter resolution time is desirable as it leads to enhanced customer experience and is of paramount importance in promoting widespread adoption and digital transformation. Whereas longer resolution time can result in users turning back from e-government services.

As we assessed these discrepancies among the regional countries like Türkiye, Turkmenistan, Kazakhstan, Georgia, Armenia, Uzbekistan and Iran in availability of digital infrastructure, we put forward an objective evaluation of the initiatives in place and policies aimed at achieving the desired digital transformation goal.

2.3.4 Number of Internet service providers (ISP)

Country	Number of Internet Service Providers (ISP) 2024	Interpretation
Armenia	220	Significantly high
Azerbaijan	165	moderate
Iran	80	low
Kazakhstan	490	Very high
Türkiye	329	Significantly high

¹⁷ Bawany, N.Z. and Shamsi, J.A., 2015. Smart city architecture: Vision and challenges. *International Journal of Advanced Computer Science and Applications*, 6(11).

Uzbekistan	50	low
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Source: ITU International Telecommunication Union

The number of internet service providers in an economy has an influence on the digital transformation, quality and tariffs as services providers operate in a competitive environment which drives them to provide a high-quality service. In this regard regionally, Azerbaijan has 165 internet service providers, lagging on the number of internet service providers to regional leaders such as Kazakhstan with 490 service providers and Türkiye with 329 service providers. Oestmann 2003 opine that the liberalization by regulators will enhance growth in the number of service providers, competition for all technologies which will serve the businesses, corporate users and reaching to untapped markets¹⁸. Countries with a larger number of internet service providers are associated with a well-developed digital infrastructure, better services quality and higher penetration rates. As opposed to counties with few internet service providers which are associated with lower penetration rates, higher prices (tariffs) and higher penetration rates.

2.3.5 International bandwidth usage

Bhanu et al (2010) defined bandwidth as the aptitude to transfer data between different points in a specified amount of time.it involves the transmission of data across different networks internationally, having influence on global communication, cloud services and data transfers¹⁹. This indicator is the backbone and core infrastructure of ICT as it facilitates communication regionally and between countries and is the foundation in the enlargement of the digital ecosystem.

Country	International Bandwidth Usage	Interpretation
Armenia	459K	low
Azerbaijan	2.42M	moderate
Iran	4.89M	High

¹⁸ Oestmann, S., 2003. Mobile operators: Their contribution to universal service and public access. *Vancouver: Intelcon Research and Consultancy Ltd.* <http://www.inteleconrsearch.com/pdf/mobile>, 20, p.26.

¹⁹ Bhanu, S.V., Chandrasekaran, R.M. and Balakrishnan, V., 2010. Effective bandwidth utilization in ieee802.11 for voip. *arXiv preprint arXiv:1005.0952*.

Kazakhstan	2.74M	moderate
Türkiye	11.8M	Significantly high
Uzbekistan	7.09M	Significantly high
Georgia	732K	low
Turkmenistan	115K	Significantly low

Source: ITU International Telecommunication Union

Countries like Türkiye and Uzbekistan with an international bandwidth which is higher 11.8 M and 7.09 M respectively, have a considerable internet penetration rate and sophisticated digital infrastructure which supports remote working and adoption of e-government services as opposed to countries with lower bandwidth signaling limited internet access and underdeveloped digital infrastructure. Azerbaijan bandwidth usage of 2.42M shows that there is a considerable level of development, though not fully developed and requiring expansion in capacity to close the gap between the regional leaders.

2.3.6 Mobile cellular subscriptions per 100 people

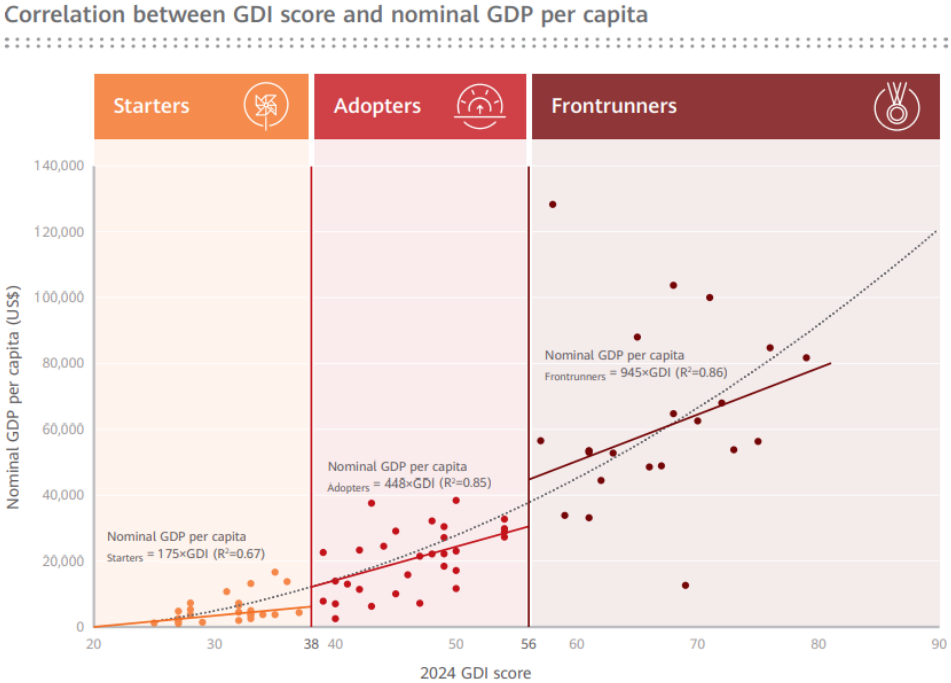
Country	Mobile cellular subscriptions per 100 people	Interpretation
Armenia	135	High
Azerbaijan	107	Moderate
Iran	165	Very high
Kazakhstan	130	High
Türkiye	106	Moderate
Uzbekistan	103	Moderate
Georgia	156	Very high
Turkmenistan	99	low

Source: World bank data

In Azerbaijan, on every 100 people, at least 107 have a mobile cellular subscription. This indicator suggests the penetration rate and possession of separate personal and work Sim cards pr mobile phones. In this regard, Azerbaijan has a good rate, but it is relatively lower than its regional counterparts such as Iran, Kazakhstan, Armenia and Georgia.

