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Development and Application of "K-Better Digital Inclusiveness Indicator" for South Korea's Central Asian ODA Strategy in the Post-COVID-Era

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Development and Application of "K-Better Digital Inclusiveness Indicator" for South Korea's Central Asian ODA Strategy in the Post-COVID-Era

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KOICA

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Summary

'Digital ODA', a much-discussed topic in the international community, is an international development cooperation activity that supports the digital transformation of developing countries in terms of ensuring that the achievements of 'digital transformation' are not the exclusive property of developed countries, but that the entire globe can enjoy them together. Discussions and activities related to digital ODA are being conducted very actively in the international community. Nevertheless, not only do the underprivileged of digital transformation still exist, but even if they experience digital transformation, do they still appear to be marginalized from the benefits?

This study presupposes that the cause of this phenomenon is due to the limitations of the perspective on digital transformation. The existing perspective has focused on the quantitative growth of digital transformation, prepared related indices, and promoted digital ODA according to that standard. Accordingly, this study argues that it is necessary to take a more comprehensive approach to the scope of digital transformation and pay attention to the creation of a sociocultural environment in which more people can satisfactorily enjoy the digital services they want. In short, this study aims to develop a better digital inclusion index and, based on this, seek a digital ODA promotion strategy that allows more people to satisfactorily enjoy the benefits of digital transformation.

"Better digital inclusion," which this study aims to address, includes the existing inclusive discussions, meaning that more people can use digital services tailored to their needs with a higher frequency, with more trust, and with more satisfaction do. In other words, this report not only includes discussions to reduce the gap between countries, gender gap, regional gap, and generation gap, which have traditionally been dealt with in digital inclusion discussions, but also alleviates or prevents the side

effects of expanding digital inclusion stemming from sociocultural backgrounds. Promote broader digital inclusion discussions, including. However, as this study is an initial study related to digital ODA, the subject of better digital inclusion index is limited to the Central Asian region. The specific research contents can be summarized as follows.

The first part of Chapter Ⅱ deals with companionship and discussions related to digital transformation and digital ODA. Regarding 'digital inclusion', which is emphasized in the recent 'digital ODA' discussion, researchers believe that the key to resolving inequality is to improve the economic production potential of the underprivileged and improve access to social services such as education, health, environment, and public administration. It was seen as ICT utilization ability and environment creation, which ultimately contributes to resolving inequality by enhancing efficiency, effectiveness, and transparency in the government, business, and social sectors. In addition, in a situation where digitalization is accelerating and becoming mainstream in the national, social, and economic (production) areas, the digital divide between social classes is a risk factor that can hinder social integration. recognized as a key factor. In this context, the international community has emphasized the issue of digital inclusion. The ITU established 'Connect 2020' in consideration of the SDGs in 2014. It included the goal of achieving equality and securing communication and ICT accessibility for people with disabilities in all countries. In 2016, the initiative (hereinafter referred to as 'EQUALS') is being promoted with UN Women to achieve the goal of enhancing women's empowerment through the use of SDG 5. In addition, since 2018, the G20 has emphasized the need for support for strengthening the rights and participation of women, girls, the vulnerable, the disabled, and remote residents in developing countries. It focuses heavily on digital inclusion issues.

While the international community is striving to increase inclusiveness in the digital transformation process, there has also been a recognition that it is necessary to respond to side effects and problems that occur in the digital transformation process along with efforts to increase digital inclusion. For example, the mobile money

(currency) system that is spreading in Africa with the advent of the digital age makes it easy for the poor to access financial services, but the lack of economic and financial knowledge and the use of financial services that are not linked to income generation. Cases that operate as a risk factor that turns these extremely poor into financial bankruptcy are confirmed. In addition, the lack of adequate regulatory mechanisms increases the exposure of these poorest people to financial crime, while illicit arms trade, corruption, trafficking in illegal goods, drug trafficking, trafficking in stolen cars, wildlife trafficking, counterfeit money, and human trafficking linked to mobile money. However, research results can also confirm that it is linked to illegal money laundering or terrorism. Various other side effects can be found.

While the international community is actively discussing digital inclusion and side effects in the process of digital transformation in ICT ODA, Korea ranks second in terms of ICT ODA based on CRS code 220, and 22040 equivalents to ICT ODA. Ranked first in terms of code, Korea is one of the top countries in terms of ICT ODA scale. In addition, in terms of the accumulated ICT ODA from 2015 to 2022, pure ICT is about KRW 358.9 billion (about 1.7% of the total), and when expanded to the convergence ICT sector, it is known that it will increase to about KRW 1,787 billion (about 9% of the total). In particular, although it is not a pure ICT business, it is confirmed that the proportion of convergence ICT business that reflects ICT elements in the business is continuously expanding. However, so far, KOICA's digital ODA projects have not identified customized projects that focus on realizing the 'principle of inclusivity', and as one of several projects, digital accessibility improvement for the digitally underprivileged and remote areas, digital literacy education and capacity. In other words, it is judged that there has been no approach or goal-level project to improve inclusiveness in digital transformation or to solve the problem of side effects in digital transformation, which is the core subject of this study.

The second part of Chapter II mentions the need for a new perspective on digital transformation, analyzes existing indices, and proposes a better digital inclusion index as a new index. To this end, among existing indices, ICT development index,

inclusive Internet index, digital economy and society index, and digital transformation index are analyzed. As a result of the analysis, the ICT development index does not contain a sufficient level of discussion on digital transformation, and the digital economy and society index relatively sufficiently emphasizes inclusiveness in terms of social and cultural aspects, but does not fully reflect the characteristics of developing countries because it targets only European Union member states. It has a limitation that it cannot be used, so it was not adopted. In addition, in the case of the digital transformation index, in which the importance of socio-cultural competency was most emphasized, it was judged that the appropriateness of the index for the country was not sufficient because it was an index for companies. On the other hand, the inclusive internet index is relatively appropriate in that it describes relatively diverse inclusiveness. However, the better digital inclusiveness index of this study is newly proposed by improving the following. In terms of better inclusiveness, in the case of the existing inclusive Internet index, first, it has focused on absolute diffusion rather than harmonious diffusion. For example, it has limitations such as evaluating the level of Internet use by residential area rather than regional differences. Therefore, better inclusiveness modifies the indicator with gap as the key word. Second, since the low weight of the existing social and cultural competency aspect is observed as a limitation, the weight is modified and introduced into the study. In addition, coordination indicators that can suggest coordination between various actors are added to increase sociocultural acceptance. Third, by adjusting the weights of the technical, human, and socio-cultural competency transitions that have been dealt with in the previous discussions, the proportion of social and cultural aspects is increased. However, the weighting for the adjustment index is limited to 10%. This reflects that it is in charge of a secondary function as an adjustment instrument compared to basic indicators. In other words, the role of the adjustment index is only possible when the transformation of technological competency, human competency, and socio-cultural competency takes place. Considering this, the weight is limited to 10%.

Chapter III examines the difficulties common to inland Central Asian countries in

digital transformation. In addition, the five countries seek ways to improve digital inclusion between countries through regional cooperation as a regional community rather than as individual countries. It calls attention to the implementation of state-led strategies and emphasizes the need for an understanding of how each government consults with various actors.

Chapter IV contains an analysis of Uzbekistan. Since April 2020, many educational institutions in Uzbekistan have moved quickly to offer remote learning opportunities to students due to the COVID-19 pandemic. However, many schools struggled to provide quality education due to technological problems such as lack of digital infrastructure and slow internet speeds. This problem was particularly noticeable in rural areas, where students in rural areas often had difficulty accessing information necessary for learning despite high digital literacy. The digital education gap between regions was also revealed in the survey. Despite the rapid digital transformation of education due to the COVID-19 pandemic, the experience of using e-learning services among local residents was significantly lower than that of cities.

The digitalization of education further exacerbated the problem of the lack of professional manpower endemic in Uzbekistan's education system. In Uzbekistan, where the number of skilled educators is absolutely lacking due to low wages, e-learning, which can provide quality education to many at the same time, is emerging as an alternative to compensate for this. Ironically, however, the lack of educational personnel leads to a lack of experts who can modify teaching methods to meet the online learning requirements, and has acted as an obstacle to building quality online educational content.

Therefore, the researchers propose the introduction of a coordination mechanism through which various stakeholders such as teachers, education experts, information and communication technology experts, and education-related government departments can communicate and cooperate in the process of digital transformation of education, and examine the existence and operation of such a mechanism. We suggest using it as an adjustment index for the BDI-Index. The top-down education

digitization promoted by the central government of Uzbekistan does not sufficiently reflect the difference in technological and human capacity between provinces and cities, and has failed to introduce appropriate technology suitable for the local reality. In other words, even though Wi-Fi and computers are secured in local educational institutions, there are frequent cases where digital technology is not used in education due to defects in communication infrastructure or teachers' lack of understanding of digital textbooks. Therefore, it is important to involve teachers who know the reality and difficulties of the local education field best in the digital education dissemination process. Through this, it will be possible to reduce the widening digital and educational gaps between regions that occur as a side effect of the digital transformation process. In addition, digital technology utilization and online teaching methods must be provided so that teachers can provide digital classes suitable for students' digital literacy level and school's level of digital technology, so that digital technology can be actively used in the learning field.

Chapter Ⅴ is a case study of Kyrgyzstan. As Kyrgyzstan moves through its digital transformation, a comprehensive effort is needed to promote digital inclusion within Kyrgyzstan. Most importantly, there is a lack of reliable data on the state of Kyrgyzstan's digital transformation. For example, according to government statistics, 88% of internet users are, but the ICT Regulatory Authority Annual Report 2021 51% of the population of the Kyrgyz Republic uses the Internet. There are also differences in statistics between international sources, such as the World Bank, ITU, UN e-Government Assessment, and Telegiography. Therefore, both governments and international organizations need to work together to collect reliable statistical data.

To improve regional connectivity, cross-country routes concerted efforts are needed to diversify routes (including routes through China and Afghanistan) and strengthen cooperation among Central Asian countries. Build relationships with satellite Internet companies (OneWeb, Starlink, etc).[1] Central Asian governments and various

1) See trans-Caspian submarine cable

stakeholders should acknowledge Russia's dependence on Internet traffic and seek viable alternatives, such as low-orbit satellite companies that can provide a way to connect remote and hard-to-reach areas. Competition within countries should also be encouraged. Sharing and joint construction of infrastructure based on public-private partnership will promote construction of communication infrastructure, especially fiber optic networks and wireless communication towers, and significantly reduce construction costs. This will help connect remote and hard-to-reach areas faster, cheaper and easier.

Furthermore, the Kyrgyz government has adopted "Infrastructure Sharing", "Co-Building", "Dig Once", "Cloud First", "Open by Default", "Cybersafety Design." Policies and regulations in urban and regional areas should be differentiated, and policies or regulations targeting local areas should be simplified or exempted.

In terms of content, the development of local language content should be encouraged. Language is particularly important in Kyrgyzstan as it can widen the digital divide between cities and provinces. The increase in vernacular content means more educational opportunities and training programs are needed to expand digital literacy. And increasing the digital literacy of rural populations can empower communities and reduce the digital divide between cities and rural areas. As a result of visiting and interviewing local communities, it seems that the level of digital technology in rural areas needs to be improved. Even basic skills like opening an email account can seem complicated. Among the activities to improve digital skills in rural areas are EU-sponsored initiatives such as Sanarip Insan (digital citizens), DigiKonush (digital neighbors) and Digital Ishker (digital workers).

In order for Kyrgyzstan, a latecomer to digital transformation in Central Asia, to build a more inclusive and inclusive digital environment, close communication and cooperation between government and non-governmental organizations are essential. As noted in this chapter, there are a number of NGOs supported by governments and

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https://kaztag.kz/amp/news/prokladku-optovolkna-po-dnu-kaspiya-poobeshchali-zavershit-v-2021-2022-gody

international organizations working to improve Internet connectivity and digital literacy in underserved rural areas. These organizations are expanding their activities to remote areas beyond the reach of the government, and are partnering with local communities in their own creative ways. In addition, it contributes to expanding social inclusion by providing information and digital education opportunities to women and girls belonging to conservative rural communities who have traditionally been marginalized. Activists from NGOs can provide key insights and experience in adapting top-down national digital policies to local conditions, and continue to call for improvement in areas where governments are less interested, such as privacy protection. By doing so, it plays a role in bringing about an improvement in the overall digital environment. Therefore, the researchers proposed to include the existence and operation of communication and cooperation mechanisms between the government and non-governmental organizations as adjustment indicators of the BDI-index, and consideration of these adjustment indicators will promote the expansion of digital inclusion in Kyrgyzstan in the manner described above.

Chapter VI conducts research on Kazakhstan. This chapter proposes to introduce a mechanism to evaluate the technology adaptability of users before the Kazakhstan government upgrades e-government and online public service platforms or introduces new technologies, and reflects this as an adjustment index of the BDI-Index. Such mechanisms are considered to be particularly important when governments work with private technology companies and fintech companies to increase the convenience and efficiency of e-government services. In the course of our research, we found that IT and fintech companies at home and abroad provide impressive innovative technologies to attract government investment, but if these new technologies are not tested for users' technological adaptability before they are widely deployed, it will widen the digital divide in the traditional sense. It has been confirmed that it can cause side effects.

The reason why satisfaction with digital services is higher in cities is because cities have better information and communication infrastructure than rural areas, and the

reason why high-income people are higher in satisfaction is because they have income to consume quality Internet services than low-income people. I can guess. In other words, it seems that technical factors determine satisfaction. However, technical descriptions only show one side of the digital transformation. In the summer of 2022, the government of Kazakhstan announced plans to introduce new login technologies such as face recognition and shape recognition to enhance the convenience of e-government users. Rostislav Konyashkin, chairman of State Information Technology JSC, a quasi-governmental organization in charge of digitization of public services, said, "Digital ID based on biometrics will enable the provision of a wider variety of e-government services than the one-time SMS authentication currently used. It is very easy and saves time," he said, persuading citizens who expressed concerns about the security of biometric data based on the convenience of the new technology. However, in the fall of 2022, the government of Kazakhstan presented the same reason and announced the introduction of QR-Code technology to replace the digital ID authentication system. Technological upgrades such as biometric data or QR-codes improve the efficiency and convenience of e-government. And in Central Asia, where the government, not the market, plays the role of an investor in innovative technology, the continuous upgrade of e-government technology is also used as a route to disseminate new digital technology to the private sector.

However, it is understood that the introduction of new technologies and technological upgrades in e-government services are occurring so rapidly that citizens do not have enough time to adapt to the new technologies. This is also confirmed by the analysis results of the survey and oral responses. Many respondents reported frequent glitches, such as freezing of QR codes or digital signature (EDS) authentication used to identify individual users and logging into e-government services, or repeatedly requesting login information. Some respondents said they were confused by the lack of relevant information about the frequent changes in e-government services available online. While it is agreed that privatization of public services increases efficiency and convenience, there were also concerns that it could undermine service

quality, transparency, and protection of personal information. Overall, citizens of Kazakhstan feel that they have no other choice but to rely on online services and information, but do not feel that services not provided by the government or public authorities are safe or completely reliable. Respondents therefore argued that the government should strengthen countermeasures against online fraud and virus attacks through internet monitoring.

Currently, Kazakhstan's national digital strategy does not include an institutional coordination mechanism to promote communication between different stakeholders in the digital transformation and effectively coordinate the different views. The site Open.egov.kz, which provides public data as part of the e-government system, has an online forum for asking questions and evaluating policies of government ministries, but it does not address digital transformation. By listening to the opinions of citizens who are the main users of e-government and directly affected by digital transformation, citizens' trust in e-public services and the government that provides them will be increased. Furthermore, by inducing public digital technology innovation that reflects citizens' opinions, technological adaptability, and expectations, it will be able to contribute to not only quantitative but also qualitative expansion of digital inclusion.

Chapter VII describes Korea's digital ODA promotion strategy for Central Asia using the K-BDI index. Korea and the five Central Asian countries have developed cooperative relations through bilateral and multilateral cooperation after the dissolution of the Soviet Union, and in this process, the field of international development cooperation has also developed. As a result, Korea's ODA to the five Central Asian countries increased from less than $100,000 in 1992 to about $80 million in 2020, and the proportion of ODA to the total of developing countries rose from 2.21% to 4.18%. In particular, among Korea's ODA to Central Asia, the proportion of ODA to Uzbekistan is high, and recently, the proportion of ODA to Kyrgyzstan is also increasing. In the same vein, among Korea's digital ODA to Central Asia from 2016 to 2020, most of pure digital ODA was donated to Uzbekistan and Kyrgyzstan.

When reviewing the digital ODA policy, whose importance is being emphasized in the development of international development cooperation with the five Central Asian countries, from the K-BDI perspective, the following limitations are identified. First of all, in terms of promotion strategy, 'digital inclusion' is being applied in a narrow manner, and there is a limit to not being able to properly respond to relevant regional issues. In terms of the current status of digital ODA policy promotion to Central Asia, responses to problems such as wide-area network construction, local language digital content development, and digital divide between cities and provinces are lacking, and it is judged that there is room for improvement in terms of the promotion system. Therefore, in order to improve Korea's digital ODA promotion strategy for developing countries, including Central Asia, it is first necessary to systematically identify the needs of partner countries (recipient countries). Based on this, it is necessary to consider the preparation of regional digital ODA strategies, prioritization of tasks required by regions or individual countries, strategic linkages with other ODA projects, and cross-sector-oriented digital ODA strategies. In addition, in the process of promoting this, efforts are needed to strengthen the cooperation mechanism between the government and non-governmental sectors and the basis for systematic support.

This study is very meaningful as it is a preliminary study related to the development of an index for preparing a digital ODA strategy. Nevertheless, it is revealed that it has the following limitations. First, in relation to the index proposal, due to the limitations of the size of the research team and the research period, only a limited level of index measurement for Central Asian countries and a macroscopic index proposal were implemented. Therefore, despite the proposal of a new index, it was not possible to properly measure each country based on the index. The measured index values are presented through the attachment.

Therefore, additional research on preparing a specific measurement method should be conducted, and measurement of the missing indicator value is proposed as a future study. After the work is done, country-level evaluation using a better inclusiveness

index can be meaningfully progressed. Second, reflecting the expertise of local researchers in Central Asia, it contains only the contents of specific fields by country, so the uniformity of the research report is found to be damaged. Through future research, a detailed and consistent analysis of the relevant countries should be added.

Lastly, this study is the result of the process of building partnerships with researchers in the field of international development cooperation in Korea, local researchers in the Central Asian region, and Central Asian researchers in the UK. During the year of the research, the newly established digital network among researchers was of great help in strengthening mutual digital capabilities, and I would like to thank KOICA for their financial support throughout the research process.

CONTENTS

Summary ····· i

Ⅰ. Introduction ····· 1

Ⅱ. Digital Inclusiveness and International Development Cooperation ····· 6

1. Digital ODA and Inclusiveness in Digital Transformation ····· 7

1) Issue of Inclusiveness in Digital Transformation ····· 7

2) Discourse on the Side-effects of Digital Transformation ····· 17

3) Digital Inclusiveness in South Korea's Digital ODA ····· 22

4) Digital Inclusiveness in UK's Digital ODA ····· 28

2. New Perspective on Digital Transformation ····· 36

1) Review of Existing Digital Transformation Indices ····· 37

2) Digital Transformation according to Existing Indices ····· 57

3) Proposal for Better Digital Inclusiveness Index ····· 62

Ⅲ. Development and Application of Better Digital Inclusiveness Index for the Region of Central Asia ····· 68

1. Current State of Digital Transformation in Central Asia : Regional and International perspectives ····· 68

1) Kazakhstan ····· 71

2) Kyrgyz Republic ····· 72

3) Tajikistan ····· 73

4) Uzbekistan ····· 73

2. Effects of Digital Transformation in Central Asia : Case Analysis ····· 74

3. Developing Better Digital Inclusiveness Index for Central Asia ····· 75

4. Application of the Better Digital Inclusiveness Index in Central Asia ····· 77

Ⅳ. Development and Application of Better Digital Inclusiveness Indicators for Uzbekistan ····· 82

1. Current State of Digital Transformation ····· 85

1) Technical Capability Transformation ····· 85

2) Human Capability Transformation ····· 88

3) Socio-cultural Capability Transformation ····· 89

4) National Digital Transformation Policy and Strategy ····· 90

2. Effects of Expanding Digital Inclusiveness : Focusing on the Education Sector ····· 93

3. Developing the Better Digital Inclusiveness Index and Coordination Marker in the Education Sector ····· 96

1) Survey and Interview Methodology ····· 96

2) Survey Results Analysis ····· 99

3) Expert Interview Analysis ····· 102

4. Conclusion: Application of the Better Digital Inclusiveness Index Metrics and Its Impact ····· 106

Ⅴ. Development and Application of Better Digital Inclusiveness Indicators for Kyrgyzstan ····· 109

1. Current State of Digital Transformation through the Lenses of the Better Digital Inclusiveness Index ····· 112

1) Technological Capability Transformation ····· 112

2) Human Capability Transformation ····· 113

3) Socio-cultural Capability Transformation ····· 113

4) National Digital Transformation Policy and Strategy ····· 113

2. Effects of Expanding Digital Inclusiveness: Focusing on the Urban-Rural Divide ····· 117

3. Developing the Better Digital Inclusiveness Index and Coordination Marker for

Non-governmental Organization Contribution ····· 120
1) Survey and Interview Methodology Overview ····· 120
2) Survey Results Analysis ····· 121
3) Expert Interview Analysis ····· 128
4. Conclusion: Application of the Better Digital Inclusiveness Metrics and Its Impact ····· 133

Ⅵ. Development and Application of the Better Digital Inclusiveness Indicators for Kazakhstan ····· 136

1. Current State of Digital Transformation through the Lenses of the Better Digital Inclusiveness Index ····· 139
1) Technical Capability Transformation ····· 139
2) Human Capability Transformation ····· 141
3) Socio-cultural Capability Transformation ····· 142
4) National Digital Transformation Policy and Strategy ····· 143
2. Effects of Expanding Digital Inclusiveness : Focusing on the e-Government 148
3. Developing the Better Digital Inclusiveness Index and Coordinator Marker in the e-Government Sector ····· 153
1) Survey Methodology ····· 153
2) Survey Results Analysis ····· 156
4. Conclusion: Application of the Better Digital Inclusiveness Index Metrics and Its Impact ····· 168

Ⅶ. Use of the K-BDI Index in South Korea's Digital ODA Strategy for Central Asia ····· 171

1. South Korea's ODA to Central Asia ····· 171
1) South Korea's Cooperation with and ODA to Central Asia ····· 171
2) Distribution of Korea's ODA to Central Asia ····· 178
2. Current Status and Evaluation of South Korea's Digital ODA to Central Asia 187
1) Current Status of South Korea's Digital ODA to Central Asia ····· 187

2) Evaluation of South Korea's Digital ODA to Central Asia ····· 191
3. South Korea's Strategy for Digital ODA to Central Asia ····· 198
1) The nature and status of the strategy based on the K-BDI ····· 198
2) Necessity of Regional ODA Strategies ····· 199
3) Strategic Priority of Challenges ····· 199
4) Linkage between digital ODA and other ODA projects ····· 200
5) Cooperation mechanisms between government and non-governmental sectors ····· 200
6) Digital ODA Strategy Focusing on Cross-Sectors ····· 201
7) Foundation for Digital ODA Implementation ····· 201

Ⅷ. Conclusion ····· 203

Bibliography ····· 206

Tables

Table Ⅱ-1. ICT Indicators and objectives of SDGs ····· 7
Table Ⅱ-2 Status of ICT ODA donors in OECD DAC Countries (1995-2018) ····· 9
Table Ⅱ-3. Inter and Intra-continental Gap in Internet Access Rate ····· 11
Table Ⅱ-4. ICT Development Index ····· 38
Table Ⅱ-5. Subcategories of Inclusive Internet Index: Availability ····· 43
Table Ⅱ-6. Subcategories of Inclusive Internet Index: Affordability ····· 44
Table Ⅱ-7. Subcategories of Inclusive Internet Index: Relevance ····· 45
Table Ⅱ-8. Subcategories of Inclusive Internet Index: Readiness ····· 46
Table Ⅱ-9. Sub-categories of Digital Economy and Social Index: Human Capital ····· 48
Table Ⅱ-10. Sub-categories of Digital Economy and Social Index: Connectivity ····· 49
Table Ⅱ-11. Sub-categories of Digital Economy and Social Index: Integration of Digital Technology ····· 50
Table Ⅱ-12. Sub-categories of Digital Economy and Social Index: Digital Public Services ····· 50
Table Ⅱ-13. How existing indices understand digital transformation (1): Sub-categories · 58
Table Ⅱ-14. How existing indices understand digital transformation (2): Indicators(selected) ····· 59
Table Ⅱ-15. Better Digital Inclusiveness Index (1): Technological Capability Transformation Indicators ····· 65
Table Ⅱ-16. Better Digital Inclusiveness Index (2): Human Capability Transformation Indicators ····· 66
Table Ⅱ-17. Better Digital Inclusiveness Index (2): Human Capability Transformation Indicators ····· 66
Table Ⅱ-18. Better Digital Inclusiveness Index (4): Coordination Indicators ····· 67

Table Ⅳ-1. Technical Capability Transformation Indicator ····· 85
Table Ⅳ-2. Human Capability Transformation Indicators ····· 89
Table Ⅳ-3. Socio-cultural Capability Transformation Indicators ····· 90
Table Ⅳ-4. Summary of Variables Statistics ····· 98

Table Ⅳ-5. Digital Educational Services Use by Region, Gender and Age ····· 100
Table Ⅳ-6. Regression Results of Digital Education Services Determinants ····· 100

Table Ⅴ-1. Technical Capability Transformation Indicator ····· 112
Table Ⅴ-2. Summary of Variables Statistics ····· 122
Table Ⅴ-3. Impact of Internet Training ····· 124
Table Ⅴ-4. Factors that Influence Digital Satisfaction ····· 125
Table Ⅴ-5. Factors Influencing Trust in Online Information ····· 126
Table Ⅴ-6. Expectation towards Government Role ····· 128

Table Ⅵ-1. Technical Capability Transformation Indicators ····· 140
Table Ⅵ-2. Human Capability Transformation Indicators ····· 142
Table Ⅵ-3. Socio-cultural Capability Transformation Indicators ····· 142
Table Ⅵ-4. Key Objectives of Digital Kazakhstan Strategy ····· 144
Table Ⅵ-5. Key Targets of Digital Kazakhstan Strategy ····· 144
Table Ⅵ-6. Services Accessible via EgovKzBot 2.0 (as of June 2022) ····· 146
Table Ⅵ-7. E-Government Services Available on the Kaspi.kz Mobile App ····· 151
Table Ⅵ-8. Summary of Variables Statistics ····· 153
Table Ⅵ-9. Education Level Distribution of Respondents ····· 154
Table Ⅵ-10. Income Level Distribution of Respondents ····· 155
Table Ⅵ-11. Spending on the Internet of Respondents ····· 155
Table Ⅵ-12. Factors Influence the Frequency of E-Government Service Usage ····· 157
Table Ⅵ-13. Analysis of Factors Affecting Digital Services Satisfaction ····· 158
Table Ⅵ-14. Factors Affecting Trust: Government Websites ····· 160
Table Ⅵ-15. Factors Affecting Trust: SNS Messages, Online News, and Official Apps ·· 161
Table Ⅵ-16. Expectation towards Government Role and Satisfaction ····· 163
Table Ⅵ-17. Expectation towards Government (E-gov Services) and Trust ····· 165
Table Ⅵ-18. Expectation towards Government (E-gov Services) and Trust ····· 166

Table Ⅶ-1. Diplomatic Relations b/w South Korea and 5 Central Asian Countries ····· 173
Table Ⅶ-2. Prior to 2010, Changes in Central Asia's priority partner countries for loans and grants and countries that established cooperation strategies for each country ····· 175

Table Ⅶ-3. Priority Partner Countries in Central Asia since 2010 ····· 176
Table Ⅶ-4. Trends in ODA share in Central Asia by sector (2006-2020, top 10 sectors) ····· 181
Table Ⅶ-5. South Korea's ODA volume and proportion to five Central Asian countries (1992-2020) ····· 182
Table Ⅶ-6. South Korea's digital ODA scale and number of projects in Central Asia (2016-2020) ····· 188
Table Ⅶ-7. South Korea's digital ODA to Central Asia by country (2016-2020) ····· 189
Table Ⅶ-8. South Korea's Digital ODA to Central Asia by country and sector (2016-2020) ····· 190
Table Ⅶ-9. Level of Innovation Competence of Partner Countries ····· 193
Table Ⅶ-10. Uzbek and Kyrgyz Strategies and Sectors for Digital Transformation ····· 194
Table Ⅶ-11. South Korea's Participation in Pure Digital ODA Projects to Central Asia ··· 197

Figures

Figure Ⅱ-1. ODA Trend in ICT Sector (1995-2021) ····· 8
Figure Ⅱ-2. Gender Digital Divide (%) ····· 12
Figure Ⅱ-3. Divide in Internet Use (2011-2012) ····· 13
Figure Ⅱ-4. Trends in Digital Opening and Control in African Countries ····· 19
Figure Ⅱ-5. Factors Contributing to the Digital Divide in Women ····· 22
Figure Ⅱ-6. South Korea's ICT ODA ····· 24
Figure Ⅱ-7. Percentage of ICT Used as a Key Element by Sector ····· 25
Figure Ⅱ-8. USAID's 'Digital Strategy 2020-2024' ····· 33
Figure Ⅱ-9. Evolution Stages towards an Information-oriented Society ····· 37
Figure Ⅱ-10. Inclusive Internet Index ····· 42
Figure Ⅱ-11. Digital Economy and Society Index ····· 47
Figure Ⅱ-12. Digital Transformation Index ····· 52
Figure Ⅱ-13. Sub-categories from existing indices: weight ····· 60
Figure Ⅱ-14. Better Digital Inclusiveness Index ····· 64

Figure Ⅳ-1. Fixed broadband internet development in period of 2017-2022 ····· 85
Figure Ⅳ-2. Mobile internet expansion in period of 2017-2022 ····· 87
Figure Ⅳ-3. Average broadband and mobile internet download speed on April, 2022 ···· 88

Figure Ⅵ-1. Egov.KzBot2.0 Telegram and eGov.kz Portal ····· 146
Figure Ⅵ-2. Opportunities and Benefits of Technology-enabled Public Service Delivery in Developing and Transitional Economies ····· 149

Figure Ⅶ-1. Trends in South Korea's Total ODA to Central Asia (1992-2020) ····· 178
Figure Ⅶ-2. Trends in ODA share in Central Asia (1992-2020) (DAC Member States vs. South Korea) ····· 178
Figure Ⅶ-3. Trends in the Share of Grants in Central Asia (1992-2020) (DAC Member States vs. South Korea) ····· 179
Figure Ⅶ-4. South Korea's ODA volume by sector in Central Asia

(2006–2020 total, top 10 sectors) ····· 180
Figure Ⅶ–5. South Korea's ODA to Kazakhstan by sector
(2006–2020 total, top 10 categories) ····· 183
Figure Ⅶ–6. South Korea's ODA to Kyrgyzstan by sector
(2006–2020 total, top 10 categories) ····· 184
Figure Ⅶ–7 South Korea's ODA to Tajikistan by sector
(2006–2020 total, top 10 categories) ····· 185
Figure Ⅶ–8. South Korea's ODA to Turkmenistan by sector
(2006–2020 total, top 10 categories) ····· 186
Figure Ⅶ–9. South Korea's ODA to Uzbekistan by sector
(2006–2020 total, top 10 categories) ····· 186

Ⅰ. Introduction

The dictionary meaning of 'digital' is 'representing data or physical quantities as binary coded numbers of 0 and 1', and 'digitalization' is a (digital) equipment or method using this code of 0 and 1 and converting the operation, expression, and work process of the existing mechanical analog method into a 'electricized' or 'computerized' method. 'Digital transformation' goes beyond digitalization and converts existing offline-based systems online through the rapid development of information and communication technologies (ICT) such as computers, Internet, mobile communication, and broadcasting that overcome the limitations of time and space. It is a transformation of a basic system to promote rapid improvement of convenience, efficiency, and effectiveness in all areas of human life including (and not limited to) production, consumption, and politics.

The much-discussed 'Digital ODA' is an international development cooperation activity that supports the digital transformation of developing countries in terms of ensuring that the achievements of 'digital transformation' are not the exclusive property of developed countries, but that the entire globe can enjoy them. Beyond the existing ICT ODA, which focuses on building ICT-related hard infrastructure in developing countries, it can be understood as digital ODA that supports 'digital transformation' by effectively operating and utilizing such infrastructure.

Discussions and activities related to digital ODA are actively pursued by the international community. For example, the international community, including the UN, emphasized the use of ICT as a useful and innovative means to realize 'inclusive growth' with the adoption of the SDGs. In fact, major donors, including Korea, are actively participating in ICT ODA, and their interest is to ensure that more people enjoy the benefits of digital transformation, that is, to expand digital inclusion, regardless of nationality, age, gender, or region. Despite the interest and efforts of

the international community, there are still classes that are marginalized from the use of ICT. For example, students living in areas where Internet infrastructure is not established cannot use online learning services. Meanwhile, despite the benefits of digital transformation, there is also people who experience its undesirable side-effects in their lives. For example, in developing countries in Africa, there are poor people who have fallen into bankruptcy due to microloans using mobile money. Why do the underprivileged from digital transformation still exist? Why there are still those who are alienated from the benefits? These are the questions we would like to explore.

This study presupposes that the answers to these questions can be found in the limited perspective on digital transformation. The existing perspective has focused on the quantitative growth of digital transformation expressed in simple indices. It has promoted digital ODA in accordance with these indices. Therefore, this study argues that it is necessary to take a more comprehensive approach to the scope of digital transformation and pay attention to the creation of a sociocultural environment in which more people can satisfactorily enjoy the digital services they want. In short, this study aims to develop a better digital inclusion index and, based on this, seek a digital ODA promotion strategy that allows more people to satisfactorily enjoy the benefits of digital transformation.

This study aims to promote a "better digital inclusiveness" (BDI). The better digital inclusiveness includes the existing digital divide and digital inclusiveness discussions, meaning that more people can use digital services tailored to their needs with a higher frequency, with more trust, and therefore, with more satisfaction. In other words, this report not only includes discussions to reduce the gap between countries, gender gap, regional gap, and generation gap, which have traditionally been dealt with in digital inclusion discussions, but also alleviates and prevents the side effects of expanding digital inclusion stemming from sociocultural backgrounds. However, this study is only an embryotic research on digital ODA and the subject area for better digital inclusion index is limited to the Central Asian region.

There are two main reasons why this study is limited to the Central Asian region. First, Central Asia is a major development partner for Korea. The year 2022, when this study was conducted, marked the 30th anniversary of the establishment of diplomatic relations between Korea and Central Asia. Since the collapse of the Soviet Union in 1992, Korea and the five Central Asian countries have established diplomatic relations. Central Asia is located in the heart of the Eurasian continent, connecting South Asia, East Asia, and Europe, and is a strategic hub for Central Asia, which has abundant natural resources such as oil, natural gas, and coal. Korea has recognized the geopolitical and geographical importance of Central Asia and has established a close political, economic, and cultural cooperation relationship in a short period of 30 years.

In 2007, Korea and the five Central Asian countries held the first "Korea-Central Asia Cooperation Forum" in Seoul, and in 2017, they established the "Korea-Central Asia Cooperation Forum" Secretariat in Seoul to strengthen multilateral cooperation. Through the "New Asia Cooperation Diplomacy" of the Lee Myung-bak government (2008-2013), the "Eurasia Initiative" of the Park Geun-hye government (2013-2017), and the "New Northern Policy" of the Moon Jae-in government (2017-2022), the cooperation relationship between Korea and Central Asia has deepened. In particular, the relationship between Uzbekistan, which is the subject of this study, and Korea was upgraded to a special strategic partnership in 2019, and the relationship between Kazakhstan and Korea was developed into a strategic partnership in 2021. In addition, the trade volume between Korea and Central Asia has grown dramatically. In 1992, the total trade volume between Korea and Central Asia was only about $15 million, but the trade amount has steadily increased, reaching approximately $6.72 billion in 2019.

Despite being a region rich in natural energy, Central Asia experienced a severe economic crisis, including low or negative economic growth and an increase in poverty, until the mid-1990s after the collapse of the Soviet Union. While energy-exporting countries such as Kazakhstan and Turkmenistan have emerged

from this economic crisis and have been smoothly integrated into the global market, non-exporting countries such as Uzbekistan, Kyrgyzstan, and Tajikistan are still experiencing a slowdown in economic growth caused by the collapse of the regional economic system due to the collapse of the Soviet Union. In particular, the national poverty line in Uzbekistan, the subject of this study, was 13.7% as of 2015, and in Kyrgyzstan, it was 32.1%. Therefore, KOICA has selected Uzbekistan as a priority cooperation country in the second and third Comprehensive Development Plan (CPS), and added Kyrgyzstan and Tajikistan to the fourth Comprehensive Development Plan adopted in 2021. In addition, KOICA has adopted digital cooperation with Central Asian countries as a priority area for ODA cooperation.