2.3.7 Economic Capacity and Digitalization: Global Digitalization Index and Nominal GDP per capita.

The Global Digitalization Index (GDI) follows the digital development of 77 countries and shows a positive correlation between the GDI and GDP. These countries are grouped into three clusters such as front runners, adopters, and starters according to their level of ICT achievements and economic development. The GDI measures the maturity of a country's ICT industry by factoring in digital infrastructure, including computing, storage, cloud, and green energy. It evaluates the situation of each country's ICT industry and its impact on their economy, national income, to help them make more informed decisions about the digital economy. The following are the main indicators of GDI as an enabler: Ubiquitous Connectivity, Digital Foundation, Green Energy and Policy & Ecosystem. As a supply-Fiber Coverage (To C), Fiber Coverage (To B), International Bandwidth, 4G & 5G Coverage, Mobile Broadband Experience, Fixed Broadband Experience, Enterprise Gigabit, Campus Penetration, IPv6 Deployment Rate, Datacenter Investment, Advanced Storage Investment, Business Continuity and Disaster, Recovery (BCDR) Adoption, Computing Power Investment, Cloud Investment, Renewable Electricity Investment, Green Travel Ratio, Charging Convenience, ICT Investment, Spectrum Policy, Digital transformation Policy, Green Energy Policy, ICT Laws and Regulations and ICT Patents.



Source: <https://www-file.huawei.com/-/media/corp2020/gdi/pdf/gdi-2024-en.pdf?la=en>

Azerbaijan is ranked on the 66th place on the Global Digitalization Index score with 31.6 points and settled among starters. Whereas post-Soviet countries such as Estonia and Lithuania are in the adopters' cluster, ranking 26th and 34th respectively. Kazakhstan as a regional country also surpassing Azerbaijan and ranking on 58th. These discrepancies existing between the economic capacity and advancement in the digital economy as reflected by GDI highlights the existence of concerns in the digitalization agenda of Azerbaijan since the country has the capacity to boost digital growth but are being held back by inadequate digital infrastructure and digital illiteracy.

2.3.8 Internet Traffic Cost Ranking by Countries in 2025

According to the Internet Cost Ranking by Country published on the global re-locate resource²⁰, Azerbaijan is ranked on 146th place in the Internet Traffic Cost Ranking by Countries in 2025 with a price of 1.76 USD for one gigabyte of internet, while another country with a similar historical development like Kazakhstan, this price is only 0.41 USD, ranked on 35th place. Belarus is also ahead of Azerbaijan, ranked 65th and Lithuania ranked 115th place. Considering that the operation of modern e-service devices is approximately 90 percent dependent on the availability of the Internet, high Internet prices reduce the accessibility of e-services to low-income groups of the population.

Figure 3: Internet Traffic Cost Ranking by Countries in 2025

Rank	Country	Mobile data price for 1 Gb (USD)	Internet speed mbps
1	Israel	0.02	41.83
35	Kazakhstan	0.41	35.71
65	Belarus	0.67	11.86
115	lithuania	1.26	83.46
147	Azerbaijan	1.76	48.41

²⁰ <https://global-relocate.com/rankings/worldwide-data-pricing>

Source: <https://global-relocate.com/rankings/worldwide-data-pricing>

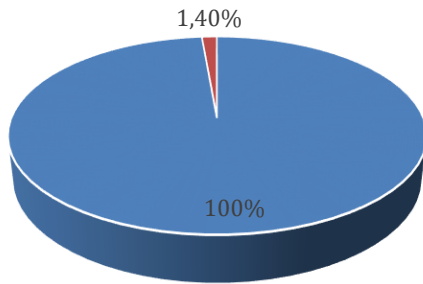
The comparison of mobile data prices based on GDP per capita and monthly average salary can provide a more detailed picture. For this, we should pay attention to the following comparisons:

- 1) In Azerbaijan, GDP in 2024 was 75.6 billion USD, and GDP per capita was 7283 USD
- 2) In Kazakhstan, GDP in 2024 was 997 billion USD, and GDP per capita was 14,291 USD.
- 3) In Lithuania, GDP in 2024 was 84 billion USD, and GDP per capita was 26,998 USD.
- 4) The average monthly salary in 2024 was 593 USD in Azerbaijan, 853 USD in Kazakhstan, and 1,521 USD in Lithuania.

Given an average of 30GB mobile internet usage, the monthly cost of mobile internet, excluding discount companies, will be 52.8 USD in Azerbaijan, 12.3 USD in Kazakhstan, and 37.8 USD in Lithuania. Thus, monthly mobile internet spending in Azerbaijan is 0.72 percent of GDP per capita and 8.9 percent of the average monthly salary, in Kazakhstan it was 0.08 percent of GDP per capita and 1.4 percent of the average monthly salary, and in Lithuania it was equal to 0.14 percent of GDP per capita and 2.48 percent of the monthly salary.

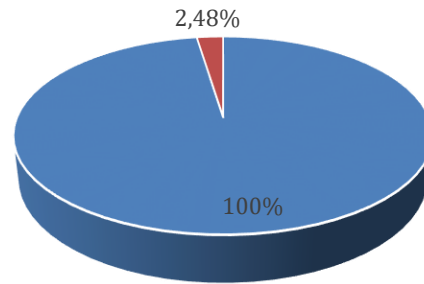
Figure 4 Proportion of the cost of mobile data and monthly average salary.

Mobile data cost share of monthly average salary in Kazakhstan



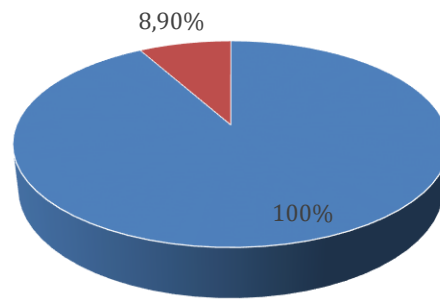
- Monthly average salary
- monthly mobile internet spending

Mobile data cost share of monthly average salary in Lithuania



- Monthly average salary
- monthly mobile internet spending

Mobile data cost share of monthly average salary in Azerbaijan



- Monthly average salary
- monthly mobile internet spending

Source: <https://global-relocate.com/rankings/worldwide-data-pricing>

It is clear from the above analysis that this cost share is more than 3 times higher in Azerbaijan than in Kazakhstan, and almost 2 times higher relative to Lithuania. This reduces the relative availability of mobile internet in Azerbaijan. It leads to less use of e-services by the population, and as a result, it slows down the pace of digitalization in Azerbaijan.

2.4 Other Challenges related to the Core Problem.

Skilled workforce shortage is one of the main challenges in digitalization strategy. Obviously, every goal undertakes a process to complete. The process itself is the determining factor of achieving any endeavor in life. When being no process, there is no result. Also, process in this regard refers to basically “know-how”. It is easy to build a skyscraper if all the required materials, their volume, and amount are known. Certainly, also if there is a skilled labor force to be able to build the entire building. In our example, to achieve 2030 goals about digitalization, it must be ensured that the country has enough workforce. According to World Bank report 2022²¹, Azerbaijan lags digital skills workforce to achieve its long-term goals. There could be several reasons such as: insufficient digital skills among workers, brain drain and skilled workforce migration, lack of digital infrastructure, limited access to financial and innovation resources.