The second reason is to emphasize the importance of both individual country-specific and regional-integrated approaches to international cooperation for enhancing digital inclusivity. Digital infrastructure is influenced not only by the situation of individual countries but also by their environmental and regional conditions. For example, Central Asia has a vulnerability in that it cannot directly connect to submarine cable networks that can be considered as global internet networks, due to being an inland region. Therefore, improving digital infrastructure requires not only cooperation with neighboring countries such as China, Russia, and India but also mutual cooperation among the countries within Central Asia. However, focusing on individual countries alone does not clearly reveal these issues and does not highlight the importance of regional cooperation and coordination. More details on this topic will be explained in Chapter III of this research report.

The background and the purpose of the study are described in this introduction. Chapter Ⅱ introduces basic information on digital ODA and discussions on the inclusiveness of digital transformation in the international community. In addition, by analyzing the existing indexes related to digital transformation, we propose a better digital inclusiveness index. Chapter Ⅲ examines the reality of digital transformation in Central Asia from the regional level and the side effects caused by the deficiency and expansion of inclusiveness. Chapters Ⅳ, Ⅴ, and Ⅵ introduce a

better digital inclusion index, and deal with Uzbekistan, Kyrgyzstan, and Kazakhstan, the level of digital transformation, positive or negative cases related to digital inclusion, and finding ways to expand desirable digital inclusion. Chapter VII examines Korea's digital ODA to Central Asia, focusing on the better digital inclusion index, and proposes a strategy for digital ODA to Central Asia to achieve better inclusiveness. In Chapter VIII, the conclusion summarizes the contents of the main text and describes the limitations of the study.

Ⅱ. Digital Inclusiveness and International Development Cooperation

Low, Dujacquier and Kaur define digital inclusion as follows: "the empowerment of individuals and societies to effectively use information and communication technologies (ICT), enabling them to contribute to and benefit from today's digitalized economies and societies." In this context, the international community, including the UN, is emphasizing the use of ICT as a useful and innovative means in realizing the 'inclusive growth' emphasized by the SDGs. Based on this perception, Nam Sang Yeol and others argue, the key challenge of inequality is the ability to utilize ICT and create an environment to enhance the economic productivity of the underprivileged and to enhance access to social services such as education, health, environment, and public administration through the means of ICT. This ultimately contributes to resolving inequality by improving economic productivity, work efficiency, communication, equal access to public and national services and by reducing transaction costs. In addition, in an information society where digitalization is accelerated and maintained in the national, social, and economic (production) areas, the information gap between social classes is a risk factor that can hinder social integration, and thus the non-discriminatory approach and use of ICT is recognized as a key factor of digital inclusion.

Focusing on the international community and Korea, this chapter analyzes the discourse on the issue of inclusiveness and side-effects in the process of digital transformation in the era of SDGs for poverty resolution and development in developing countries. For this, the chapter examines the UN's digital inclusiveness-related strategic documents and initiatives, digital ODA policies and best practices of OECD DAC countries, and policies of South Korea's digital divide and inclusiveness.

1. Digital ODA and Inclusiveness in Digital Transformation

1) Issue of Inclusiveness in Digital Transformation

In September 2015, the UN General Assembly recognized ICT as an important means of achieving SDGs. Among the 17 SDGs goals, the goals that refer to ICT in the detailed goals are SDG 4 (education), SDG 5 (gender equality), SDG 9 (industrial and innovation), and SDG 17 (partnership). In particular, the gender equality of SDG 5 and the industry and innovation of SDG 9 emphasize digital inclusion of the underprivileged in developing countries, which are the core topics of this study. SDG 4 and SDG 17 refer to international cooperation to enable developing countries to enjoy the achievements of ICT innovation. In addition, the ITU recognized the importance of ICT in the implementation of SDGs and suggested the meaning of ICT for each of the 17 goals of the SDGs.

Table Ⅱ-1. ICT Indicators and objectives of SDGs

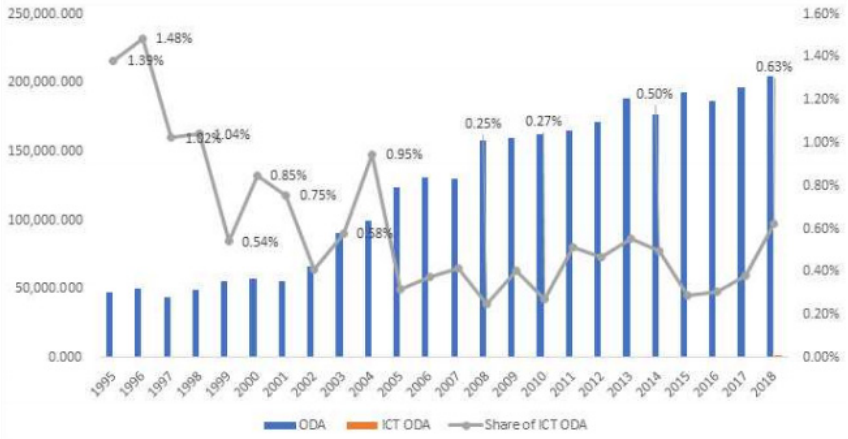
SDG	Sector	Indicators	Objectives
4	Education	4.b	By 2020, substantially expand globally the number of scholarships available to developing countries, in particular least developed countries, small island developing States and African countries, for enrolment in higher education, including vocational training and information and communications technology, technical, engineering and scientific programmes, in developed countries and other developing countries
5	Gender Equality	5.b	Enhance the use of enabling technology, in particular information and communications technology, to promote the empowerment of women
9	Industry & Innovation	9.c	Significantly increase access to information and communications technology and strive to provide universal and affordable access to the Internet in least developed countries by 2020
17	Partnership	17.8	Fully operationalize the technology bank and science, technology and innovation capacity-building mechanism for least developed countries by 2017 and enhance the use of enabling technology, in particular information and communications technology

Source: Author's reorganization based on KISDI data/original source: Woosung Lee et al., "Governance of Science, Technology and ICT Diplomacy in Korea," STEPI(2016)

Reflecting the recognition of the importance of ICT in the implementation of SDGs, the size of ODA in the ICT field has been on the rise since 2015. Unlike the MDGs, which emphasized social development such as absolute poverty, gender equality, education, and disease eradication in the past, awareness of the value of ICT is changing as a means of enabling development along with the adoption of SDGs that emphasize development in various areas of society. Despite this importance, however, ICT ODA has decreased in the proportion of total ODA since 2001 because the increase in the total ODA is far ahead of the increase in ICT ODA.

Figure Ⅱ-1. ODA Trend in ICT Sector (1995-2021)

(단위: 100만 불, %)



Source: Geonwoo Park, "How Does Aid Boosts Development?: An Empirical Study of the Impact of ICT ODA on Economic Growth in Developing Countries," STEPI(2020), p. 20.

The size and weight of ICT ODA in total ODA are CRS code 220 (communication), and the code that aggregates Information and Communication Technology is 22040, which corresponds to the subcode of 220 code. According to the code, based on the top code 220, the largest number of ODA donors are Japan, South Korea, United States, and United Kingdom, followed by France, Germany, Canada, Netherlands, Spain, and Sweden. On the other hand, based on the code number 22040 which refers to ICT ODA, South Korea ranks first, followed by Canada, Finland, Japan, and United Kingdom, followed by Sweden, Germany, Australia, New Zealand, and Switzerland.

Table Ⅱ-2 Status of ICT ODA donors in OECD DAC Countries (1995-2018)

(CRS 220 Communication 기준)

Rank	Country	Total Amount of ICT ODA	Share of ICT ODA
1	Japan	3339.787	36.04%
2	Korea	1089.927	11.76%
3	United States	890.0529	9.60%
4	United Kingdom	629.4958	6.79%
5	France	564.6642	6.09%
6	Germany	498.8108	5.38%
7	Canada	344.8278	3.72%
8	Netherlands	274.9732	2.97%
9	Spain	248.1798	2.68%
10	Sweden	219.0632	2.36%

(CRS 22040 ICT 기준)

Rank	Country	Amount of Pure ICT ODA	Share of ODA
1	Korea	735.0328	43.67%
2	Canada	154.2294	9.16%
3	Finland	123.9069	7.36%
4	Japan	101.531	6.03%
5	United Kingdom	97.36971	5.78%
6	Sweden	82.49503	4.90%
7	Germany	72.5195	4.31%
8	Australia	40.6948	2.42%
9	New Zealand	37.64188	2.24%
10	Switzerland	34.1563	2.03%

Note: Unit: 100 million USD, %

Source: Geonwoo Park, "How Does Aid Boosts Development?: An Empirical Study of the Impact of ICT ODA on Economic Growth in Developing Countries," STEPI(2020), pp. 28~29.

Recognizing the importance of ICT in the implementation of SDGs, Nam Sang-yeol et al. dealt with digital inclusion issues along with analyzing how international organizations and the international community perceive the importance of ICT through a report titled 'A Study on International Cooperation of ICT for Achieving SDGS in the Asia-Pacific Region.' The study analyzed that the UN emphasized inclusion under the SDGs' principle of "Leave No One Behind" and suggested children, the disabled, refugees, the elderly, minorities, and migrants as underprivileged people who need special consideration. In addition, the study introduced that the UNDP defines the underprivileged as a group lacking choice and capacity necessary to enjoy the benefits of development due to factors such as geographical location, limited access to technology, unequal governance, socioeconomic status, and vulnerability to conflict and disaster. In particular, in the case of limiting access to

technology, which is the core of digital inclusion, it is difficult to participate in the economic, social, and political processes due to lack of access to mobile and Internet devices, resulting in the exclusion of the underprivileged in these areas.

In addition, Nam et al. further explained the problem of inclusion identified in the benefits of digital innovation by using the concepts of 'absolute deprivation' and 'relative deprivation' of the underprivileged arising from these various factors. They explained that 'absolute alienation', which is 'absolute deprivation' in ICT sector, is discrimination in terms of access to ICT devices and broadband networks. On the other hand, it was considered that 'relative alienation,' which is 'relative deprivation,' arises from the difference in the ability to utilize ICT contents due to social and structural inequality. Therefore, since 'absolute deprivation' means lack of accessibility, it can be solved through device support and broadband expansion, and in the case of 'relative deprivation', the problem can be solved through ICT utilization capacity building such as ICT education.

However, this approach still has a limitation in that it was narrowly approached only in terms of availability and affordability. This study emphasizes that situations in which exclusion occurs due to socio-cultural constraints and discriminatory factors such as geographical location, unequal governance, and socio-economic status within the same society or group should be considered more actively. In addition, it is emphasized that the problem of accessibility to ICT infrastructure, services, and contents of the underprivileged should be accompanied with proper ICT education in order to solve the problem of digital divide or alienation, rather than a separated approach based on absolute and relative deprivation concepts.

As supporting this theoretical discussion, the digital divide between developing and developed countries is clear. As ITU's 2015 data shows, it is a meaningful development that the difference between the poorest and developing countries and the developed countries on mobile phones in developed countries is not significant. However, it can be seen that there is a big gap depending on the economic level in relation to mobile and fixed broadband, and computer retention, which are the main issues of the digital

gap. In addition, it can be seen that the gap between countries on the same continent is very large.

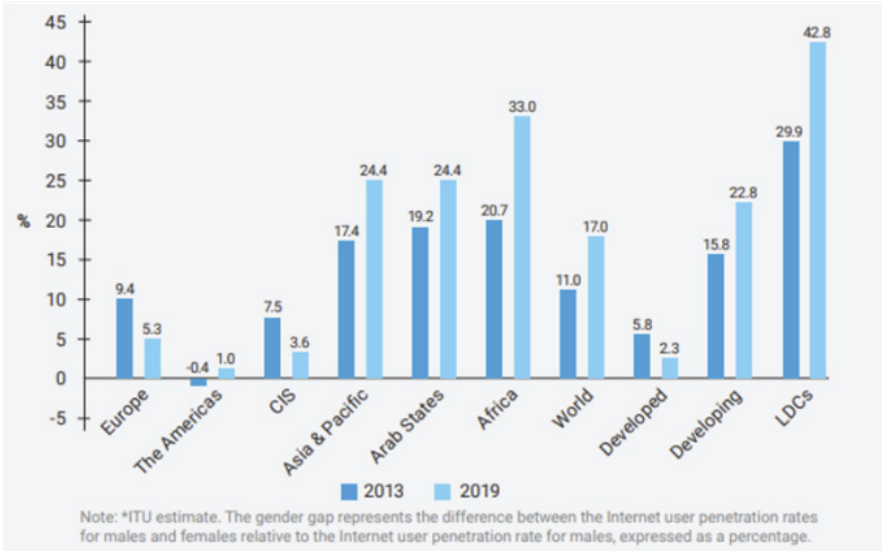
Table Ⅱ-3. Inter and Intra-continental Gap in Internet Access Rate

Region	Internet access	High	Low
Europe and Central Asia	84%	Liechtenstein (99%)	Turkmenistan (21%)
North America	88%	Bermuda (98%)	United States (88%)
Latin America & Caribbean	66%	Aruba (97%)	St. Vincent & Grenadines (21%)
Middle East & North Africa	65%	Bahrain (100%)	Libya (22%)
South Asia	20%	Maldives (63%)	Afghanistan (11%)
Southeast Asia	47%	Malaysia (84%)	Laos (26%)
Sub-Saharan Africa	19%	Mauritius (64%)	Eritrea (1.3%)

Source: World Bank website, "World Development Indicators," https://databank.worldbank.org/source/world-development-indicators (access: 11 Oct. 2022).

It can be seen that the gender gap directly related to the issue of digital inclusion in the internet access rate constituting the digital society is also remarkable. From a gender perspective, the gap between women and men is also confirmed in the developed countries but the gap is insignificant compared to developing countries. This gap is narrowing as 2019 goes on in the developed countries. However, the gap is very large in developing and poorest countries and it is worrisome that the gap has tended to widen in recent years.

Figure Ⅱ-2. Gender Digital Divide (%)



Source: George Ingram, "Bridging the Global Digital Divide," Brooking Institution (2021), p. 5.

There is currently no digital inclusion index (index) to comprehensively present the degree of convenience and innovation brought by the era of digitalization between groups and classes in terms of the digital divide in a country's society. Economist's Inclusive Internet Index (III) is used as an indicator system that shows the level of 'internet', not digital transformation, inclusion by country. While the lack of a comprehensive index for digital inclusiveness, the recent report by the Inclusive Internet Index (III) shows that a gender digital divide decreased from 2017 to 2021 and it is attributable to the result of an improvement in the gender gap in Asia, the Middle East, and North African countries.

Lastly, 〈Figure Ⅱ-3〉, a short piece of data showing the current status of the digital gap, shows that the gap is occurring not only according to the gender gap discussed above, but also according to the city, region, age, and income level.

Figure Ⅱ-3. Divide in Internet Use (2011-2012)



Note: Internet use in Africa, by demographic and socioeconomic characteristics 2011-12 (% of individuals); Simple average for 10 countries. The Upper 60% and Bottom 40% refer to individuals' household income distribution.

Source: World Bank, "World Development Report," World Bank(2016), based on Research ICT Africa.

As the development of ICT and awareness of its social effect spread, discussions on digital divide of the underprivileged at the international community also spread. In this section, it examines how key initiatives on digital inclusiveness by the international community have been evolved.

First, the International Telecommunication Union (ITU) is a group that is alienated from the enjoyment of ICT, and has begun to pay attention to women and respond to it. Since 2011, the ITU has held the Girls in ICT Day event on the fourth Thursday of April every year to improve ICT access to girls and women. The event aims to promote employment in the ICT field based on bridging the digital divide between girls and women. In particular, the 2014 ITU Plenipotentiary Conference in Busan adopted 'Resolution 70 (REV. Busan, 2014): Mainstreaming a Gender Perspective in ITU and Promotion of Gender Equality and the Empowerment of Women through Information and Communication Technologies'. Through this resolution, the ITU emphasized that

the international community should strive to bridge the digital divide to promote gender equality and women's rights in developing countries, and support for women in rural, underprivileged and vulnerable areas. In addition, the resolution emphasized the need for policies to strengthen women's capacity and encourage employment in the ICT field, the importance of ICT education for women in elementary, middle, and lifelong education, and the promotion of women's start-up activities.

In addition, in 2014, when discussions for establishing SDGs goals reached the end, ITU established 'Connect 2020' to reduce the digital gap and expand broadband to solve the digital gap between countries and the digital gap within countries. First, in order to alleviate the digital gap between countries, the goal of 50% Internet access for families and individuals in developing countries, 15% for families in the poorest countries, and 20% for individuals was presented. In addition, the goal of reducing the difference in ICT availability between developing and developed countries by 40% was also established. In particular, 90% of the rural population corresponding to the digital gap in the country included the goal of providing broadband services, achieving gender equality in Internet use, and securing access to communication and ICT for the disabled in all countries.

In 2016, the ITU and the UN Women worked together with the International Trade Center, the Group Special Mobile Association (GSMA), and the United Nations University to implement initiatives to promote women's empowerment through the use of SDG 5. Above all, this initiative is meaningful in that it is a project that seeks convergence between SDG, ITU, and UN Women organization goals. Based on this idea, the EQUALS project was launched in September 2016, and EQUALS is characterized by seeking to discover and promote projects based on partnerships with various networks and actors. The project promoted a partnership project to enhance gender equality in the digital era in the fields of access, skills, and leaders. In the field of access, the need for access to digital technology, connection and complementary promotion projects for girls and women, and in the field of skills, the need for science, technology, engineering, and mathematics (STEM) education

support projects for girls and women was emphasized. In the leaders field, it contains the content of enhancing support necessary for growth as leaders and entrepreneurs in the ICT field of women.

Finally, the ITU's 'Connect 2030' strategic document established in 2018 is meaningful in that the ITU has comprehensively approached the issue of inclusion identified in the process of digital transformation and presented a roadmap to cope with it. In the inclusion section of strategic documents consisting of growth, inclusion, sustainability, innovation, and partnership, it can be said to contain strategic directions on how ITU plans to solve the problem of digital divide and inclusion. In addition, in 2019, the GIGA project was launched as a cooperative program to supply the internet to schools around the world in cooperation with UNICEF. Most recently, in 2022, a policy document was adopted that mandates gender approach in all areas, including the operations and policies of ITU. In addition, ITU established the 'Broadband Commission' in cooperation with UNESCO in 2010. Founded to expand broadband use and accessibility worldwide, the organization organized a working group dealing with digital transformation issues from a gender perspective in 2013, which developed into a digital gender gap working group in 2016. In 2014, the organization established a working group that deals with digital issues for young people, while in 2017, it also organized a working group that deals with digital issues in vulnerable countries.