First, insufficient digital skills among workers²² plays a significant role since the policy is a general measure, but the individual components such as workers determine the improvement in the digital sector. For example, if a person is a business analyst and working in an organization which is analytics heavy and it is required to provide daily reports, but he/she chooses to do it manually every time or is unable to do it, there can be no further discussion in development. So, that is the problem Azerbaijan is currently facing since technological education is not part of all the university curriculum, only in master’s degree people are required to take informatics exam and it is also at the basic level. It covers mainly mathematical, historical, and informational parts of informatics, not any hard skills that could be utilized in the workplace. Also, universities do not teach or enforce digital education at the general level. For example, in many modern companies in the capital Baku, data query languages are used, but none of them are being taught or given introduction in universities. Taking into consideration that the era is about data, and being able to query it is like talking and receiving insights. If anyone does not have such talking skills, how can they even extract ideas and more. That is the big question to ask because in 2030 plans are not too far from the current time being and many more ideas and capabilities in technology will arise. That is why there is need to make sure that basic technological skills are in place to even think about

²¹<https://documents1.worldbank.org/curated/en/099621006292298672/pdf/P17756509a1fdc0608d2e0f206d42fcb6f.pdf>

²² <https://report.az/en/ict/azerbaijan-s-technology-parks-to-produce-ai-technologies/>

any catch-up with current time, let alone development. Also, it is worth noting that technological, or even all development is flourishing when the country is in its good times²³. However, Azerbaijan was for 30 years under occupation of 20 percent of its land. During those years, the country was investing in its military strengthening. That is why due to all that havoc around war, the situation did not allow for technology development focus to be prioritized. Consequently, now there is a lack of skilled workforce in digital industry.

Second, there is brain drain and skilled workforce migration. There are a lot of pillars in one's career and everybody wants to make the most out of it. Everybody is individualistic in nature and when observing lagging in their career life, they switch places, positions, cities, and even countries. When the current circumstances did not allow people to grow further, and let them apply their novel ideas and skills, they migrated. Unfortunately, the country also has experienced it so that is one of the reasons why there is not enough skilled labor force. Such talented people are living abroad: in western Europe, North America, and some luxurious Asian and Arabic countries. Current world settings have allowed them to live wherever they want and showcase their skills globally, and they get the benefit of such globalization. They travel the world, experience new cultures, and apply their skills in those countries.

Third, lack of digital infrastructure as mentioned above is one of the contributing factors. It is also related to the previous point since it encapsulates infrastructure to apply sophisticated skills in the industry. If the industry is not ready, such people as mentioned above migrate. However, digital infrastructure is also not an easy thing to implement overnight since there needs to be significant analysis on what the industry or country needs so that resources are not spoiled for the sake of just digitalization. To apply that, there needs to be skilled labor force again and such labor force is better be local than foreign. Because a skilled person apt in their country's capability and shortcoming can deeply understand and analyze what is needed and bring them with the most optimal solution.

The last factor is limited access to financial and innovation resources. This is a very essential point since its result is not immediately apparent. When there is a new policy about granting certain support and finance to startups and innovation, there does not immediately occur a new Meta or Apple company, it takes years. In this regard, Azerbaijan has just recently been able to launch

²³ <https://www.brookings.edu/articles/technology-and-the-innovation-economy/>

startup ecosystem plan after war and covid issues. That is why even though there is opportunity now, it cannot be expected that by 2030, there will be a million-dollar company emerging. The main factor in innovation as being talked over all platforms is some amount of failure. Failure is also process and processes take time.

Consequently, this influences the resistance of a unit to bear all the consequences and go forward without paying attention to procedural failures or time consumption. There is a very famous Apple smartphone introduction by Steve Jobs all over the internet which is said to take 6 months for the presenter to prepare and make such an impressive, comprehensive, and interesting speech. That is called innovation which takes lots of resources. However, all these time frames and actions have not been present in the country so far. That is why it becomes a bit unreasonable to expect such significant growth and make the country an innovation hub in a very short time. However, it signals that there is a lot to do, and the current problem is very significant. To create something phenomenal out of this situation takes perseverance, hard work, vision, and know-how.

To sum up, certain problems were listed above, and their significance was emphasized so that there are solutions and processes to overcome the challenges. The 2030 plan is very brave but also demanding. To help realize it, there needs to be enough business and policy analysis to measure the risk and be sure of the deadline. Without it, some parts would be uncompleted causing them to be postponed for the next doable. However, as it is about technology, any lag makes the process harder and complicated because when working today, technology makes you think about the future, and if you even have problems in the past, one could become paralyzed and become weak in the face of the promises that have been made and are unable to attain them.

CHAPTER 3: POLICY ALTERNATIVES

After conducting semi-structured, in-depth interviews and analysis of secondary data, various policies were formulated to solve the problem of inadequate digital infrastructure and other problems related to the core problem as described in the previous chapter. Also, because of a robust quantitative and qualitative analysis, the regional strategic position of Azerbaijan was observed and below mentioned policy options will work in the best interests for the betterment of the regional competitiveness of Azerbaijan.

- 1) Upgrading Digital Infrastructure
- 2) Improve Regulatory Framework

3) Increasing fintech ecosystem and leveraging blockchain technology.

On the contemporary times, there are some initiatives meant to drive digitalization for example the “Azerbaijan 2030: National Priorities for Socio-Economic Development”. According to the reports from the Ministry of Digital Development and Transport in 2023, this strategic plan is aimed at advancing digital literacy, innovation and accessibility of public services on various platforms. Though some gaps were evidenced such as connectivity in marginalized areas, lack of resilience in cybersecurity and low digital adoption rates. Thus, a more feasible and realistic policy option will advance digitalization efforts in Azerbaijan.

3.1 Upgrading Digital Infrastructure

This policy option in-tells the advancement of fundamental systems, digital tools and technologies that facilitate the provision of public services, social inclusion and communication. (Castells 2011) postulated that having a robust digital infrastructure and digital networks is a key enabler in transforming the state of the economy into a knowledge-based economy. These digital infrastructures include networks, software and hardware which are instrumental in digitalization, enhancing connectivity and doing away with digital divide. Some major aspects in upgrading digital infrastructure include the proliferation of broadband accessibility across the country, expanding the tech networks, establishment of data centers and the development of cybersecurity systems. This can be achieved through the establishment of public-private partnerships. These strategic partnerships do not only close the expertise gap but also help in solving the financial constraints encountered in the quest to pursue digitalization agenda Baller et al 2016. Also, establishing partnerships will reduce pressure on the public sector, which in many cases lags the private sector in adopting digital initiatives. This will boost usage rates for firms and citizens who are the customers.