The OECD, along with the G20, dealt with the problem of alienation of the elderly and the vulnerable. In 2015, the OECD presented measures to promote participation of the elderly in the digital economy, examining how the digital economy by population aging and ICT innovation is changing the future of labor at the Global Coalition on Aging (GCOA) and Oxford University workshops. The main contents were to discuss new flexible job models and old-age-friendly job and living environments due to population aging and technological innovation, establish a lifelong education system by enhancing access to new learning platforms to create an inclusive digital economy for the elderly, and revitalizing cooperation between companies and

governments. Since then, in 2018, the 'Working Better with Age' policy study dealt with the disadvantages of the elderly in the labor market and pointed to strengthening the ICT capacity of the elderly as a means of enabling active participation in the rapidly changing labor market. In addition, a great contribution from the OECD's perspective of digital inclusion is that in 2019, "Going Digital: Shaping Policies, Improving Lives", pointed out the digital gap between women, the elderly, and the disabled, and raised the need for attention to social problems caused by digital transformation. In other words, it is meaningful in that it diagnosed the problems occurring in the process of digital transformation that this study focuses on by dealing with the political, economic, and social problems caused by digital transformation.

The G20 expanded the target of alienation in the existing digital society to a comprehensive target, which was limited to women and the elderly. At the 2016 Digital Economy Summit held in Hangzhou, China, shortly after the adoption of SDGs, the G20 began discussions on innovation brought by the digital society, and the 2017 G20 Digital Economy Ministerial Meeting confirmed the need for digital connection. The Ministerial Declaration pointed out that only half of the world's population is connected to the Internet, and that the socially disadvantaged and the poor are alienated, confirming that efforts are needed to bridge the digital divide to have the opportunity to enjoy the benefits of the digital economy. To this end, it was emphasized that it is necessary to expand internet connectivity, improve digital technology and literacy, digital entrepreneurship, and digital services. Since 2018, it has expanded the target of the underprivileged to the disabled and rural residents with less physical access, emphasizing the need to strengthen and participate in people-centered and inclusive growth in the digital age, especially women, girls, vulnerable, disabled, and rural residents.

In addition, the 'Internet Society', established in 1992 as a non-profit organization, aims to enhance digital inclusion through 'Growing the Internet', and is carrying out projects to expand Internet penetration with several public-private partners. Among them, 'Community Network Projects' is mainly carrying out projects to expand

Internet access in developing countries, although advanced countries are also subject to projects.

2) Discourse on the Side-effects of Digital Transformation

As the international community strives to increase inclusion in the digital transformation process, there has been a recognition that it is also necessary to respond to side effects and problems arising in the digital transformation process. Recognizing the need for appropriate response to the issue of infringement of national, corporate, and private interests in the process of digital transformation and innovation in 2019, the OECD emphasized the importance of access to information protection and data flow. This concern stems from the recognition of the government's legitimacy, trust issues, and the possibility of infringement of democracy or human rights, and concerns over the possibility of conflict and infringement of interests among various subjects in the economic field. In addition, the OECD also recognized the need to prepare better measurements to reflect various aspects of digital transformation.

In the same vein, Susanna Moorehead, chairman of the OECD Development Assistance Committee (DAC), and Jorge Moreira da Silva, director of the Development Co-operation Directorate, described digitization as a 'double-edged sword.' In other words, it is pointed out that digital transformation provides infinite possibilities for humans and society, but the digital divide between developed and developing countries, women and men arising from the process of digital transformation is widening, causing a new type of inequality problem. It was also concerned that women and children were subject to online crime and harassment in the era of digitalization. In addition, digitalization serves as a channel for new communication by raising the public's voice in the labor market, media, and politics, but on the other hand, digitalization is a double-edged sword, such as being used to violate democracy, freedom of speech, and human rights.

For example, with the advent of the digital era, the mobile money system, which is

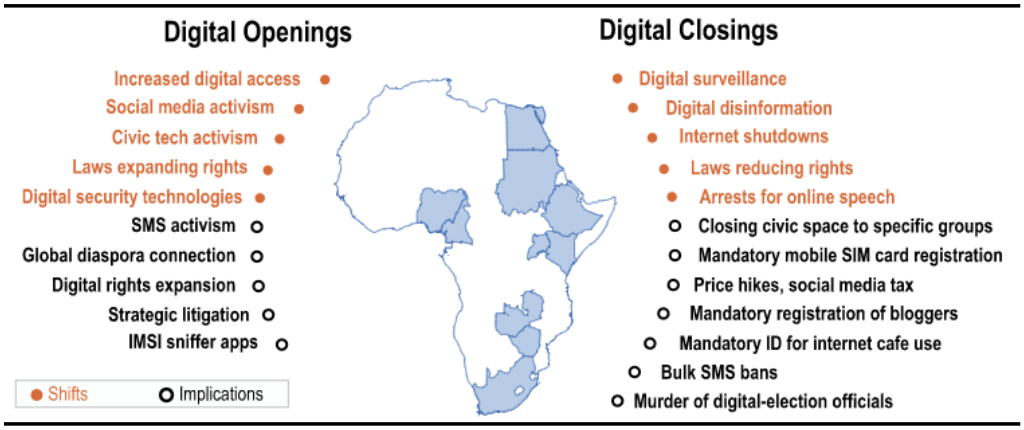
spreading in Africa, facilitates access to financial services for the poorest people. However, the lack of economic and financial knowledge and the use of financial services that are not linked to income generation also serve as a risk factor for turning these poorest people into financial bankruptcy. In addition, studies show that the lack of adequate regulatory mechanisms increases the possibility of financial crime exposure among the poorest people, while linked to mobile money, corruption, illegal goods, drug trade, stolen car trade, wildlife trade, counterfeit money, human trafficking, illegal money laundering, or terrorism.

Cases of side effects that can cause digital transformation in the field of education have also been reported. As a result of analyzing elementary schools in 49 sub-Saharan African countries from 2000 to 2012, a study has suggested that increasing Internet penetration has a negative effect on countries with less than moderate educational quality. This study does not suggest an analysis of why these results came out in that it is a quantitative study. Meanwhile, Ranjitsinh Sale, the winner of the World Bank's 'Teacher & Winner of the Global Teacher Prize 2020', argues that digital services in schools can be expected to be fair to everyone (without discrimination against men and women, regions, etc.), economically accessible (Internet access equipment or the Internet), and when they are used systematically and complementary tools by teachers.

There are also concerns that digital transformation can act as a factor that hinders democracy and human rights. In a report titled "Going Digital: Shaping Policies, Improving Lives," the OECD expressed concerns about trust in the government and democracy in the era of digital transformation. Concerns over privacy violations and lack of trust in the government and data processing institutions do not participate in digitalization or provide personal information, and the government's personal human rights violations and monitoring mechanisms caused by digitalization that are not controlled by legitimate authorities or organizations. In addition, problems such as cyberbulling or unhealthy content in children and youth groups, and work stress caused by the inability to block work and families as they enter a hyperconnected

society with digitalization were pointed out. As a solution to this problem, it emphasized the promotion and control of consensus-based digitalization based on the participation of various subjects such as civil society, guaranteeing access to digital hardware and software, establishing transparency and safety devices in importing and using personal information, blocking and controlling false information, ensuring cross-border data flow, and cybersecurity issues.

Figure Ⅱ-4. Trends in Digital Opening and Control in African Countries



Source: Tony Roberts, ed, "Digital Rights in Closing Civic Space: Lessons from Ten African Countries," Institute of Development Studies (IDS), http://dx.doi.org/10.19088/IDS.2021.003 (access: 11 Oct. 2022).

In the same vein, Barney Warf viewed the authoritarian political environment and slow market opening in Central Asian countries as the main factors leading to domestic Internet inequality. In particular, even before the introduction of Internet technology, it was pointed out that the culture of media control and censorship in the CIS region, including Central Asian countries, hinders the spread of Internet technology.

As of 2021, Uzbekistan's Inclusive Internet Index scored 67.7 points, recording 59.1 points, 63 points, 70.7 points, and 64 points in terms of availability, affordability, adequacy, and readiness, respectively. Looking at detailed indicators, Uzbekistan's Internet penetration rate is 52.3% of the population, and the mobile device

penetration rate is close to 93.9% of the population. Interestingly, however, Internet usage fees are higher than the national average in the income section, and local Internet resources (including apps and web) that users can access using communication devices are only 9.43 points out of 100. This is due to the strict Internet policy focused on internal and external cybersecurity and information control rather than high Internet usage fees and information liberalization, and the government-led expansion of information and communication technology infrastructure.

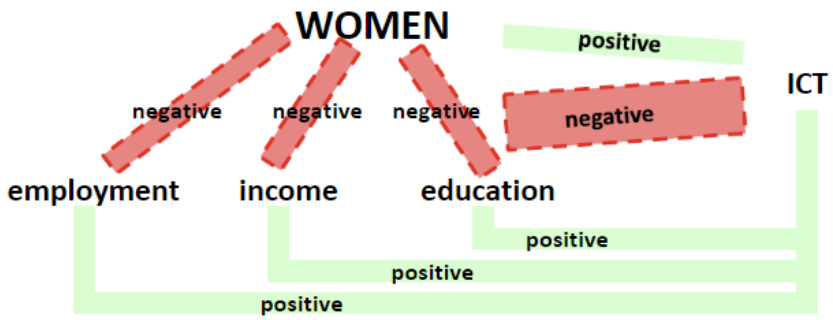
In fact, in the early days of the introduction of Internet technology, most Central Asian countries were very slow to generate Internet resources and services using the Internet due to insufficient information and communication technology infrastructure and economic factors. As a result, it was observed that Internet users in Central Asia rely on Internet resources generated in Russian. Therefore, Russian-based online information and services supported by the public sector, such as e-government, cyber libraries, online education, and health notifications, have been developed in common in Central Asian countries. On the other hand, domestic language-based services provided in the private sector are insufficient in terms of quantity and quality, and thus depend on overseas technologies. Currently, online information provided in Russian, the universal language of the CIS in the public domain, is less diverse and accurate than its own language information, so minorities in Central Asia (14% of Uzbekistan and 23% of Kyrgyzstan) are known to have difficulty accessing local government policies, civil complaints, education, and health information.

In the discussion of digital inclusion, the importance of social and cultural aspects has been discussed in various ways, especially when introducing advanced technologies, and there is also a discussion on the problems caused by not considering the socio-cultural aspects of developing countries. Chrisanti Avgerou raised the question of the lack of a sophisticated theoretical framework to enable ICT innovation, despite the need for a systematic review in socioeconomic terms of

whether it improves or restricts the lives of residents in developing countries. Therefore, it is criticized that ICT innovation and the 'development' that it is possible tend to be close to estimation of the participatory domain that has not been proven or scientifically explained. Avgerou also introduces examples that "disruptive transformation" is also possible if ICT innovation is introduced without actually considering the socioeconomic or political situation of developing countries. As an example of this destructive transition, many international NGOs have introduced telecentre in Africa in the expectation and belief that it will contribute to poverty reduction and development in the region, but it has often ended with negative and disappointing projects, contrary to its positive expectation. Therefore, Avgerou argues that this problem is the result of the failure to consider the socio-economic and political context of the region where ICT innovation technology was introduced.

On the other hand, Martin Hilbert analyzed the women's problem from the perspective of the digital gap. Hilbert analyzed 12 Latin American countries and 13 African countries that the cause of the digital gap between men and women in developing countries is due to the structural environment in which women are differentiated from men in terms of education, employment, and income. Hibert argues that if these factors were controlled, women were found to be more active in using digital means than men. It also emphasizes the need for customized content for women and girls in this study, and the need to overcome the prejudice that women are more technophobic than men. Meanwhile, it was also argued that efforts to increase women's accessibility to ICT education centers or telecommunications centers, which Avgerou questioned their effectiveness, could be a way to resolve the digital gap between men and women.

Figure Ⅱ-5. Factors Contributing to the Digital Divide in Women



Source: Martin Hilbert, "Digital gender divide or technologically empowered women in developing countries? A typical case of lies, damned lies, and statistics," *Women's Studies International Forum*, Vol. 34, No. 6(2021), p. 21.

While the international community have been interested in and studied the side effects or problems that occur in the process of digital transformation, South Korea has focused only on digital inclusion and gap issues, so it is rarely able to deal with the side effects of digital transformation. The above mentioned the need to discuss the negative effects of digital transformation on the developing countries and the need to discuss and establish guidelines for various possible negative effects, but the systematic approach to these side effects in South Korea is still insignificant.

3) Digital Inclusiveness in South Korea's Digital ODA

Through an analysis of the current status of ICT ODA in South Korea, we would like to examine what concerns the Korean government's aid agencies have in terms of discourse and policy issues arising from digital inclusion and digital transformation.

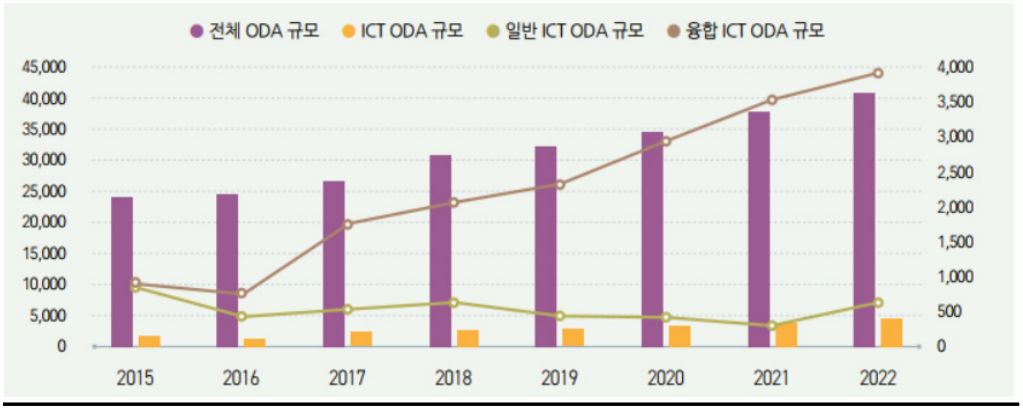
South Korea is known as the country with the most ODA in the field of digital transformation support. South Korea supports 18.2% of digitalization-related fields, followed by the U.S. with 13.4%, the EU with 11.5%, and Germany with 10.6%. In particular, ODA using ICT is showing an increase of 67% over four years and an annual average of 14% from 270 billion won in 2018 to 450 billion won in 2022. In response to South Korea's efforts, there is also a peer review of the OECD in 2018 that South

Korea's ODA strategy using its expertise in science and technology is impressive.

As for the specific status of ICT ODA promotion in South Korea, the current status in 2020 and 2021 was updated based on the classification criteria borrowed by Korea Information Society Institute(KISDI). KISDI classified ICT infrastructure construction projects such as communication networks, broadcasting, and information systems as 'pure ICT' projects, and if some of the project or program elements include ICT elements, they were classified as 'converged ICT', and data was based on the Implementation Plan of International Development Cooperation.'

As a result of KISDI's 2015-2022 ICT ODA status analysis, it can be seen that the cumulative net ICT is about 358.9 billion won (about 1.7% of the total), and when expanded to the converged ICT field, it is about 1,787 billion won (about 9% of the total). In particular, although it is not a pure ICT project, it can be seen that the proportion of converged ICT projects that reflect ICT elements in the project is continuously expanding. This means that the use of ICT technology in solving low development and challenges in many areas such as politics, society, economy, and culture in developing countries is recognized as new possibilities and alternatives. However, the limitation of ICT ODA in terms of overall size is that in order for a specific society to transition to a digital society, basic ICT infrastructure (hardware and software) must be established in various areas, and in this respect, the size and proportion of South Korea's pure ICT projects are very small.

Figure Ⅱ-6. South Korea's ICT ODA

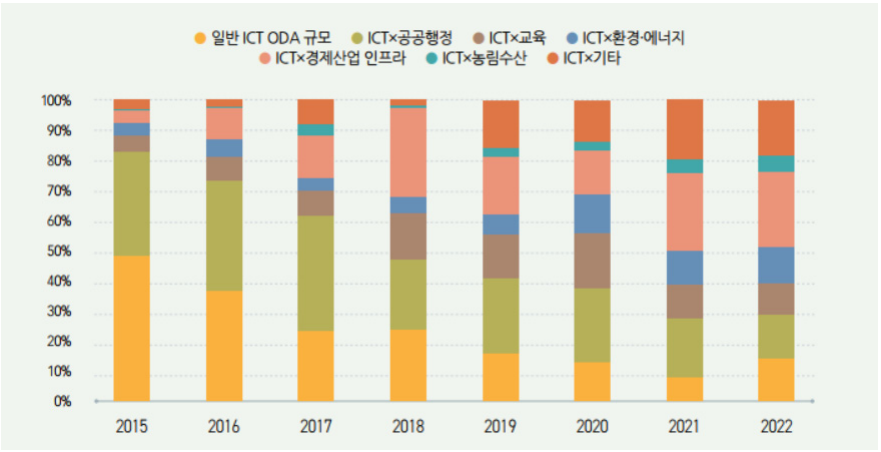


Note: unit: 100 million won

Source: Youngmin Sohn and Sunghoon Yoo, "Status of ICT ODA in Korea," 『KISDI Perspectives』, (May 3, 2022). p. 9.

Looking at the distribution of converged ICT projects by sector, it can be seen that the proportion of pure ICT projects in all ICT projects has continued to decline over the past 7 years (2015-2021), and the converged ICT ODA project has increased dramatically. Specifically, it can be seen that the public administration sector centered on the e-government was a key business sector in the convergence ICT project in the past, and has been diversified to other areas besides economic industrial infrastructure, education, environment, energy, and health since 2018. This means that the perception of the role and necessity of ICT as a means is expanding beyond the meaning of its own purpose.

Figure Ⅱ-7. Percentage of ICT Used as a Key Element by Sector



Note: Year of 2022/unit: %

Source: Youngmin Sohn and Sunghoon Yoo, "Status of ICT ODA in Korea," *KISDI Perspectives*, (May 3, 2022). p. 10.

Ji-soo Yoo and Sung-hoon Yoo divided ICT ODA into 'connection,' 'utilization,' 'legal system,' 'digital innovation,' and 'security,' which implicitly contributes to strengthening digital inclusion, given that the final beneficiaries of these subject-specific projects are unspecified. On the other hand, since ICT infrastructure, institutions, and human capabilities in developing countries are at a low level, it is necessary to consider the reality that most projects do not address concrete topics such as resolving digital inequality among the vulnerable or ordinary residents. In fact, strengthening connectivity through establishing basic infrastructure in the ICT field has no choice but to focus on building the most basic ICT infrastructure. Activation of ICT utilization also tends to focus on strengthening the capabilities of major stakeholders and functional groups in consideration of the efficiency and effectiveness of the project, and ICT projects in the legal system also focus on improving ICT-related policies and systems at the macro level. In addition, ICT ODA projects in developing countries with the theme of digital innovation have no choice but to focus on improving business effectiveness in the field by focusing on groups with a certain level of expertise in ICT and digital fields. It is in this context as the

Korean government's approach to ICT ODA. Therefore, in the strategy, direction, actual cases, and trends of Korea's ICT ODA project, no projects have been identified to deal with digital inclusion in terms of resolving or mitigating inequality arising from benefitting the outcome of the digital revolution among the vulnerable groups. Nevertheless, this section will examine whether there are strategic concerns to respond to the negative effects of digital inclusion and digital transformation in the Korean government's ICT ODA policy.

The 'Science, Technology, and ICT ODA Strategy' introduced that the international community is positively evaluating Korea's science, technology, ICT, and digital ODA. It is also meaningful in that it presents a strategic direction for what kind of efforts Korea will continue to make in these areas. In addition, it is encouraging in that it includes concerns, strategies, and business plans for inclusion in the process of digital transformation. However, in order to solve the inclusive problem in digital transformation, it has a limitation that it focuses only on quantitative expansion of hardware-based construction, which is to expand infrastructure to expand accessibility. Therefore, if these policies continue, Korea can be evaluated as a leading country in quantitative ICT ODA, but if Korea fails to properly respond to or lead discussions on inclusion and side effects mitigation in the digital transformation that the international community is concerned about, its status as a leading ICT ODA will be half.

In March 2021, the Korean government announced a plan to expand the digital ODA in the field of international development cooperation by reflecting the changed environment after COVID-19. Under the goal of "1. Supporting Science and Technology and ICT Innovation at the Level of each recipient country," this strategic document contains a plan to focus on basic infrastructure such as expanding communication networks (broadbands, wireless networks, etc.) and information access centers for countries or regions with low ICT accessibility. It also included a support plan to provide customized education and expand access opportunities through IT volunteer groups and ICT education centers to narrow the digital gap of

the underprivileged, such as women and children. In addition, the strategy included infrastructure-building support projects such as establishing ICT-based power and communication networks, providing locally available technologies and services, and expanding future generation digital education opportunities for children and adolescents. On the other hand, it is meaningful in that it is in line with the international community's efforts to bridge the digital gap, which emphasizes acceptance and inclusion of recipient countries, by reducing the digital gap in underprivileged areas and classes, such as establishing information access centers and IT education centers under the 'low level' strategy.

In addition, projects to enhance digital inclusion in the field of education and health care are included in the strategy '2. Six major areas for promoting digital transformation by sector.' First of all, the education sector includes enhancing educational access to vulnerable groups such as children and women and underprivileged areas under the goal of 'spreading edutech-based digital education infrastructure,' and introduces a project to establish a mobile-based educational broadcasting station to improve educational access in remote areas. In the health and medical field, under the goal of 'improving medical access through digital healthcare such as telemedicine,' telemedicine system support projects were included to improve medical access for underprivileged people such as the disabled and islands in developing countries. Finally, the strategy '3. Strengthening Science and ICT ODA Global Cooperation' included seeking cooperation measures for GIGA initiatives (in-school Internet supply projects) initiated by ITU and UNICEF under the strategy of promoting joint cooperation projects with international organizations.

Under this strategy, the Korea International Cooperation Agency (KOICA), which is dedicated to free aid, established a strategy to promote digital ODA projects in March 2021, achieved 80 percent of digital mainstreaming of new projects, expanded 10 percent annually, and implemented statistics management with digital markers. Above all, KOICA adopted the core principles of usability, inclusion, openness, scalability, data base, and information security in the progress of digital ODA. Based

on this principle, projects that increase accessibility, efficiency, and effectiveness of projects by incorporating digital technology into all fields and types of ODA projects were classified as 'digital mainstreaming'. On the other hand, projects that directly support digital transformation in developing countries using digital technology as the main means were classified as 'digital core projects', and a plan was established to increase the proportion of these two projects.

However, until now, no customized projects have been identified that focuses on realizing the principle of 'inclusiveness' in KOICA's digital ODA project. Instead, digital access to the digital underprivileged and remote areas, digital literacy education, and capacity building projects are dealt with as one of the vertices of various projects. In other words, no approach or purpose-level project has been discovered to improve inclusiveness in digital transformation or to solve side effects problems in digital transformation, which is a key topic of this study. Therefore, discussions on the introduction of 'inclusive' markers have not been made in the discussion on the introduction of 'KOICA Digital Markers' initiated by KOICA. In the past, KOICA used ICT markers from 1991 to 2016 across science and technology, and then STI (Science, Technology, Innovation) markers from 2017 centered on science and technology innovation, and recognized the need to develop new markers to supplement them. Although the necessity of the marker is recognized in the 'Science Technology and ICT ODA Strategy' analyzed earlier, the development of a marker that deals with the principle of 'inclusiveness' has not been discussed yet. Currently, KOICA is only using digital mainstreaming and digital core businesses divided into KOICA digital markers 1 and 2.

4) Digital Inclusiveness in UK's Digital ODA

(1) Digital Inclusion of the United Kingdom

The UK has adopted the "International Research and Innovation Strategy" in 2019 to support science and technology development and social science fields to solve the

development difficulties facing vulnerable countries and developing countries. In terms of financial resources, the 'Global Challenge Research Fund' has supported the formation of research clusters with developing countries to solve global challenges. In 2018, by adopting 'Digital Strategy 2018-2020,' the UK adopted a development cooperation strategy aimed at building an inclusive digital environment by increasing the Internet accessibility of the socially underprivileged rather than simply expanding information and communication technologies in vulnerable and developing countries.

Based on this, the UK is providing about 11.13 million pounds for ODA in the field of information and communication technology, of which about 10 million pounds is provided to the 'Prosperity Fund cross-HMG: Digital Access Program (DAP)', which aims to promote digital inclusion for the socially vulnerable. Prior to 2016, the UK generally focused on the spread of digital technology, electronic financial inclusion, e-health, educational digitization, and agricultural technology, and evaluated that these strategies had significant results. However, it was evaluated that digital scalability and sustainability have limitations in connectivity, digital technology, constraints on digital content and services for the vulnerable, safety and security in cyberspace, and support for local digital-related companies. In the meantime, the UK's approach was transformed with the World Bank's 2016 Digital Divides World Development. In other words, the UK has come to recognize the importance of access to the fundamental problems that lead to digital gaps. Above all, it emphasizes the need for an inclusive, accountable and integrated approach to securing sustainability in the digital transformation of developing countries.

DAP, introduced in July 2019 after complementary work through a pilot project in 2018, is a representative project related to digital inclusion of the UK. According to '2021 Annual Review' for the project, DAP tested and demonstrated 73 models for comprehensive and secure digital access in five partner countries (Kenya, Nigeria, South Africa, Brazil, and Indonesia). In addition, 286 marginalized communities in 2020-21 have improved access to digital connectivity, digital technology, and local-related digital content and services to more than 2.3 million people.

Specifically, DAP supported 18 national plans for policy documentation projects to increase digital inclusion, such as Kenya's 'ICT Authority of Kenya' and 'TV White Space Regulation,' Brazil's 'Community Network Policy Framework,' Nigeria's 'National Broadband Plan,' and Indonesia's 'Telemedicine Strategy.'

In particular, the DAP initiative included business elements to respond to negative problems arising from digital inclusion and digital transformation. Indonesia's DAP initiative opened an online safety website in Bahasa language and worked with an Indonesian NGO called SAFENET to raise awareness of online gender violence. In Nigeria, cybersecurity education was conducted for more than 3,000 small and medium-sized enterprises and more than 6,000 residents. The cybersecurity campaign is known to have spread to more than 46 million residents through social media and radio. The Kenyan government and DAP Tech Hub also launched 'Kenya National Chamber of Commerce & Industry' to enhance local digital entrepreneurs' access to clear, user-friendly information about the regulatory environment. The online toolkit recorded more than 300,000 views in the first three months and more than 1 million views by June 2021.

(2) Digital Inclusion of the United States of America

The United States established the Internet for Economic Development Initiative (IED Initiative) in 1999. This project can be evaluated as a plan to promote digital transformation with the main focus of establishing Internet and e-commerce systems in developing countries from a perspective of inter-countries' digital divide rather than bridging the digital gap within the developing countries.

In the IED initiative, a detailed project directly connected to the digital gap was carried out in Guinea to support broadband access to small and medium-sized cities, and a project to support women's income generation programs in connection with small-scale loan programs. In Uganda, there are teacher education, computer room construction, and Internet connection projects in 100 schools as a school network support project, and ICT education for 7,000 students per year is possible due to the

effect of the teacher education organization. In addition, a program to promote information exchange in health, economy, and education was conducted with women's institutions in Kampala-based institutions. Guatemala also supported a project to build an online sales network for handicrafts produced by local cooperatives. The Mozambican high-speed satellite antenna installation project was provided to small and medium-sized cities to improve Internet access for women and schools as well as Mozambican entrepreneurs, educators, and communities. In Haiti, e-commerce, frequency management, and related laws were supported by improving Internet access for small and medium-sized cities and local residents, and computer-based teacher re-education programs were implemented in Morocco.

The United States Tele-Communication Training Institute (USTTI) has been carrying out ICT invitation training projects, and as a result of the project, the 'Gender and ICT' program is known to have contributed to strengthening women's access to ICT and creating opportunities for economic activities. Specifically, the 'Safe Motherhood and Infant Care Program' with Grameen Phone in Bangladesh, telephone stores in Senegal and Morocco, and telephone retailers in Ghana are considered to have contributed to reducing the ICT gap for the underprivileged. In addition, USAID carried out a project to grow value-added services by increasing ICT accessibility in mountainous areas in Kenya, Indonesia, and the Philippines through the Global Broadband Innovation (GBI) program in 2010. As a project to contribute to the easing of the information gap between urban and rural areas, a project to improve ICT accessibility for local schools was also conducted in Jamaica.

USAID, the U.S. aid agency, established 'Digital Strategy 2020-2024', and this strategic document is meaningful in that it recognizes side effects and problems arising from digital transformation as well as digital inclusion, and suggests USAID's response strategy. The strategic document considered that in digital transformation, telecommunications companies and authoritative governments are increasing their access to sensitive information due to the lack of personal privacy protection systems or mechanisms. In addition, it is pointed out that in the economic area, digital gaps

hinder the inclusive economic development of the underprivileged while causing excessive marketization. It also pointed out that false information is expanded and reproduced through social media and threatens democracy, and that authoritarian governments use digital technology as a means of intimidation and surveillance against individuals, groups, minor religions and ethnic groups that demand transparency and accountability. Under this awareness of the problem, USAID presented three Intermediate Results (IRs) and nine Sub-IRs under the goal of Strategy 2 'enhancing inclusion, security, and openness on the national digital ecosystem'. In particular, these IRs are meaningful in that they are strategies and goals that reflect the recognition of inclusiveness problems and side effects in digital transformation and USAID's concerns to solve them. Sub-IR 3.1 aims to enhance the capacity of vulnerable and underprivileged people to enjoy the digital ecosystem, Sub-IR 3.2 aims to promote the use of safe and responsible digital ecosystems by civil society, media and women, youth, religious and minority groups, indigenous organizations and institutions, and Sub-IR 3.3 aims to enjoy the digital ecosystem for market, information and financial access for individuals, self-employed and SMEs.

Figure Ⅱ-8. USAID's 'Digital Strategy 2020-2024'

VISION

Advance progress in communities in our partner countries on their journeys to Self-Reliance through efficient, effective, and responsible digital initiatives that enhance security and economic prosperity, consistent with the American values of respect for individual rights, freedom of expression, and the promotion of democratic norms and practices.

GOAL

To achieve and sustain open, secure, and inclusive digital ecosystems that contribute to measurable development and humanitarian-assistance outcomes and increase self-reliance in our partner countries.

SO 1: Improve measurable development and humanitarian-assistance outcomes through the responsible use of digital technology in USAID's programming		**SO 2:** Strengthen the openness, security, and inclusiveness of national digital ecosystems		
IR 1: Secure and appropriate use of digital technology across USAID's programming improves measurable development and humanitarian-assistance outcomes	**IR 2:** USAID's partners use effective approaches to engage with the digital ecosystem responsibly	**IR 3:** Communities in partner countries adopt, and have the capacity to securely use, and contribute to, digital ecosystems for improved services, economic opportunities, and civic engagement	**IR 4:** Improved commitment and capacity in partner countries foster digital ecosystems that align with established global best practices	**IR 5:** Digital economies led by the private sector are competitive, innovative, responsible, and inclusive
Sub-IR 1.1: Insights from assessments of digital ecosystems and advanced data analysis used across USAID's Program Cycle (to inform strategic planning and design)	**Sub-IR 2.1:** USAID's partners demonstrate digital awareness and alignment with established digital best practices	**Sub-IR 3.1:** Vulnerable or underserved groups are capable of using, contributing to, and benefiting from digital ecosystems	**Sub-IR 4.1:** Internationally established digital best practices implemented by public institutions and the private sector	**Sub-IR 5.1:** Private-sector investments in digital infrastructure and services align with internationally established best practices
Sub-IR 1.2: Established digital best practices integrated into Missions' strategies, programming, monitoring, and evaluation	**Sub-IR 2.2:** Exchanges of information between USAID and its partners expand established digital best practices	**Sub-IR 3.2:** The secure and responsible use of digital ecosystems increases the effectiveness of civil society and the media, including organizations led by women, youth, people from religious and ethnic minorities, and Indigenous Peoples	**Sub-IR 4.2:** Enabling environment for digital ecosystems improved through collaboration between USAID, governments, the private sector, and civil society; malign influences in digital ecosystems countered	**Sub-IR 5.2:** Private-sector skills, incentives, and capabilities contribute to development and promote inclusive and responsible service-delivery in the digital economy
Sub-IR 1.3: Missions make cross-sectoral investments in components of the digital ecosystem, such as infrastructure, services, policies, organizational commitment, etc.	**Sub-IR 2.3:** Multi-stakeholder engagements improve alignment with, or reform, the digital strategies, policies, and systems of partner governments	**Sub-IR 3.3:** Individuals and micro, small, and medium-sized enterprises (MSMEs) engage with the digital ecosystem to gain access to markets, information, and finance	**Sub-IR 4.3:** Policy-makers and regulators engage with, and provide responsible oversight of, digital ecosystems	**Sub-IR 5.3:** Local innovators, especially women, youth, ethnic and religious minorities, and Indigenous Peoples, participate in the digital economy
Sub-IR 1.4: Agency staff demonstrate awareness of, and competence and capabilities in, digital development				

Source: USAID, "Digital Strategy 2020-2024," https://www.usaid.gov/sites/default/files/documents/USAID_Digital_Strategy.pdf.pdf, (access: 10 Oct. 2022).

(3) Digital Inclusion of Japan

Japan recognized the issue of 'digital divide' as an important agenda in its ICT ODA policy. In this context, the 'Comprehensive Cooperation Package to Address the International Digital Division' was adopted in July 2007. The digital gap mentioned here mainly means a gap between countries. Therefore, it focused on infrastructure, software, and manpower development projects in developing countries to alleviate the digital gap between developing countries and developed countries. However, the details of JICA's goal of 'improving IT policy establishment capability' in the mid-term ICT international cooperation goal included the establishment of policies to bridge the domestic information gap in developing countries.

Under these goals, the ICT for Human Development and Human Security Project in Fiji is evaluated to have contributed to narrowing the regional gap by allowing 48% of University of the South Pacific (USP) students to receive remote education. Specifically, the project to build a remote education system based on the satellite communication network strengthening project for USP students co-operated by 12 South Pacific island countries contributed to reducing the information gap in the island area by enabling remote education for 22,000 students (48% of USP students).

In addition, Japan established 'Japan Fund for Information and Communication Technology (JFICT)' in ADB in 2001 to carry out knowledge sharing and capacity building projects to support information and communication policies in rural areas. Major projects for the digital vulnerable include 'Implementing Poor Farmers' Living Through Rice Information Technology' in 2004, 'Empowering the Real Area Through Community under the SASEC Program' in 2004, and 'Information and Communication Technology for Innovating Rural Education' in 2004.

Through UNESCAP and e-Center, Japan has also implemented projects to alleviate the digital gap between cities and rural areas, including poverty reduction and quality of life improvement projects in rural areas in Bangladesh, Bhutan, India and Nepal. In addition, JICA, Japan's aid agency, is promoting 'Digital for Development' in 18

business topics. In terms of digital inclusion and response to side effects and problems arising from digital transformation, JICA emphasized cybercrime and cybersecurity, and proposed the 'Data Free Flow with Trust (DFFT)' concept to the G20 in 2019 as a framework that encompasses this approach. In particular, DFFT is a plan based on the premise that side effects and problems in digital transformation can be supplemented by ensuring reliable information production and flow from the perspective of market economy, free trade system, and democratic threats caused by false and distorted data.

(4) Digital Inclusion of Sweden

Sweden recognized the importance of ICT and established an ICT4D department in SIDA, its ODA performance department. As a representative ICT ODA program, the 'The Swedish Program for ICT in Developing Region (SPIDER)' project, which was launched in 2004 through public-private cooperation with universities. How the SPIDER project perceives digital inclusion issues can be seen as gender, ICT accessibility enhancement, social environmental factors consideration, rights-based access, environmental, and disability factors understanding.

First of all, analysis based on the gender perspective helps to understand the necessary factors in the use of technology not only for women but also for men and the underprivileged, which provides a useful framework for project planning. In addition, SPIDER interprets digital-based development as the realization of human rights, so if all humans, especially the discriminated social groups, can expect the greatest benefit from digital transformation, improving ICT accessibility in these groups can cause great change in society. In the same vein, SPIDER takes a human rights-based approach to digital international development cooperation, and under this approach, it believes that the SPIDER program should enable people to claim their rights. Under these principles, SPIDER recognized the importance of the digital divide between urban and rural areas in developing countries by including the concentration of ICT4D projects in rural and urban poor areas, while prioritizing the digital divide

between countries such as the southern Sahara.

Sweden's efforts to address this digital divide can be seen in SPIDER's detailed projects, such as 'Education for Sustainability–Study Circles,' 'ICT and the Youth' in Kenya in 2011, and 'Implementing Productive and Child Health Services through ICT projects' in Cambodia in 2013 and these were a project for the underprivileged.

2. New Perspective on Digital Transformation

In this chapter, we first review existing digital related indices second, try to understand the digital transformation described by those indices third, propose an index for better digital inclusion from the limitations of existing approaches. We study ICT Development Index by the United Nations, the Inclusive Internet Index by The Economist, Digital Economy and Society Index by the European Union and the Digital Transformation Index by DELL Technologies as existing digital related indices. The ICT Development Index covers all countries worldwide, the Inclusive Internet Index covers most countries (excluding some countries), the Digital Economy and Society Index covers European Union members, and Dell's Digital Transformation Index covers companies in selected countries.