According to Pepper et al 2016 “effective digital communication networks established between countries, citizens and institutions are a cornerstone in driving economic growth and productivity”. This is because, improved digital infrastructure creates ground for infant industries and will act as key facilitator in developing existing sectors. Falch and Henten 2010 were of the idea that telecommunication market characterized by large number of internet service providers who are more competitive due to reduced barriers to entry and exit, which in-turn yield sophisticated service delivery at a low possible cost. The adoption of regulation reforms such as deregulation on

the licensing framework will create a desirable level of competition which will incentivize internet service providers to scale on digital initiatives and innovation.

Digital infrastructure can be upgraded through boosting accessibility of broadband which Qiang et al 2009 highlighted that the penetration rates have a strong positive relation with gross domestic product especially in developing countries. It is of paramount importance to capitalize on the strategic initiative “Online Azerbaijan” through boosting broadband infrastructure in marginalized areas. Some of the benefits associated with the expansion of broadband infrastructure Saksena and Whisler 2003, it ensures quality and speed in connectivity, promoting security on cross platforms and thus data protection. Through advancing broadband systems, the telecommunication costs are subsequently reduced as well as the transaction cost with improved accessibility on multi-media applications.

Moreso, as part of upgrading digital infrastructure, cloud services and data centers cannot be ignored because their existence in a more sophisticated manner brings about a reduction in information technology related costs, scalability, resilience since they are the backbone for innovation to which the various sectors of the economy can capitalize from Marston et al (2011). Thus, developing high tech sophisticated data centers and adopting cloud services will promote innovation, security and enhancing data accessibility in a cost-effective way. With reference to key sphere of economy like the health sector, data centers and cloud services will allow for big data analysis, processing and storage which can go a long way in advancing predictive analysis and reinforcing the level of awareness and preparedness to unforeseen disasters.

Advanced data centers will help in managing digital data which is presumably sensitive and personal to citizens. Such secured data centers and cloud services will give citizens peace of mind in adopting digital initiatives since they involve sharing of sensitive information and will pave the way for participation in public spaces. The data centers and cloud services as digital infrastructure components also closely relate to the cybersecurity infrastructure, a domain centered on data protection. In upgrading digital infrastructure, it implies adopting well-built security protocols, response mechanisms, encryption and firewalls to secure all forms of communication and guarantee national security.

3.2 Improve Regulatory Framework

While significant progress has been made in digital public services and the necessary infrastructure building, the lack of a strong, modern, adaptive regulatory framework hampers development and undermines the achievements made. Outdated regulations and their amendments and additions, lack of coordination across agencies, especially those that are driving forces of digitalization, and slow legislative processes harm innovation and the adoption of new technologies for digitalization.

The main specific legislation regulating digitalization in Azerbaijan is as follows:

- a) Law of the Republic of Azerbaijan on Information, Information Provision and Information Protection(1998) last amendment was 2023.
- b) Decree of the President of the Republic of Azerbaijan on some measures related to improving governance in the field of digitalization, innovation, high technologies and communications in the Republic of Azerbaijan..(2021) last amendment was 2022.
- c) Law of the Republic of Azerbaijan on telecommunications(2005) last amendment was 2017.
- d) Law on electronic signature and electronic document of the Republic of Azerbaijan(2004) last amendment was 2023.
- e) Law of the Republic of Azerbaijan on E-Commerce (2005) last amendment was 2017.
- f) Law of the Republic of Azerbaijan on Personal Data (2010) last amendment was 2024.
- g) Law of the Republic of Azerbaijan On obtaining information(2005) last amendment was 2012.
- h) Decision of the Cabinet of Ministers of the Republic of Azerbaijan on approval of the criteria for determining startups.(2021) last amendment was 2024.
- i) Resolution of the Cabinet of Ministers of the Republic of Azerbaijan on approval of the “Transition Plan of State Information Systems and Resources to the “Government Cloud” and some measures related to the “Government Cloud” (2020) last amendment was 2024.
- j) Decision of the Cabinet of Ministers of the Republic of Azerbaijan on approval of the criteria for determining startups.(2021) last amendment was 2024.

If we look at the dates of adoption of these laws and the latest amendments to them, we will see that in many cases they are outdated and need updating to keep up with the rapid digitalization process. For this, it is necessary to Launch a national audit of all laws related to digital technologies

(e-commerce, data, cybersecurity, AI, fintech) while Identifying outdated provisions and legal shortcomings.

Form a cross-sectoral working group (government, municipalities, technology and related industry, legal experts, civil society) to guide the reforms. Sometimes, while different areas have achieved great achievements in themselves, when it comes to interaction, this results in a huge waste of time and occurs as a result of the legislation for regulating such cases not being coordinated with specific cases. Include clauses in all digital laws requiring automatic review every 2-3 years. Considering the rapid development of digitalization, it is necessary to keep this time period short.

Harmonize Azerbaijan's laws with international norms to boost global competitiveness in order to keep up with constant development and strengthen international integration. Align with frameworks like the General Data Protection Regulation(2016) for data protection, Organisation for Economic Co-operation and Development Artificial Intelligence Principles (2016).

Strengthening digital expertise at various levels of the legislature, as well as in the courts, and giving due weight to the opinions of such experts. To this end, train parliamentarians, judges, and public servants on digital trends and legal implications to create a digitally literate legal system capable of interpreting new-age regulations and implementing these laws in line with modern requirements.

To accelerate digitalization, legislation should also include provisions that will encourage several areas:

- a) Adoption of articles that clearly and precisely regulate the scope of powers of artificial intelligence and the division of responsibility for their use.
- b) Adopting laws that provide for international data transfer mechanisms, such as standard contractual clauses.
- c) Articles providing for taking measures to reduce the use of paper data carriers in government agencies.
- d) Adding provisions that provide for salary increases for employees who pass special exams on digital skills.
- e) Articles providing for customs benefits for individual entrepreneurs who bring special equipment to digitize their business.

- f) Articles that provide for the creation of experimental digital economic zones with customized modern regulations.
- g) Taking measures to recognize certificates and other documents issued through state information systems and resources during administrative proceedings
- h) Adoption of additional strengthened administrative penalty provisions to increase the integrity and accuracy of ICT-related statistical data.
- i) Enact legislation that would legally recognize digital identities and electronic signatures universally.
- j) Adoption of legal provisions regulating and offering incentives for using renewable energy in tech operations and include administrative measures that require new data centers to meet energy efficiency standards.
- k) Strengthen consumer rights easy returns, clear terms and conditions, protection against unfair algorithmic decisions for the restoration of consumer rights in the event of some violations caused by the digitalization of services and the widespread use of e-commerce.
- l) Although many institutions have switched to providing digital services, there are still institutions that are far from such services, and the lack of full regulation of the transition by law is one of the main factors creating this situation. A bill should be adopted that requires all institutions to complete the transition to digital services by a certain period of time.
- m) Adding articles regulating state support for replacing databases storing information obtained by individual entrepreneurs during the provision of services and other activities with electronic information systems and resources.