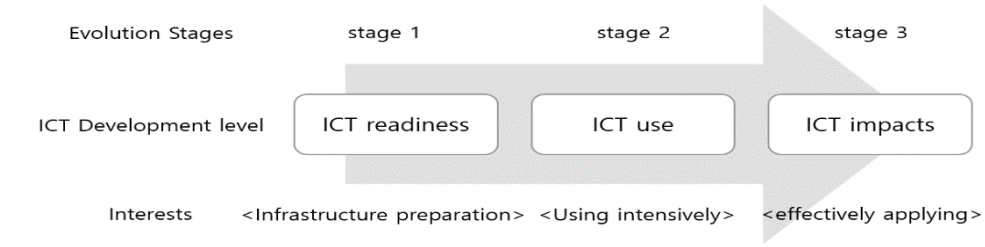
Since those indexes has certain characteristics of dealing with digital conversion, each would reveal various aspects of digital transformation. In addition, as the earliest approach, it is meaningful to look at the ICT development index, and the inclusive Internet index has the meaning of review as an index that focuses on 'inclusiveness'. The Digital Economy and Society Index by the European Union is introduced here based on the assumption that it will provide implications for the analysis of Central Asia in terms of its interest in connectivity within the region. The Digital Transformation Index is included in the discussion of this chapter based on the assumption that the digital transformation in the foremost industrial aspect should be reviewed. All indices are analyzed based on the latest data as of April 2022.

1) Review of Existing Digital Transformation Indices

(1) ICT Development Index[2)]

ICT Development Index is the result of evaluating the development level of information and communication technology (ICT) by country, and has been published by the United Nations every year from 2009 to 2017. First, the ICT development index is to measure the changes in the level of ICT development within a country over time, and second, this index is to recognize the gap between countries in the level of ICT development. Finally, it had been published to invite all nations to discuss on what might be the ICT development and to cooperate a sustainable development in this field.

Figure Ⅱ-9. Evolution Stages towards an Information-oriented Society



Source: Authors.

ICT Development Index has drawn interest in measuring the level of ICT development under the assumption that ICT can not only enable but also promote development in each state. In particular, the UN 's ICT development index sets the evolution to an information-oriented society based on the ICT development process as shown in the figure below.

The first stage focuses on ICT readiness, especially on hardware preparation level. The second stage is the one of paying attention to the level of ICT use, and focuses

2) Most contents are summarized from the following website.
https://www.itu.int/en/ITU-D/Statistics/Pages/IDI/default.aspx(June 28, 2022).

on how intensively people use ICT infrastructures. Although there are no related indicators in ICT Development Index, the index highlights the third stage is the place in which the efficient use of ICT in all fields is achieved as the final destination of an information-oriented society.

UN had measured the level of development into an information-oriented society based on various indicators for each of the first and second stages. The ICT development index is divided into sub-domains such as ICT access, ICT use, and ICT use skills, and each item includes 3-5 indicators. In the first stage of the evolution to an information-oriented society, a development strategy would focus on ICT readiness and ICT use, and ICT technology-related indicators might be proposed in this stage.

Table Ⅱ-4. ICT Development Index

ICT access	Weights (in the stage)	Weights (in the index)
Fixed-telephone subscriptions per 100 inhabitants	20%	40%
Mobile-cellular telephone subscribers per 100 inhabitants	20%	
International internet bandwidth per internet user (bit/s)	20%	
Percentage of households with a computer	20%	
Percentage of households with internet access	20%	
ICT use	Weights (in the stage)	Weights (in the index)
Percentage of Individual using the internet	33%	40%
Fixed-broadband subscriptions per 100 inhabitants	33%	
Active mobile-broadband subscriptions per 100 inhabitants	33%	
ICT skills	Weights (in the stage)	Weights (in the index)
Mean years of schooling	33%	20%
Secondary gross enrollment rate	33%	
Tertiary gross enrollment rate	33%	

Source: ITU Access at https://www.itu.int/en/ITU-D/Statistics/Pages/IDI/default.aspx(June 28, 2022).

The first category of ICT Development index is related to ICT access includes following indicators; 1) fixed-telephone subscriptions per 100 inhabitants, 2) Mobile-cellular telephone subscribers per 100 inhabitants, 3) international internet bandwidth per internet user (bit/s), 4) percentage of households with a computer, and 5) percentage of households with Internet access. Second, there are following indicators in the ICT use category; 1) percentage of individual using the internet, 2) fixed-broadband subscriptions per 100 inhabitants, and 3) active mobile-broadband subscriptions per 100 inhabitants. Finally, the ICT skills matters handle 1) mean years of schooling, 2) secondary gross enrollment rate, and 3) tertiary gross enrollment Rate. Each category is weighted differently as seen above.

Let us look at the indicators within each category. In terms of the first category related to ICT access, firstly, the term "fixed-telephone subscriptions" refers to the sum of active analogue fixed-telephone lines, voice-over-Internet Protocol (VoIP) subscriptions, fixed wireless local loop subscriptions, Integrated Services Digital Network voice-channel equivalents and fixed public payphones. It includes all accesses over fixed infrastructure supporting voice telephony using copper wire, voice services using Internet Protocol (IP) delivered over fixed (wired)-broadband infrastructure, and voice services provided over coaxial-cable television networks. Secondly, the term "mobile-cellular telephone subscriptions" means to the number of subscriptions to a public mobile telephone service providing access to the public switched telephone network using cellular technology. It includes both the number of postpaid subscriptions and the number of active prepaid accounts, and also includes all mobile-cellular subscriptions that offer voice communications. Thirdly, the term "international internet bandwidth" refers to the total used capacity of international internet bandwidth, in megabits per second (Mbit/s). Used international Internet bandwidth refers to the average usage of all international links, including fibre optic cables, radio links and traffic processed by satellite ground stations and teleports to orbital satellites (expressed in Mbit/s). This indicator is calculated by converting to bits per second and dividing by the total number of Internet users. Fourthly, the indicator "household with a computer" means that the computer is available for use

by all members of the household at any time. Computer in this part refers to a desktop computer, laptop (portable) computer, tablet or similar handheld computer. Lastly, in terms of the indicator "percentage of households with internet access", the Internet is a worldwide public computer network. Access can be via a fixed or mobile network. Household with Internet access means that the Internet is available for use by all members of the household at any time. Data for above indicators, are obtained by countries through national household surveys and are either provided directly to ITU by NSOs or obtained by ITU through its own research, for example from NSO websites.

There are three indicators to capture ICT intensity and usage. Firstly, the term "percentage of individuals using the Internet" refers to people who used the Internet from any location and for any purpose, irrespective of the device and network used, in the previous three months. Secondly, the terms "fixed-broadband subscriptions per 100 inhabitants" refers to fixed subscriptions for high-speed access to the public Internet, in the previous three months. This includes cable modem, DSL, fibre-to-the-home/building, other fixed (wired)-broadband subscriptions, satellite broadband and terrestrial fixed wireless broadband. It also contains fixed WiMAX and any other fixed wireless technologies, and both residential subscriptions and subscriptions for organizations. Thirdly, the term "active mobile-broadband subscriptions per 100 inhabitants" refers to the sum of data and voice mobile-broadband subscriptions and data-only mobile-broadband subscriptions to the public Internet. It covers subscriptions actually used to access the Internet at broadband speeds, not subscriptions with potential access, even though the latter may have broadband-enabled handsets. Subscriptions must include a recurring subscription fee to access the Internet or pass a usage requirement - users must have accessed the Internet in the previous three months. Data for these indicators obtained by countries through national household surveys and are either provided directly to ITU by NSOs or obtained by ITU through its own research.

In the last category of ICT development index, there are two indicators. Firstly, the term "mean years of schooling" is the average number of completed years of education

of a country's population, excluding years spent repeating individual grades. It is estimated using the distribution of the population by age group and the highest level of education attained in a given year, and time series data on the official duration of each level of education. Secondly, the terms "gross enrolment ratio (secondary and tertiary level)" refers to the total enrolment in a specific level of education, regardless of age, expressed as a percentage of the eligible official school-age population corresponding to the same level of education in a given school-year. Data on mean years of schooling and gross secondary and tertiary enrolment ratios are collected by the United Nations Educational, Scientific and Cultural Organization Institute for Statistics.

(2) The Inclusive Internet Index[3)]

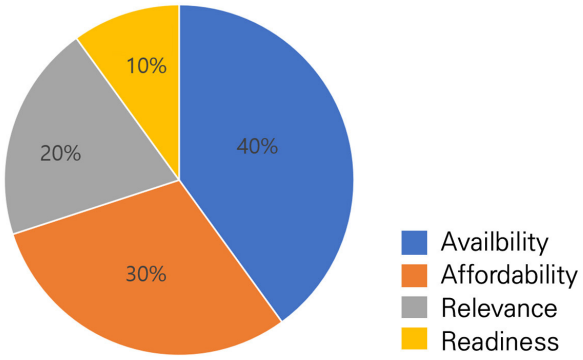
The Inclusive Internet Index was published six times from 2017 to 2022, as a result of the Economist's assessment of the level of Internet inclusivity by country. The Inclusive Internet Index aims to firstly compare the effective use of the internet by country, and secondly, to help policy makers and other relevant experts to clearly understand the factors contributing to the expansion of sustainable ICT inclusion. In particular, this index emphasizes the differences from existing indices in that it is concerned with the inclusiveness of internet use.

Unlike the ICT development index, the Inclusive Internet Index does not analyze the level of ICT development by stages, but spreads out the items listed at all stages and measures the development level of all indicators. The indicators are divided into four categories: availability, affordability, relevance, and readiness, and 62 indicators are included in these categories. Meanwhile, the weights for each category are as follows; 40% for effectiveness, 30% for economic feasibility, 20% for relevance, and 10% for readiness.

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3) Most contents are summarized from the following website.
https://impact.economist.com/projects/inclusive-internet-index/2022(June 28, 2022).

Figure Ⅱ-10. Inclusive Internet Index



Source: Authors.

The first category called "availability" captures the quality and breadth of available infrastructure required for access. Insufficient or unavailable infrastructure can limit Internet connectivity. This category looks at Internet use, the quality of the Internet connection, the type and quality of infrastructure available for Internet, and electricity access in both urban and rural areas of the country. First, to measure the level of usage, Internet users, fixed-line broadband subscribers, mobile subscribers, gender gap in Internet access, and gender gap in mobile phone access are used as indicators. Second, to evaluate quality, average fixed broadband upload and download speed, average fixed broadband latency, average mobile upload and download speed, average mobile latency, and bandwidth capacity are introduced as indicators. Third, to look at the infrastructure level, we measure 2G, 3G, 4G network coverage and 5G deployment level, government and private initiatives for Wi-Fi, unlicensed spectrum policy, and the number of Internet exchange points. Finally, the level of electricity provision is identified through the level of electricity use in cities and provinces.

Table Ⅱ-5. Subcategories of Inclusive Internet Index: Availability

Usage	Unit	Source
Internet users	Household proportion	ITU
Fixed broadband subscribers	Per 100 inhabitants	ITU
Mobile subscribers	Per 100 inhabitants	ITU
Gender gap in Internet access	(Ratio of male users - female usage ratio) / Male usage ratio	ITU/ Gallup
Gender gap in mobile phone access	(Ratio of male users - female usage ratio) / Male usage ratio	ITU/ Gallup
Quality	**Unit**	**Source**
Average Fixed Broadband Upload Speed	Mbps	Ookla
Average Fixed Broadband Download Speed	Mbps	Ookla
Average Fixed Broadband Latency	Minute	Ookla
Average mobile upload speed	Mbps	Ookla
Average mobile download speed	Mbps	Ookla
Average mobile latency	Minute	Ookla
bandwidth capacity	Bit/s per user	ITU
Infrastructure	**Unit**	**Source**
2G network coverage	Population %	ITU
3G network coverage	Population %	ITU
4G network coverage	Population %	ITU
5G deployment	Qualitative evaluation 0-2	Ookla
Government initiatives to make Wi-Fi available	Qualitative evaluation 0-2	EIU
Private-sector initiatives to make Wi-Fi available	Qualitative evaluation 0-2	EIU
unlicensed spectrum policy	Qualitative evaluation 0-3	EIU
internet exchange points	IXP per million people	EIU
Electricity	**Unit**	**Source**
Urban electricity access	Population %	IEA
Rural electricity access	Population %	IEA

Source: The Economist (2022, 18-21).

Secondly, the category called “affordability” examines the cost of accessing the Internet and considers initiatives, whether private or public, to lower costs or other ways to promote access. Cost of access relative to income is a critical factor in the inclusive adoption of Internet. This category includes factors that focus on price, such as the cost of a handset or fixed-line broadband, and the competitive environment for network operators. Looking at each of these, the price introduces smart phone cost(handset), mobile phone cost (prepaid tariff), mobile phone cost (postpaid tariff), fixed-line monthly broadband cost. On the other hand, the competitive environment contains average revenue per user, wireless operators' market share, and broadband operators' market share.

Table Ⅱ-6. Subcategories of Inclusive Internet Index: Affordability

Price	Unit	Source
Smartphone cost(handset)	0-100	GSMA
Mobile phone cost(prepaid tariff)	% of GNI per capita	ITU
Mobile phone cost(postpaid tariff)	% of GNI per capita	ITU
Fixed-line monthly broadband cost	% of GNI per capita	ITU
Competitive environment	Unit	Source
Average revenue per user	Dollar	EIU
Wireless operators’ market share	0-10,000	EIU
Broadband operators’ market share	0-10,000	EIU

Source: The Economist (2022, 21-22).

Next, this category called “relevance” considers the value of being connected, in terms of useful services and the availability of locally relevant content. If consumers do not find value in being connected, then Internet adoption is less likely. This category measures the availability of local content, such as whether basic information or government services are available online in the local language. It also measures whether content and services that stimulate economic activity, such as those relating to health, finance, commerce or entertainment, are available online. This category includes measures which determine the value of the Internet to consumers. Among them, the local content measures the level based on availability of local news in local

languages, concentration of websites using country-level domains, and availability of e-government services in the local language. Certainly, relevant content is evaluated on the basis of indicators such as e-finance content, value of e-finance, e-health content, value of e-health, e-entertainment usage, e -commerce content and so on.

Table Ⅱ-7. Subcategories of Inclusive Internet Index: Relevance

Local Content	Unit	Source
Availability of local news in local languages	0-3	EIU
Concentration of websites using country-level domains	0-3	Alexa
Availability of e-government services in the local language	0-3	EIU
Relevant content	**Unit**	**Source**
E-finance content	0-2	EIU
Value of e -financial	%	EIU Survey
E- Health content	0-3	EIU
Value of e- Health	%	EIU Survey
E- entertainment usage	%	EIU Survey
E-commerce content	0-100	UNCTAD
Value of e -commerce	%	EIU Survey
Open Data Policy	0-2	EIU
Value of e- education	%	EIU Survey
E- education in local language	0-3	EIU

Source: The Economist (2022, 22-23).

Finally, the category called "readiness" measures the capacity among internet users to take advantage of being online. The category is divided by 3 parts; literacy, trust & safety, and policy. Here, literacy is measured as indicators of level of literacy, educational attainment, support for digital literacy, and level of web accessibility. Next, trust & safety refers to the level of privacy regulations, trust in online privacy, trust in government or non-governmental websites or apps, trust in information from social media, and e-commerce safety. Lastly, policy deals with national female e-inclusion policies, comprehensive female e-inclusion plan, female digital skills training plan, female STEM education plan, and government e-inclusion strategy.

Table Ⅱ-8. Subcategories of Inclusive Internet Index: Readiness

Literacy	Unit	Source
Level of literacy	%	UNESCO
Educational attainment	Year	UNDP
Support for digital literacy	0-3	EIU
Level of web accessibility	0-4	EIU
Trust & safety	**Unit**	**Source**
Privacy regulations	0-2	EIU Survey
Trust in online privacy	%	EIU Survey
Trust in government websites and apps	%	EIU Survey
Trust in non-government websites and apps	%	EIU Survey
Trust in information from social media	%	EIU Survey
e-commerce safety	%	EIU Survey
Policy	**Unit**	**source**
National female e-inclusion policies	0-4	EIU
Comprehensive female e-inclusion plan	0-2	EIU
Female digital skills training plan	0-1	EIU
Female STEM education plan	0-1	EIU
Government e-inclusion strategy	0-2	EIU
National broadband strategy	0-3	EIU
Funding for broadband buildout	0-1	EIU
Technology-neutral policy for spectrum use	0-1	EIU
National digital identification system	0-2	EIU
Government efforts to promote 5G	0-3	EIU
Online harassment/bullying prevention	0-2	EIU

Source: The Economist (2022, 24-28).

Most of the detailed indicators of the comprehensive Internet index use publicly available sources such as the International Telecommunication Union (ITU) and statistical data from each country. In the case of the survey, the minimum sample for each country is 50 people, and relevant information is collected in a manner that is divided by age, gender, income and region.

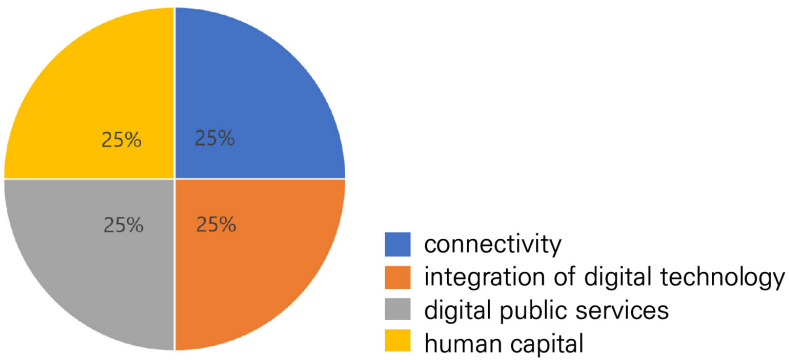
Certainly, the Inclusive Internet Index has evolved by introducing additional items each year so that inclusiveness can be measured more appropriately. Looking at the case of 2022, first, in economic feasibility, an additional understanding of inclusivity

was proposed by examining the supply environment in the internet market by adding the market share of wired and wireless operators. Second, in terms of relevance, online education and online education in the local language were introduced as additional indicators to more clearly measure the inclusivity of the Internet in the field of education. Third, readiness suggests that the side effects of the comprehensive use of the Internet should be considered in the process of expanding Internet use by examining the state's response to online bullying.

(3) Digital Economy and Society Index[4)]

Digital Economy and Society Index has been published by the European Commission for EU member states since 2014. This index is the result of measuring the level of digitization in EU member states, and the results are designed to be a reference for identifying areas where member countries should be concerned to achieve digital transformation that contributes to economic and social development.

Figure Ⅱ-11. Digital Economy and Society Index



Source: Authors.

4) Most contents are summarized from the following website.
https://digital-strategy.ec.europa.eu/en/policies/desi (June 28, 2022).

This index is largely divided into four categories: human capital, connectivity, integration of digital technology, and digital public services. Certainly, weights for each category all have the same 25 %. There are 1–4 sub–categories for each category, with metrics under the sub–categories.

First, human capital is a category to describe the internet user skills ICT specialists with a weight of 50% each. Among these, internet user skills is measured by the percentage of individuals who can use minimum basic digital skills, the percentage of individuals who can use digital skills above basic level, and the percentage of individuals who can use minimum software skills as indicators. In addition, advanced technology and development capabilities are evaluated in terms of the proportion of ICT experts, the proportion of female ICT experts, the proportion of companies providing ICT education, and the proportion of ICT graduates.

Table Ⅱ–9. Sub–categories of Digital Economy and Social Index: Human Capital

Internet user skills	Unit	Source
At least basic digital skills	Personal ratio	Eurostat
Above basic digital skills	Personal ratio	Eurostat
At least basic software skills	Personal ratio	Eurostat
Advanced skills and development	**Unit**	**Source**
ICT specialists	Percentage of employed people aged 15-74	Eurostat
Female ICT specialists	Total ICT experts	Eurostat
Enterprises providing ICT training	Enterprise Ratio	Eurostat
CT graduates	Graduate rate	Eurostat

Note: Eurostat (European Statistics by European Commission).
Source: DESI(2021, 5).

Secondly, the category called “connectivity” is for evaluating the level of digital hard infrastructure, and sub–items include fixed broadband take–up, fixed broadband coverage, mobile broadband, and broadband prices. Specifically, first, the indicators to measure the fixed broadband take–up overall fixed broadband take–up, at least 100 Mbps fixed broadband take–up, and at least 1 Gbps take–up. Second, the level of fixed broadband coverage is evaluated by fast broadband coverage and fixed very

high capacity network coverage. Third, the level of mobile broadband is judged through metrics of 4G coverage, 5G readiness, 5G coverage, and mobile broadband coverage. Finally, broadband prices are estimated using the broadband price index.

Table Ⅱ-10. Sub-categories of Digital Economy and Social Index: Connectivity

Fixed broadband take-up	Unit	Source
Overall fixed broadband take-up	Percentage of households	Eurostat
At least 100 Mbps fixed broadband take-up	Percentage of households	COCOM
At least 1 Gbps take-up	Percentage of households	COCOM
Fixed broadband coverage	**Unit**	**source**
Fast broadband (NGA) coverage	Percentage of households	EC
Fixed Very High Capacity Network (VHCN) coverage	Percentage of households	COCOM
Mobile broadband	**Unit**	**Source**
4G coverage	Percentage of the population	EC
5G readiness level	Overall level of harmony	COCOM
5G coverage	Percentage of the population	EC
Mobile broadband penetration	Percentage of individuals	Eurostat
Broadband prices	**Unit**	**Source**
Broadband Price Index	0-100	EC

Note: Eurostat (European Statistics by European Commission), European Commission, through the Communications Committee (COCOM), European Commission (EC).

Source: DESI(2021, 6).

Integration of digital technology is a category to examine the level of integration of digital intensity, digital technologies for businesses, and e-commerce. Among them, digital intensity is evaluated as SMEs with at least a basic level of digital intensity. Next, the level of digital technologies for businesses is measured based on the level of electronic information sharing, social media, big data, cloud, AI, ICT for environmental sustainability, and e-Invoices. Finally, the level of e-commerce is judged SMEs selling online, e-commerce turnover, and selling online cross-users.

Table Ⅱ-11. Sub-categories of Digital Economy and Social Index: Integration of Digital Technology

Digital intensity	Unit	Source
SMEs with at least a basic level of digital intensity	% SMEs	Eurostat
Digital technologies for business	**Unit**	**Source**
Electronic information sharing	% enterprises	Eurostat
Social media	% enterprises	Eurostat
Big data	% enterprises	Eurostat
Cloud	% enterprises	Eurostat
AI	% enterprises	Eurostat
ICT for environmental sustainability	% enterprises having medium/high intensity of green action through ICT	Eurostat
E-invoices	% enterprises	Eurostat
E-commerce	**Unit**	**Source**
SMEs selling online	% SMEs	Eurostat
E-commerce turnover	% SMEs	Eurostat
Selling online cross-border	% SMEs	Eurostat

Note: Eurostat (European Statistics by European Commission).
Source: DESI(2021, 7).

The final category called "digital public services" examines the level of e-government. The evaluation of e-government is made through five indicators: e-Government users, pre-filled forms, digital public services for citizens, digital public services for business, and open data.

Table Ⅱ-12. Sub-categories of Digital Economy and Social Index: Digital Public Services

E-government	Unit	Source
E-government users	% internet users	Eurostat
Pre-filled forms	0-100	eGovernment Benchmark
Digital public services for citizens	0-100	eGovernment Benchmark
Digital public services for business	0-100	eGovernment Benchmark
Open data	% maximum score.	European data portal

Note: Eurostat (European Statistics by European Commission)
Source: DESI(2021, 8).

Most of the above indicators of the Digital Economy and Social Index are produced by national statistical offices and use data approved by Eurostat. In addition, COCOM is the Communications Commission of the European Union, and the data produced by it are reviewed by members of the Communications Commission appointed by the Member States and are introduced into the Index. The e-government Benchmark, together with a digital consulting company called Capgemini, provides data verified by the relevant ministries of member countries. Certainly, the European data portal is data collected by Capgemini from representatives appointed by the relevant ministries of member countries. For the most recently published data for 2021, the indicators were evaluated for 28 EU member states. The analysis of the index is carried out including digital transformation considering the balance of each country and policy preparation for this purpose, and it can be understood as an index used to achieve digital transformation based on the European Union's connectivity ultimately.

(4) Digital Transformation Index[5)]

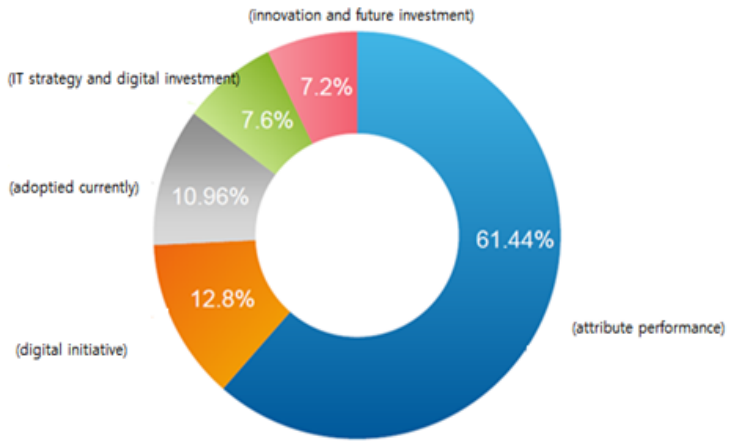
Digital Transformation Index is an index produced by a company called DELL Technologies, designed in 2016 to evaluate the progress of digital transformation of medium-sized and large enterprises around the world, and to suggest consulting for efficient transformation. It has been released until the 2020 version. As of the 2020 version, digital transformation levels were evaluated for 4,300 companies in 13 industries in 18 countries. The 18 countries include the United States, Canada, Mexico, and Brazil in the Americas, Australia, China, India, Japan, New Zealand, and Singapore in the Asia-Pacific region, France, Germany, Italy, Netherlands, Poland, Spain, Sweden, Britain is included. The 13 industries include public health, private health, financial services, insurance services, technology, telecommunications, media, and manufacturing.

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5) Most contents are summarized from the following website. https://www.dell.com/en-us/dt/perspectives/digital-transformation-index.htm (June 28, 2022).

The index has five major sub-categories; attribute performance, digital initiative, adopted currently, IT strategy and digital investment and innovation and future investment. The Digital Transformation Index assesses the level of digital transformation of 4,300 companies in such a way that each subcategory includes multiple questions and answers those questions.

Figure Ⅱ-12. Digital Transformation Index



Source: DELL Technologies (2020, 22).

Looking at the questions in the sub-categories, first, the question corresponding to the attribute performance is "how is your organization addressing each of the below to stay competitive and succeed in this increasingly digital world?"

- Predictively spot new opportunities
- Innovate in an agile way
- We prove we can be trusted
- We are transparent
- Provide unique, personalized experiences
- Always on, operate in real time

For each of the above, respondents selected one of the below statements (score in

brackets):

Doing well, organization-wide (128 points)

Doing well, in pockets of the organization (e.g. some regions/departments)

(70 points) Not doing well, organization-wide (20 points)

Not doing well, in pockets of the organization (10 points)

Research/planning stage (5 points)

No plans (0 points)

I don't know (0 points)

Maximum score = 768 points

Second, the question pertaining to the digital initiative category is, "in terms of your organization's existing IT strategy, to what extent are you doing the following to support your digital business transformation?" The Digital Transformation Index defines an appropriate digital initiative to include consideration of the following issues.

- Made significant investment in Edge to expand computer and online use and connectivity to data storage, etc.
- Made significant investments in a multi cloud environment
- Made significant investments in Artificial Intelligence
- Made significant investments in data management and analytics
- Made significant investments in cybersecurity and privacy
- Made significant investments in 5G infrastructure
- Made significant investments in on demand digital services
- Made significant investments in the digital workplace

For each of the above, respondents selected one of the below statements (score in brackets):

Fully completed most recent round of investment (20 points)

In process of doing - mature stages (15 points)

In process of doing - early stages (10 points)

Planned to do (3 point)

Not done and no plans to do (0 points)

I don't know (0 points)

Maximum score = 160 points

Third, the question pertaining to the adopted currently category is, "what new innovations or solutions is your organization investing in over the next 1–3 years to enable digital business? The Digital Transformation Index presents the following options to this question, and gives a final score by asking multiple answers to the corresponding options. Basically, it can be seen that the index treats the state of adopting all the items of the score given in the options as the final point of digital transformation. However, each item has a separate score based on a different weight for its importance. When all items are selected, the maximum score of 137 is obtained, and in this case, it can be evaluated that the most advanced form of technology adoption for digital transformation has been achieved.

- Artificial intelligence algorithms (near-autonomous/learning technology, trained to automatically answer questions, discover insights and provide recommendations) (11 points)
- Real-time applications at the Edge (sensor enabled data processing and location aware technologies that can send and receive data) (11 points)
- Quantum computing (use the properties of quantum physics to store data and perform computations; resulting in a leap in processing power) (0 points)
- Neuromorphic hardware (an electronic system for information processing. It resembles the behavior of a biological nervous system, can learn from its inputs and requires very little power) (6 points)
- Brain-machine interfaces (devices that enable its users to interact with computers by mean of brain-activity only) (0 points)
- Evolutionary nanotechnology (in shaping matter at the atomic and molecular scale, nanotechnology offers the potential for new, faster kinds of computers and more efficient power sources) (0 points)
- Additive manufacturing (creates three dimensional objects by depositing materials, usually in layers) (5 points)
- Mixed Augmented or Virtual Reality (11 points)
- Natural user interfaces (touch screen, gesture analysis, speech recognition) (11 points)
- Distributed ledgers such as Blockchain (6 points)
- 5G ready hardware (5 points)
- 5G infrastructure (5 points)
- Data management tools to transform data into something that is useful and protected (11 points)
- Cybersecurity solutions (infrastructure, application and end-user device security)

- (11 points)
- Privacy software (e.g. to help businesses know what data they have, evaluate their risks and disclose data to customers upon request) (11 points)
- Commercial robotics (UAVs/drones, medical robots, co-bots etc.) and/or Industrial robotics (automated, programmable robots, to perform tasks with high precision and repeatability) (11 points)
- Software: containers (standard unit of software that packages up code and all its dependencies so the application runs quickly in any IT infrastructure) and serverless (built on next-generation cloud services that auto-scale and charge only when used) (11 points)
- Multi-cloud environment where each application is deployed in the most appropriate cloud (private, public or hybrid) (11 points)
- We are not investing in any technology initiatives to enable digital business (0 points)
- I don't know (0 points)

Fourth, the question pertaining to the IT strategy and digital investment category is "thinking about your digital transformation strategy, which of the following is your organization doing? The Digital Transformation Index presents the following options to this question, and gives a final score by asking multiple answers to the corresponding options. Basically, it can be seen that the state of adopting all the items of the score given in the options is treated as the final point of digital transformation in terms of IT strategy and digital investment. However, each item has a separate score based on a different weight for its importance. When all items are selected, the maximum score of 95 is obtained, and in this case, the most advanced IT strategy for digital transformation exists, and it can be evaluated that digital investment has been made.

- Practicing Ci/CD (continuous integration, continuous delivery) (18 points)
- Actively encouraging a fail-fast-then-succeed mindset (18 points)
- Working with LOBs to identify digital Use Cases (18 points)
- Practicing DevSecOps (creating a 'security as a code' culture. Building robust security and privacy protocols into all devices, applications and algorithms) (18 points)
- Making decisions based on data in real-time (18 points)
- Prioritizing sustainable technology (i.e. using recyclable material/technologies that use less power) (5 points)
- I don't know (0 points)
- None of these (0 points)

Finally, the question pertaining to the innovation and future investment category is "When you think about the workforce in the digital age, what is your organization doing? The Digital Transformation Index presents the following options to this question, and gives a final score by asking multiple answers to the corresponding options. Basically, it can be seen that the company of adopting all the items of the score given in the options is treated as the final point of digital transformation in terms of innovation and future investment. However, each item has a separate score based on a different weight for its importance. When all items are selected, the maximum score of 90 is obtained, and in this case, it can be evaluated as the most advanced form of innovation and future investment for digital transformation.

- Sharing knowledge across business functions (for example, equipping IT leaders with business skills and business leaders with IT skills and / or dispatching IT staff to specific LoB departments) (10 points)
- Appointing/ed a Chief Data Officer (10 points)
- In communication with/from the C-Suite to identify discrete projects in the business that can be digitized (10 points)
- Investing in digital skills/talent (i.e. teaching all employees how to code, training IT staff on automation, cloud, etc.) (10 points)
- Hosting hackathons/scrums to encourage innovation and collaboratively fix problems (10 points)
- We've always encouraged remote working (10 points)
- Addressing the digital skills gap through our diversity and inclusion programs (10 points)
- Using emerging tech to develop and motivate staff in different, more engaging ways (e.g. through gamification) (10 points)
- I don't know (0 points)
- None of these (0 points)

The detailed indicators of the Digital Transformation Index have limitations in generalization in that they all target a limited number of respondents, and in terms of survey results, it is difficult to respond to social changes quickly or periodically. Nevertheless, as one of the important actors in digital transformation, it is an index that can specify the level of change in the corporate aspect to digital transformation, and it is very specific and has the advantage of providing technical implications. In short, the Digital Transformation Index covers the infrastructure capabilities,

technical capabilities, and human capabilities that companies at the forefront of digital transformation should have. Moreover, it identifies the elements of the highest level of digital transformation not only for companies but also for all institutions and individual actors.

2) Digital Transformation according to Existing Indices

As discussed, the ICT Development Index, Inclusive Internet Index, Digital Economy and Society Index, and the Digital Transformation Index evaluated the level of digital transformation of specific countries and companies by introducing detailed indicators. Here, we explore how each index understands digital transformation by analyzing the types and compositions of indicators that each index contains.

To do this, the indicators introduced in all indices are newly classified into three categories based on their characteristics: technological capability transformation, human capability transformation, and socio-cultural capability transformation, and all indicators are rearranged. In this discussion, therefore, digital transformation in under a situation in that we need to have technological capabilities that enable activities using digital service, human capabilities that can use digital technologies and develop better digital technologies, and socio-cultural acceptance of those digital activities.

When the sub-categories from each index are newly divided first, the ICT development index has ICT access and ICT use in terms of technological capability transformation, and analyzes ICT skills in terms of human capacity transformation. In other words, it can be seen that the ICT development index is understanding the transformation of technological and human capability as a major category of digital transformation.

Second, the Inclusive Internet Index deals with a safety issue from readiness, affordability and availability in terms of technological capability transformation. Certainly, human capability transformation is examined through the level of literacy

from readiness, and socio-cultural capability transformation is measured by the level of trust and safety indicators from readiness. In short, the Inclusive Internet index actively includes not only the categories of technological and human capability transformation but also socio-cultural capability transformation.

Table Ⅱ-13. How existing indices understand digital transformation (1): Sub-categories

	ICT Development Index	Inclusive Internet Index	Digital Economy and Society Index	Digital Transformation Index
Technological Capability Transformation	ICT access ICT use	Availability Affordability Readiness(safety)	Connectivity	Digital initiatives Adopted currently IT strategy & digital investment
Human Capability Transformation	ICT skills	Readiness(literacy)	Human Capital	Innovation & future investment (Human capital investment)
Socio-Cultural Capability Transformation	-	Readiness (Trust & Safety) Readiness(Policy) Relevance	Integration of digital technology Digital public services	Attribute performance Innovation & future investment

Source: Authors.

Third, the Digital economy and society index explores connectivity in terms of technological capability transformation and evaluates its level. In terms of human capability transformation, the degree of digital transformation is measured through the indicators from a sub-category of human capital. In addition, in terms of socio-cultural capability transformation, the level is evaluated by looking at the sub-categories of digital technology and digital public service. In other words, it can be confirmed that the digital economy and society index deals with not only the transformation of technological and human capabilities but also the transformation of socio-cultural capabilities as major issues of digital transformation. Meanwhile, it was confirmed that the issue of connectivity between countries, which was expected to be the focus of this index at the beginning of the study, was reflected, albeit in a limited way, through the indicator of 'the number of SMEs conducting international e-commerce' from the sub-item of integration of digital technology.

Finally, the Digital transformation index has the characteristic of having only one

indicator among the sub-items of innovation and future investment in terms of human capability transformation. On the other hand, in terms of technological capability transformation, we look at indicators within various sub-categories such as digital initiatives, adopted currently, IT strategies and digital investment. In terms of socio-cultural capability transformation, it is examined at that level through various indicators in multiple sub-categories, such as attribute performance, innovation & future investment. In other words, it can be confirmed that the digital transformation index looks at digital transformation in a balanced way from all aspects, such as technological capability transformation, human capability transformation, and socio-cultural capability transformation.