3.3 Increasing fintech ecosystem and leveraging blockchain technology.

The world is going on with sharp progress with new technologies. Every step towards the future is perceived by the evolution of technology. People are talking about it and paying significant attention. For example, electric cars: when the idea was revealed and products were manufactured, other car manufacturing countries and corporations started to shake. It was some hallucination for the masses but became the norm afterwards. Now electric cars are being sold at higher speed,

recent data showing the 25% increase in sales just compared to the previous year²⁴. That is why technological trends need to be taken seriously. Currently in the world, the cryptocurrency fintech market is growing and a hot topic. A lot of news is published day by day, even after the election of US president, there were lots of spikes in the market²⁵. This signals the essence of implementing blockchain technology in the country as well to achieve digitalization goals for 2030 because if the ecosystem does not improve by that time, the country will fall behind the world again, thus making the policy goal obsolete.

First, decentralized bank services need to be opened. The existing services all belong to banks. There are a few fintech startups launched mainly by existing tech giants in the country, such as: m10 and akart. However, all these serve as a third-party gateway for centralized banks since both digital wallets transact through Pasha Bank. That is also due to regulations in the country that do not support individual banking systems other than the centralized system. Whenever you open an m10 account, that account by m10 for the customer is created in the database of pasha bank so that later the user can make transactions. However, it is contradictory to blockchain technology. Whenever one transaction is made, it should be overseen and approved by every other node in the network, not by only the central system. That is why there should be new regulations allowing legal entities to be able to make digital cash flow without central involvement. This increases the trust among customers, and they start even investing more. There is data showing that Azerbaijan is 92nd in digitalization²⁶, even falling behind its neighbors Georgia and Armenia ranking 54th and 77th respectively. There is another perspective that the country is at war with the latter country, and it needs to outperform its neighbor to mitigate hostility. When the war happens, centralized services are the most attacked since they contain the most amount of data. In this regard, not locating far away, and being neighbor by the Caspian Sea, Uzbekistan takes the lead regionally ranking 33rd. As mentioned, even neighboring countries are far ahead than the country which raises the red flag on the way to 2030 goals about digitalization. This goal is not easy to reach, but preliminary actions should be made such as legally at least opening the doors for decentralized networks to be able to operate.

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Furthermore, more fintech companies and services should be provided. Countries being agile in the face of digitalization have adopted many payment systems and methods. There are even ways to pay by just QR code or with face recognition without any gadget. However, in Azerbaijan, there is no such systems. Only between 2021 and 2023, there was a startup called “SmilePay”, but it also did not go far. There are several issues that need to be suggested to increase such services, not to close. First, people do not trust digital services, especially if it comes with a new name that they have not heard as one of recognized bank as an instance. During those days, in markets, there were just stands which would read people’s face patterns and make digital payments without any individual technology use by customer’s side. However, even though there are security issues in huge banks, people did not even give them a chance, and even the ones who gave the chance did not keep significant amounts of money in their digital face wallets. That is why the country needs to take cybersecurity much more seriously and work on itself to make campaigns to show transparency to customers. Also, culture plays a significant role in fintech since certain people do not prefer online money transfers. For example, in rural areas of Azerbaijan, people do not often use bank card money transfers, they make those transactions face to face as obviously known as cultural phenomena. That is why there is a saying that no innovation comes before ideology. First people or leadership shift their understanding about something and later those changes come. For example, if someone is always wearing black and satisfied by that, they would never think about wearing colorfully. But if the inner world becomes shinier and creative, it will be reflected outside as well. In this regard, the suggestion is to even bring leaders or cultivate the ones to infuse fintech ideas among the population so that when innovation comes, it is welcomed and put into production. That way could ensure robust digitalization strategy and clear road to the goal for 2030 digitalization plan.

These three policy options are aimed at addressing inadequate digital infrastructure as identified in Chapter 2. Adoption of these policy options will advance the digital economy, regional and international competitiveness of Azerbaijan.

CHAPTER 4: EVALUATION OF POLICY OPTIONS

The policy options in this research will be examined against five criteria, such as Effectiveness, Efficiency, Feasibility, Equity and Flexibility.

4.1 Upgrading Digital Infrastructure.

This policy option is of greater importance in addressing the inadequate digital infrastructure faced in Azerbaijan which restricts efficiency in e-governance, inclusion, economic growth and the development in the digital economy. By upgrading digital infrastructure, it implies initiatives to boost the backbone of digital infrastructure such as broadband networks, 5G mobile network, fiber optic connectivity, data centers as well as expanding the internet in the marginalized areas.

With regards to the effectiveness of this policy option, it is highly effective in countering the research problem identified. This is because digital infrastructure is the backbone of digitalization across all sectors of the economy such as finance, education, healthcare as well as governance. A good example is the investment in 5G mobile networks and high-quality broadband networks which will boost public service delivery, encourage working and learning from home and ensuring access and adoption of digitalized financial services. Also sophisticated digital infrastructure is foundational in the provision of digital platforms, governance which is data driven and cloud

services. With reference to the ITU well developed digital infrastructure turns to inhibit resilience and adaptability in the face of disaster, giving a huge chance to quickly respond to crises. In this regard, significant investments in digital infrastructure are of paramount importance for Azerbaijan to assume a leading role in the level of digitalization regionally.

When assessing the feasibility of this option, upgrading digital infrastructure is both operational and technically feasible. In Azerbaijan, the Ministry of Digital Development and Transport has the capacity to harness the development of the digital infrastructure through its institutional framework. It also lowers the transactional costs and boosts competitiveness. Once applied in Azerbaijan, it will guarantee a reduction in inequalities as opportunities will be made accessible to marginalized areas. It is worth noting that there is a need for strategic partnerships and coordination at each level between the private and public tech companies, international firms and the government. These strategic partnerships will play a huge role in addressing financial constraints from the geographic perspective, for example in the regional areas with mountains. This will also provide for a phased implementation approach where the implementation will start in the urban centers and spread to the rural places.

With regards to efficiency, there is a huge outlay associated with upgrading digital infrastructure for example, costly fiber optic cables, cloud facilities as well as the base station. For the sake of economic growth, which is long-term in nature, the benefits associated with upgrading digital infrastructures are greater than the associated costs. According to the OECD, developed digital infrastructure is positively associated with positive returns as it will result in enhanced digital services delivery, job creation and productivity. In Azerbaijan, the Ministry of Digital Development and Transport has the capacity to harness the development of the digital infrastructure through its institutional framework. It also lowers the transactional costs and boosts competitiveness. Once applied in Azerbaijan, it will guarantee a reduction in inequalities as opportunities will be made accessible to marginalized areas.

When assessing the policy against equity, it is worth noting that upgrading digital infrastructure can minimize the inequalities depending on two critical components such as implementation and design. The policy should ensure that there is a fair distribution of benefits and if there are any inequalities, they should be redressed considering education, geography and income. In terms of geography, the urban parts of Azerbaijan relative to the marginalized areas which are subject to poor connectivity and accessibility concerns might suffer more in terms of widening the inequality

gap if the policy is concentrated in urban centers which are already developed. In this case, this policy will aim to resolve these disparities through focusing on upgrading digital infrastructure in the rural and marginalized areas. When assessing this policy on income equality perspective, upgrading digital infrastructure without a backing of subsidized access and digital learning centers might impact the low-income earners and widening the gap between the haves and have-nots. this policy will ensure intergenerational equity in Azerbaijan as the future generation will benefit from the digital infrastructure that will be made in place during this period. The overall assessment of equity is that upgrading digital infrastructure will be inclusive and fair if equity consideration is made in design and implementation.

Furthermore, this policy was evaluated in terms of its flexibility. This in tells considerations on sustainability and adaptability. It seeks to ensure whether the policy option is rigid or flexible to factors such as technological changes, political environment and changes in the demographic trends as there is a potential of obsolescence and mismatch with citizens expectation. Upgrading digital infrastructure is done from a very broad perspective, not only considering the current needs but also future demands. A good example are fiber optic networks and other modern infrastructures which are modular and scalable. Also, considering the political and legal environment, the new infrastructure needs to blend with the regulatory framework of Azerbaijan. There is also a need for institutional flexibility which implies the capacity bestowed in both local as well as national institutions with the purpose of managing and maintaining the infrastructure. This policy is flexible in that it is not a one-size-fits-all but rather it aims to address the unique needs of various regions in Azerbaijan. This implies a solution is made as pe the needs of a certain area, solving real problems and leaving room for innovation and change.

Policy Options	Effectiveness	Feasibility	Efficiency	Equity	Flexibility

Upgrading Digital Infrastructure	High- Strongly boost connectivity and accessibility. Build digital services capacity. 4/5	Moderate-Huge initial outlay. Prone to constraints in Logistics (marginal areas) 3/5	Moderate-Huge capital investment is needed, with a long-term cost saving. 3/5	High- Strong potential in addressing digital divide if equity centered. 4/5	High- if designed in a modular and adaptable manner. Scalability is possible 4/5
Improving Regulatory Framework	<i>High- promote sustainable competition, protection of privacy rights and ensuring trust</i> 5/5	<i>High- requires few resources but more on legal expertise</i> 5/5	<i>High- A cost effective approach relatively, with a broader implication</i> 4/5	<i>Moderate- Advances data protection, though it fails to close inequality gap directly.</i> 3/5	<i>High- Highly adaptable and resilient to changes in various factors (technology, demography and politics)</i> 4/5
Increasing fintech ecosystem and leveraging blockchain technology.	Moderate- Promotes innovation, transparency and financial inclusion 3/5	Moderate- prone to institutional resistance and it is dependent on regulatory framework and digital skills 3/5	High- Blockchain eliminates intermediaries. Reduced infrastructural costs 4/5	Moderate- Digital divide and access gap may widen 3/5	Moderate- Block chain may be impacted by resistance as well as rigid legal framework. 3/5

4.2 Improving Regulatory Framework.

The implementation of digital systems without legal regulation can lead to legal uncertainty, data security risks and possible violations of human rights and this requires additional resources and coordinated actions to improve the legal base including financial resources, human resources, organizational and administrative resources.

Financial resources. Budget funds are necessary for preparing new bills, organizing public discussions, attracting expert groups and conducting training.

Personnel resources. Lawyers, specialists in digital technologies, ICT engineers and experts in state administration must participate in this process. This increases the demand for qualified personnel in the labor market.

Technological resources. The improvement of the digital infrastructure is important for the implementation of the legal basis. Examples include the creation of electronic archives, the digitization of legal databases, and the expansion of citizens' access to legal information online.

Administrative and organizational resources. Cooperation and coordination of relevant state bodies, institutional reforms, and in some cases the creation of new institutions or sub-institutes are decisive for the implementation of legal reforms.

Improving the legal base can lead to the following positive results in the process of digitization:

A. Increasing transparency: a clear and effective regulatory framework prevents corruption and increases the transparency of government funds management.

B. Improvement of service quality: correct application of legal mechanisms to electronic services increases citizen satisfaction and reduces the burden on state bodies.

C. Improving the investment environment: external legal rules and ensuring legal protection in the digital environment create favorable conditions for foreign and local investors.

D. Contributing to development through the protection of human rights: data protection, recognition of rights on the Internet and strengthening of legal protection are guarantors of civil

rights in the digital era and contribute to the development of a society in which the rights of citizens are reliably protected.

Although the improvement of the legal base requires large financial costs at the initial stage, these costs are justified in the medium and long term.

Short-term expenditure. Funds allocated to legislative initiatives, infrastructure projects, and training programs.

Medium-term and long-term benefits. increasing the efficiency of the state budget, reducing paper documentation due to the use of electronic services and minimizing administrative costs.

If we turn to international experience, we can see how legal norms simultaneously reflect digitalization and lead to significant savings in the next stages. The following examples can serve as good examples: Estonia is one of the leading models of the legal base in the field of digitization. In this country, the "electronic residency" program, online elections and centralized databases are managed on a transparent and legal basis. Georgia has achieved legal transparency due to the implementation of blockchain technology in its land registration system.

Strengthening the legal framework directly affects the effectiveness of the digitalization process. As a result of the introduction of the law on electronic signatures, the legal regulation of digital payment systems, and the formation of the legal basis for e-government services, the quality and accessibility of services have increased. These changes have simplified citizens' relations with the state and strengthened transparency in governance. However, legal gaps associated with some new technologies like the use of artificial intelligence, blockchain-based services and cross-border transfer of personal data can reduce effectiveness. The slow adoption of legal documents and the uneven level of enforcement skills of law enforcement agencies create additional obstacles to effectiveness.

From the point of view of economic efficiency, for example, the reduction of court costs and the acceleration of the work process because of the introduction of electronic court systems demonstrate the real advantages of legal digitization. On the contrary, failure to update the legal base will lead to legal gaps in the digitalization process, the growth of legal disputes and the waste of additional public funds. Improving the legal framework increases the efficiency of the state in terms of long-term management and resource use. Electronic documents, digital identification, and automated processes reduce the workload of state bodies and increase efficiency.

The Azerbaijani government's declaration of digital development as a priority and the special place given to legal reforms in the "Digital Azerbaijan 2022–2026" strategy make it possible to improve the legal framework. In addition, cooperation with international organizations like UN, Council of Europe and World Bank strengthens legal and institutional support for this policy. However, in some areas, the lack of complete readiness of legal mechanisms in line with modern technologies or the fact that old laws are still in force may complicate the implementation of this policy. The pace of adaptation of some state institutions to legal changes is slow.

Rapid changes in technology require a flexible approach from the legal system. In this regard, it is important for the legal framework to be flexible, that is, to adapt to new technologies and respond promptly to new regulatory requirements. Although Azerbaijani legislation has shown some progress in this area, flexibility is not fully ensured. The creation of "sandbox" legal testing regime mechanisms can be useful in increasing flexibility.

Currently, some legal documents in Azerbaijan address these issues, for example, the Law on Electronic Government. However, equal legal access to digital services for people living in the regions, people with disabilities, and the elderly population is not yet fully ensured. Therefore, the comprehensiveness and inclusiveness of the legal framework should be increased.

4.3 Increasing Fintech Ecosystem and Leveraging Blockchain Technology.

It is always good to follow global trends and apply them locally, but not always the concurrent ecosystem is ready to take it. The world adopted blockchain technology decades ago, and now there are lots of services on them. Even there are countries who are using the blockchain in their governance. For example, in Estonia, voting has been migrated to decentralized digital system to ensure transparency and ease of participation. So, the citizens do not have to commute during specific hours of elections day in which there are even traffic and general people conjunctions. Such problems are avoided by a certain number of people to save energy and time since they do not want to contribute by distracting their comfort. However, blockchain technology helps ensure everyone can participate with ease of use.

The first criterion is effectiveness which also has both sides: government and citizens. When the government wants to launch a certain program, it must think of the costs that are to be incurred. Although blockchain technology is not expensive, its implementation comes with expertise and security considerations. Especially in the government sector, security is very essential. It is not

easy to claim that the next election will be on blockchain voting system and apply it right away. There are lots of dimensions to be reviewed such as non-citizen network detection and elimination, cyber-attacks during the voting such as penetrating the whole system or stealing the votes of the citizens by proxy software services. That is why the government would not be so willing to take all the charges and take responsibility just for the sake of implementing it. Due to that reason, they will not see it as a cost-effective strategy because implementing such a system will require international experts and their salaries, also their support for a few years until the system is fault tolerant and local workers have reached the expertise to sustain it. Besides, as it is government system, it is not always welcoming to grant the implementation to foreigners since the political system would be depended on third parties. Furthermore, the local businesses can take the initiative to improve their enterprise globally. For example, if the AZN equivalent of cryptocurrency is developed by a company and international sales start being made via that, they could earn so much benefit if offered at a reasonable price. This approach would be very much cost-effective since if developed significantly, government support might also come. If the government observes improvement, there will be more willingness to expand the services and even apply blockchain to their internal services. This way would also benefit the businesses who have developed it since they gained expertise. In the future, if any attention is given to the field, they will be the forefront of blockchain implementation through the entire country and even other businesses.

With regards to efficiency, increasing the fintech ecosystem and leveraging blockchain technology is highly efficient in Azerbaijan's case especially in various sectors including public and financial institutions. Innovation in financial technology, for example e-payments and mobile banking, will cut the cost associated with operations as well as removing intermediaries. The utilization of blockchain in Azerbaijan will ensure real time and secure transactions which implies efficient. With reference to other regional countries such as Kazakhstan and Georgia, there is a noticeable adoption of blockchain and is being utilized in the voting system, international payment as well as land registries. Its adoption in Azerbaijan will provide closely or similarly benefits. Fintech innovation will play a major role in resolving financial exclusion, reducing costs, increasing tax base as more taxes will be collected by means of digital footprints which largely proliferates the banking and financial sector. Together with blockchain, there will be reduced fraudulent activities and since the processes are streamlined, there will be less need for paperwork for verification. The efficiency of this policy also depends on adequate planning to avoid inefficiencies. This can be done by rolling out training programs and standardized protocols to ensure efficiency.

Assessment against flexibility indicated that increasing the fintech ecosystem and leveraging blockchain technology is moderately flexible as they are designed modularly and can be scaled across various sectors. Different financial products, for example digital wallets can be adaptable and scalable according to varying expectations of users. This aligns with Azerbaijan economy where there is a digital gap between the rural and urban citizens when it comes to the level of financial knowledge. The application and adoption of blockchain technology is also flexible in both private and public sector, for example in public procurement as well as decentralized finance innovation. In Azerbaijan, blockchain can be utilized by various ministries in a way that suits their needs in terms of data integrity and transparency. With that in mind, flexibility also comes with consequences such as fragmentation which occurs if the policy is not administered properly. This normally occurs when overlaps exist with implementation issues which will affect the adoption rate.

The policy option was also examined against equity as a criterion. It however presents an opportunity to promote equity but with a potential to risk the worsening of the digital divide. The greatest opportunity is in enhancing access to the underserved, for example, areas without fintech services can be tapped into through the utilization of mobile platforms especially in marginalized areas. This has a resultant effect of resolving financial exclusion and promoting fairness in accessing resources. The use of blockchain technology will solve corruption concerns, promoting equal opportunities through transparency as well as accountability. On the other hand, the attainment of equity can be debatable since the tech savvy tends to benefit more at the expense of those without the digital skills and know-how, which might worsen the digital gap. It however requires backing with training programs as well as a robust regulatory framework.

When evaluating the feasibility of the policy option, it is noticed that increasing the fintech ecosystem and leveraging blockchain technology is moderately feasible and highly dependent on the support from the regulatory framework, readiness and the level of maturity in the ecosystem. In Azerbaijan, there is a strong political will to advance the state of digital economy which points out that the policy environment is favorable to expand fintech and leverage blockchain technology. The demographic composition of Azerbaijan population which is characterized by young age will facilitate and determine how feasible to adopt this policy can be, with increasing domestic digital finance startup and the will to venture and partner with other international players. On the other hand, there are several factors to consider when it comes to feasibility such as the regulatory framework on cryptocurrencies which is noticeably underdeveloped as well as blockchain

governance. These concerns hamper innovation and investments since there will be uncertainty and lack of trust. Other concerns include the lack of expertise in data science and blockchain development which will affect the implementation of this policy.

CHAPTER 5: RECOMMENDATIONS

This chapter focuses on the policy recommendation from the policy options put forward in the previous chapters and examined to come up with a solid and sound policy conclusion. The focus of this research project was to investigate the digitalization priorities of Azerbaijan, the challenges and perspectives encountered in the quest to proliferate the digital growth to attain economic growth and economic diversification. The major research problem identified was lack of adequate digital infrastructure and other problems related to the core problem were lack of digital skills, lack of competitiveness as evidenced by fewer internet service providers.

Firstly, there are key findings from this research project such as accessibility concerns and digital gaps that exist between the urban parts of Azerbaijan relatively to the marginalized areas. With majority of the citizens having access and connectivity in the urban areas as well as considerable digital skills, the rural areas continue to lag. This calls for a need to upgrade the infrastructure to ensure digital equity. Another key finding that was highlighted from interviewing the experts was the existence of gaps within the legal and institutional sphere. This encompasses the laws and standards that regulate data protection, digital rights and cybersecurity. The current protection laws to some extent do not comprehensively align with the digital principles of OECD and GDPR. This creates an undesirable effect as uncertainty looms and trust issues persist on both sides thus citizens and investors. Citizens and investors are particularly concerned about the misuse of data, safety and rights which will lower the receptiveness to digital initiatives. Furthermore, the research also found out that the progress in the digital transformation is being dragged by inadequate digital skills, limited connectivity in the regional areas and lack of data centers.

The main advantage of interviews with experts was that they presented approaches based on practical observations and experience. These approaches more realistically reveal gaps in legislation, uneven implementation of digital services or inadequate infrastructure. Their insights allowed the researchers to understand problems that are not visible in legal and technical documents but arise during implementation in the field.

The state of the digital economy was examined from the literature review perspective, secondary data and analysis by experts. From these strategic sources, three policy options were highlighted such as upgrading digital infrastructure, improving regulatory framework as well as increasing the fintech ecosystem and leveraging blockchain technology. These options varied in terms of their possible benefits and drawbacks and as such they were evaluated using the two most important criteria such as culture fitness and cost effectiveness. From this close examination, this chapter will outline a viable recommendation to the digital transformation agenda of Azerbaijan.

Recommendation.

Following the primary and secondary methods applied to collect data, we recommend improving the regulatory framework as a primary policy to solve the inadequate digital infrastructure in Azerbaijan. This policy is cost-effective, requiring only administrative and legal costs. It is highly recommended to adopt this policy in Azerbaijan as it also fit with the current state of the economy, capacity and the governance culture of Azerbaijan. It is regarded as the best option since it is readily actionable, with prospects of boosting public trust and attracting investments because of a solid regulatory framework. It further enhances the protection of digital rights at the same time creating an environment where internet service providers can thrive in service delivery, being innovative and contributing significantly to infrastructural development. The level of competition that will arise will boost the quality and coverage of digital initiatives.

This policy is strongly supported as it aligns with international laws and standards, for example GDPR and other digital principles as set by OECD. The benefits associated with this alignment is that it boosts the global positioning of Azerbaijan, increasing the digital cooperation on a cross-border level as well as enhancing trade. Moreso, an improved regulatory framework will harness digital transformation as it is the foundation of all digital initiatives. For example, an initiative to upgrade the digital infrastructure or innovation and the use of block chain requires a bold legal structure, standards with underlying enforcements for them to be sustainable.

APPENDIX

CAPSTONE RESEARCH PROJECT INTERVIEW CONSENT FORM

Students Names: Orkhan Arzumanli, Rashad Kazimzada Blessing Mudede

Title: Digitalization Priorities: Challenges and Perspectives.

The consent form aims to inform and seek permission to interviewees of this research project that examines the digitalization priorities in Azerbaijan: Challenges and Perspectives. Your decision to participate in this research project is of greater significance in knowledge creation and problem solving as the information obtained will go a long way in facilitating a sound policy recommendation. The interviews will be conducted by students from ADA University under the supervision of Dr Jeyhun Mammadbayli.

The Research Project:

Digitalization Priorities: Challenges and Perspectives.

Consent of Participation in the Research Interviews

1. Participation in this capstone project is voluntary to ensure interviewee's rights
2. The interview duration is 45-60mins under ethical consideration of Anonymity and Confidentiality.

3. Information from the interviews will only be available to the interviewer, interviewee and the supervisor.
4. No intended harm or risk to the partakers as interviewee maintains the right to leave or stop the interview anytime, and reserves the right to pass on some of question(s) on his/her own will subject to comfortability
5. Interview will be recorded, so that it can be used by the interviewer for the purpose of taking notes after the interview and transcriptions for analysis. This transcript will only be accessed by the interviewer and the supervisor and after transcript analysis, this interview recording will be destroyed.
6. The interviewee holds the right to contact the supervisor in search of clarity
7. Interviewees should also note that participation in this capstone project does not have any direct benefit or payment afterwards or in the future.

Interviewee:

Name..... Date.....Signature.....

Interviewer:

Name..... Date.....Signature.....

INTERVIEW QUESTIONS

Warm Up Questions

- i. *Thank you for your consent to be interviewed for the purpose of advancing our research project. Feel free to introduce yourself.*

- ii. *Can you give an account of your area of specialization and how long have you been active in this area?*
- iii. *What grabbed your attention on this research topic “Digitalization Priorities in Azerbaijan: Challenges and Perspectives”?*

Main Interview Questions with proposed follow up Questions

- 1) What is the progress in the digitalization Strategic Plan of Azerbaijan
-which key achievements or targets have been reached? (follow up)
- 2) There are digitalization priorities highlighted in the “Azerbaijan 2030: National Socio-Economic Development”. How do these strategic priorities match the expectations and dynamic needs of local firms and citizens?
- 3) How would you evaluate the backbone of digital infrastructure in Azerbaijan such as cloud services, internet and data centers?
- 4) How influential are data centers and cloud services in advancing the digitalization agenda of 2030?
- 5) How do you perceive the current digital transformation in ensuring inclusion and accessibility to marginalized areas and vulnerable groups?
*-What are some of the challenges being faced in the process e.g. digital literacy?
-Which measure are being put in place to scale digital skills? (follow up)*
- 6) How effective are digital platforms such as ASAN Service in delivering services nationwide?
-what are some of the grey areas in the adoption and use of digital platforms? (follow up)
- 7) In what ways digitalization efforts shape the interaction between businesses, citizens and governmental institutions?
- 8) To what extent do current digitalization policies support infant industries and SME” s?
*-What are some of the challenges faced by SME” s and other startups to fully partake in this digitalization agenda?
-What kind of support can be extended to SME” s and startups?*
- 9) From your own experience, what is your view on international partnerships in advancing digital development in Azerbaijan?
-Which sectors of the economy can benefit more from these partnerships?

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