Table Ⅱ-14. How existing indices understand digital transformation (2): Indicators(selected)

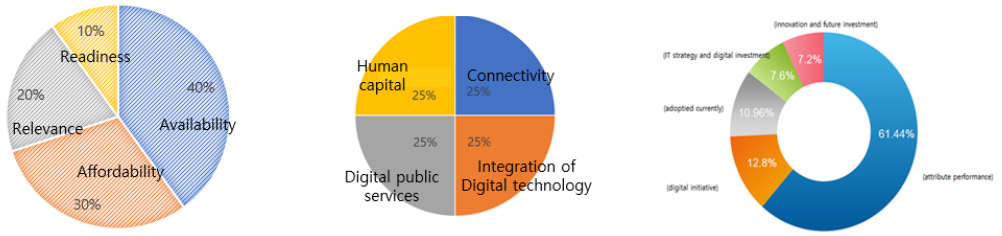
	ICT Development Index (selected)	Inclusive Internet Index (selected)	Digital Economy and Society Index (selected)	Digital Economy and Society Index (selected)
Technological Capability Transformation	* % households with a computer * % households with internet * International internet bandwidth per internet users * % individual using the internet	* Network coverage(min 2G/3G/4G), 5G Deployment * Urban electricity access, Rural electricity access * Internet users * Smartphone cost, Mobile phone cost * Broadband operators' market share * e-Commerce safety	* Overall fixed broadband take-up * Fast broadband (NGA) coverage * 4G coverage * 5G readiness	* investment in Edge * investments in a multi-cloud environment * investments in Artificial Intelligence * investments in data management and analytics
Human Capability Transformation	* Mean years of schooling * Gross enrollment ration * Proportion of individuals with ICT skills	* Level of literacy * Educational attainment * Support for digital literacy * Level of web accessibility	* At least basic digital skills * Above basic digital skills * ICT specialists * Enterprises providing ICT training	* Investing in digital skills/talent
Socio-Cultural Capability Transformation	-	* Trust in online privacy * Trust in government websites and apps * Trust in non-government websites and apps * National female e-inclusion policies * e-Finance content, e-Health content, e-Entertainment usage	* SMEs with at least a basic level of digital intensity * Digital public services for citizens * Digital public services for businesses * Open data	* Predictively spot new opportunities * Innovate in an agile way * Be trusted and transparent * Provide unique, personalized experiences

Source: Authors.

Through the distribution of indicators within each index, it was confirmed that the category of digital transformation actively included socio-cultural capability transformation. Additionally, each indicator in the index can be more clearly identified through weighting. Here, we examine how the Inclusive Internet Index, Digital Economy and Society Index, and Digital Transformation Index, excluding the ICT Development Index, deal with the weight of social and cultural capability

transition.

Figure Ⅱ-13. Sub-categories from existing indices: weight



Source: Authors.

First, in the Inclusive Internet Index, readiness and relevance were used as sub-categories dealing with socio-cultural capability transition, but the weights of the relevance are relatively small compared to other categories. In the Inclusive Internet Index, readiness and relevance have indicators corresponding to 10% and 20%, respectively, which are low compared to 40% of availability and 30% of affordability. In other words, the Inclusive Internet Index introduces various indicators to look at the shift in socio-cultural capability transformation, and strives to quickly read the changing digital transition through the addition of indicators, but it still considers the transition in technological capability and human capability as digital transformation.

Second, in the Digital Economy and Society Index, integration of digital technology and digital public services were used as sub-categories dealing with the shift in socio-cultural capability transformation, and the weights of the relevant items were doubled compared to connectivity and human capital. In other words, the Digital Economy and Society Index not only introduces various indicators to examine the shift in socio-cultural capability transformation, but also reflects the importance of the detailed indicators of the relevant indicators in a very meaningful way throughout the index.

Finally, the Digital Transformation Index uses functional attributes, innovation and future investment as sub-categories dealing with socio-cultural capability transition, and its weight is impressive compared to digital initiatives, adoption, IT strategies and digital investments. In particular, the attribute of function is a category that accounts for 61.44% of the total, and the change in that category is a structure that has no choice but to have a very important impact on the overall level of digital transformation. Moreover, since innovation and future investment also account for 7.2% of the total, it can be seen that the transformation of social and cultural capabilities in the Digital Transformation Index accounts for about 70% of the overall digital transformation.

In short, as a traditional index, the ICT Development Index only covered technological capability transformation and human capability transformation as categories of digital transformation. It can be seen that the Inclusive Internet Index, Digital Economy and Society Index, and Digital Transformation Index, which include recent changes, recognize social and cultural capability transformation as a category of digital transformation. In particular, in the case of the Inclusive Internet Index, indicators of socio-cultural capability transformation are added every year through continuous revision of the index composition. In the Digital Economy and Society Index, the proportion of indicators discussed in terms of technological capability transformation, which was emphasized in the ICT development index, is relatively decreasing, and the proportion of indicators discussed in terms of socio-cultural capability transformation is relatively increasing. Although the Digital Transformation Index looks at the digital transformation of companies, it is characterized by a relatively large number of indicators related to the transformation of socio-cultural capabilities. When looking at the weight of each indicator in the index, it can be seen that the socio-cultural capability transformation plays an important role in digital transformation. In particular, in the Digital Economy and Society Index and the Digital Transformation Index, the socio-cultural capability transformation accounts for more than 50% of the share, so it can be understood that the evolution of digital transformation discussion as seen through the index-related

discussions focuses on the level of socio-cultural capability transformation.

3) Proposal for Better Digital Inclusiveness Index

Discussions on inclusiveness in digital transformation have been ongoing. As digital capabilities are understood to have a significant impact on economic development, the digital inclusiveness is frequently discussed in terms of providing infrastructure that can be used by more people and ensuring that many people have the capabilities to use it.[6] Therefore, the international community has provided digital ODA to provide ICT infrastructure for more people and help them to use it.[7] Therefore, the increase in digital inclusiveness provided by digital ODA is evaluated to have a positive impact on global development in various aspects. In this process, it was mentioned that the main challenges of digital inclusiveness are mitigating the gap between countries, the gap within countries, and minimize the gap between genders, regions and generations. In short, in the traditional discussion, the digital inclusiveness has focused on strengthening infrastructure capability and technology utilization capacity to reduce the marginalized in terms of country, gender, region, and generation.

On the other hand, in some cases, it can be explained that the increase in digital inclusion does not always show only positive effects and can cause various social problems. In the Pacific Islands, fake news and digital bullying issues become more

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6) Kang, Insoo et al. 2015. *Strategies for promoting ODA projects in response to paradigm shifts in ICT development cooperation (I).* Korea Information Society Development Institute; Yoo, Jisu and Sunghoon Yoo. 2019. "Korea's ICT ODA status: Analysis of comprehensive implementation plan for international development cooperation for the last 5 years." *ICT International Development Cooperation Study Series* 31(5), 59-121; Hong, Sungyeon and Minjung Kim. 2011. "ICT development cooperation trends of international organizations and major developed countries." *Broadcasting and Communications Policy* 23(14), 36-91.

7) Nam, sangyeol, Sungwoo Kim, Byungwoo Kim, and Sodam Choi. 2018. *A study on international cooperation in ICT in the Asia-Pacific region to achieve the Sustainable Development Goals (SDGs).* Korea Information Society Development Institute; Kim, Jongil. 2014. *Development cooperation plan for Vietnam's ICT sector.* KIEP; Kim, Jinha et. al. 2020. *Research on science and technology diplomacy promotion strategy and establishment of system foundation.* Ministry of Science and ICT.

serious when more people enjoy digital facilities.[8] According to analyzing the period from 2000 to 2012 in 49 sub-Saharan African countries, increasing Internet penetration had a rather negative effect in countries with low-to-moderate education quality.[9] Certainly, mobile money systems, which are expanding in developing countries, make it easier for the poor people to become financially bankrupt, and to engage in financial crime.[10] Therefore, it can be confirmed that efforts for digital inclusiveness so far have limitations despite several positive results. It is clear that there is a need to think about better inclusiveness.

Therefore, "better digital inclusiveness" to be addressed in this study includes the existing discussion of inclusiveness, that is, based on providing more people to use digital services. Moreover, we add the points that digital services would be proper people's needs as much as they want, with a higher level of satisfaction and trust. In this study, we would like to propose a better digital inclusiveness index that can serve as a basis for promoting this perspective. To this end, we propose a index to secure better inclusiveness by inviting additional indicators based on the Inclusive Internet Index from existing digital transformation related indices. In the case of the Digital Economy and Society Index, in which the aspect of socio-cultural capability transformation was sufficiently emphasized, it was not adopted because it had limitations in that it did not sufficiently reflect the characteristics of developing countries we focus on here. In addition, in the case of the Digital Transformation Index, in which the importance of socio-cultural capability transformation was most emphasized, it was judged that the appropriateness of the index for the country was not sufficient because it was an index for companies.

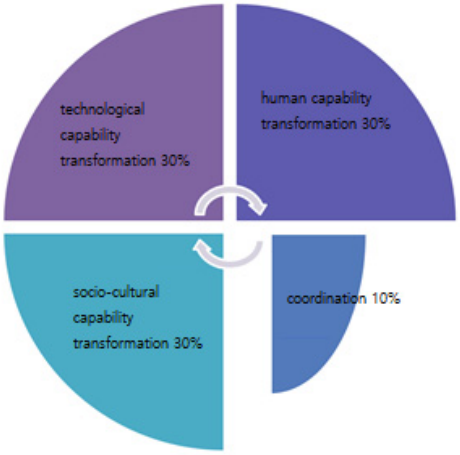
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8) Using Digital Technology for Development Outcomes in the Pacific. 2022. Access at https://www.internationalaffairs.org.au/australianoutlook/using-digital-technology-for-development-outcomes-in-the-pacific (October 30, 2022).

9) Asongu, S.A., Odhiambo, N.M. 2019. "Enhancing ICT for quality education in sub-Saharan Africa." Educ Inf Technol 24, 2823-2839.

10) Mobile Money and Organized crime in Africa. 2020. Access at https://www.interpol.int/News-and-Events/News/2020/Report-Criminals-infiltrating-Africa-s-booming-mobile-money-industry (October 30, 2021).

Figure Ⅱ-14. Better Digital Inclusiveness Index



Source: Authors.

In terms of better inclusiveness, in the case of the existing Inclusive Internet Index, first, has focused on absolute diffusion rather than harmonious diffusion. For example, it highlights the level of internet use by residential area rather than regional differences. Therefore, better inclusiveness modifies the indicator with gap as the key word. Second, since the low weight of the existing socio-cultural capability aspect is observed as a limitation, the weight is modified and applied into the study. In addition, in order to increase socio-cultural acceptance, coordination related indicators are added. In particular, we would like to include specific coordination indicators that can address the better inclusiveness at the regional level for Central Asia. Third, by adjusting the weights of the technological capability transformation, human capability transformation, and socio-cultural capability transformation, which have been dealt with in the previous discussions, the proportion of reflection on the socio-cultural aspect is increased. Certainly, the weighting for the coordination index is limited to 10%. This reflects that it is in charge of a secondary function as an adjustment instrument compared to basic indicators. In fact, the role of the adjustment index is only possible when the transformation of technological capability, human capability, and socio-cultural capability takes place. Considering

this, the weight is limited to 10%. In conclusion, the following Better Digital Inclusion Index is proposed. Following chapters review the indicators for each Central Asian countries and make suggestions for coordination markers for improving digital inclusiveness for successful digital transformation.

Table Ⅱ-15. Better Digital Inclusiveness Index (1): Technological Capability Transformation Indicators

Indicator	Source	Indicator	source
Internet users	ITU	5G Deployment	ITU
Mobile Population Coverage	ITU	Government initiatives to make Wi-Fi available	Economist
Fixed-line broadband subscribers	ITU	Private-sector imitative to make Wi-Fi available	Economist
Mobile subscribers	ITU	Unlicensed spectrum policy	Economist
Households with computers	ITU	Internet exchange points	Liberia IXP Association
Households with the Internet access	ITU	Smartphone cost(headset)	GSMA
Average fixed broadband upload speed	Ookla	Mobile phone cost(prepaid tariff)	ITU
Average fixed broadband download speed	Ookla	Mobile phone cost(postpaid tariff)	ITU
Average fixed broadband latency	Ookla	Fixed-line monthly broadband cost	ITU
Average mobile upload speed	Ookla	Household expenditure on ICTs	ITU
Average mobile download speed	Ookla	Average revenue per user	Telegeography
Average mobile latency	Ookla	Wireless operators' market share	Telegeography
Bandwidth capacity	ITU	Broadband operator's market share	Telegeography
Network coverage (min 2G)	ITU	National broadband strategy	Economist
Network coverage (min 3G)	ITU	Funding for broadband buildout	Economist
Network coverage (min 4G)	ITU	Technology-neutral policy for spectrum use	Economist
Fixed-broadband internet traffic	ITU	Government efforts to promote 5G	Economist
Mobile internet traffic (within the country)	ITU	Regional gap in internet access	ITU

Note: Refer to the code book included in the Appendix

Source: Authors.

Table Ⅱ-16. Better Digital Inclusiveness Index (2): Human Capability Transformation Indicators

Indicator	Source
Level of literacy	ITU
Educational attainment	UNDP
Support for digital literacy	Economist
Gender gap in internet access	ITU
Gender gap in mobile phone access	ITU
Government e-inclusion strategy	Economist
Generation gap in internet access	ITU

Note: Refer to the code book included in the Appendix

Source: Authors.

Table Ⅱ-17. Better Digital Inclusiveness Index (2): Human Capability Transformation Indicators

Indicator	Source
Availability of local news in local languages	Economist
Concentration of websites using country-level domains	Alexa Internet
Open data policy	Economist
Privacy regulations	Economist
National digital identification system	World Bank
Availability of e-government services in the local language	Economist
e-Finance content	Economist
Value of e-finance	Economist
E-Health content	Economist
Value of e-health	Economist
e-Entertainment usage	Economist
e-Commerce content	Economist, UNCTAD
Value of e-Commerce	Economist
Value of e-education	Economist
E-Education in local languages	Economist
Trust in online privacy	Economist
Trust in government websites and apps	Economist
Trust in non-government websites and apps	Economist
Trust in information from social media	Economist

Note: Refer to the code book included in the Appendix

Source: Authors.

Table Ⅱ-18. Better Digital Inclusiveness Index (4): Coordination Indicators

Indicator	Source
1. Country level	
Central-local government coordination	official documents, each country
Provider-user coordination	official documents, each country
Technological-Human-Socio-cultural capability coordination	official documents, each country
2. Regional level	
Regional coordination	official documents, each country
3. International level	
International coordination	official documents, each country

Note 1: Refer to the code book included in the Appendix

Note 2: Examples of additional coordination indicators by country will be proposed in following chapters

Source: Authors.

Ⅲ. Development and Application of Better Digital Inclusiveness Index for the Region of Central Asia

1. Current State of Digital Transformation in Central Asia : Regional and International perspectives

All five Central Asian countries have a national development strategy that engages with digital inclusiveness, information technology and internet services in line with global trends which view information communication technology as an enabler, facilitator and contributor for economic and social benefits. Digital inclusiveness is the cornerstone of all the national programs of the countries in Central Asia. Kazakhstan (Digital Kazakhstan 2018-2022 program), Kyrgyz Republic (Digital Kyrgyzstan 2019-2023 Strategy also called Tara Koom which was adopted in 2017), Tajikistan (Presidential decree 2019), Turkmenistan (2019-2025 Strategy) and Uzbekistan (National Strategy 2017). All five countries have services related to e-governance, some like Kazakhstan started e-governance services in 2006.

Kazakhstan's digital program focuses on digitization of economic sectors, development of secure high-speed communication networks, increased digital literacy in the education sector, provision for technological entrepreneurship, and e-government services.[11)]

The Kyrgyz Republic's digital strategy encompasses the social and economic life of the population with a view towards digital modernization and transformation as a means to bring progress.[12)]

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11) N. Zhangarin, 2022. Information and Communication Technologies, https://www.trade.gov/country-commercial-guides/kazakhstan-information-and-communication-technologies (12 May2022)

12) UNDP and Effective Governance Through Socioeconomic Recovery Facility in Kyrgyzstan project. 2021. *Entry points for digital transformation in Kyrgyzstan.* https://www.undp.org/kyrgyzstan/news/entry-points-digital-transformation-kyrgyzst

Tajikistan's national strategy touches on nearly all aspects of societal life including the economy and governance. The digitization process in the country is viewed as a facilitator for development and progress while at the same time as bringing Tajikistan closer into the global arena.

The presidential decree approving the concept of developing the country's digital economy for 2019–2025 in Turkmenistan was further supplemented in 2021 with the document of the new State Program on the Development of the Digital Economy of Turkmenistan for 2021–2025.[13] The main focus of the national strategy was e–governance and diversification of the economy.

Uzbekistan's national strategy in 2017 focused on e–governance and strengthening of ICT for all sectors of the economy including building infrastructure. The Presidential decree of 2018 further strengthened the resolve of the government by calling on raising the standards and use of information systems for digital economy and e–government.[14]

All five states have accepted that modern society requires increased ICT engagement from the government and the public. The presidential decrees in all cases assert the importance of building infrastructure which is secure, fast and connected globally. Infrastructure development and e–governance are the top priorities of all the countries. Mobile and internet communications are being widely used and touted as digital transformation and Central Asia in in line with the developments either in aspiration and/or in planning. In terms of e–governance, Kazakhstan established a platform as early as 2006 and has led the region in providing electronic services to

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an (12 May 2022)

13) Muhamedov, R. 2021 "Serdar Berdimuhamedov and Turkmenistan's Digital Transformation." *The Diplomat.* https://thediplomat.com/2021/07/serdar–berdimuhamedov–and–turkmenistans–digital–transformation/ (12 May 2022)

14) S. Shin, J. Ho and V. Y. Pak. 2020. "Digital Transformation through e–Government Innovation in Uzbekistan," 2020 22nd International Conference on Advanced Communication Technology (ICACT), 2020, pp. 632–639, doi: 10.23919/ICACT48636.2020.9061507

its citizens (6 million over 760 services).[15)]

The World Bank, UNSCAPE, CAREC, ADB and a host of international and regional organizations are in the region (CIS and Central Asia) to help curate, build and facilitate this digital transformation. In terms of country actors, China and Korea, along with Russia are giving both physical and monetary assistance to Central Asia. Reports from agencies point to challenges ranging from "infrastructure development, digital literacy and technological competitiveness prevail and hinder the realization of digital potential in the subregion."[16)]

The overwhelming consensus from these agencies rely on the achievement of sustainable development goals (SDGs) that have become the central pillar for a global paradigm. The UN's 17 SDGs are the core of the 2030 Agenda for Sustainable Development by the UN in 2015. They range from alleviating poverty and hunger to providing clean water and quality education, decent economic growth, communities and cities, and also includes innovation, industry and infrastructure.[17)] The goal for innovation, industry and infrastructure includes support and development of information technology including "Support domestic technology development, research and innovation in developing countries, including by ensuring a conducive policy environment for, inter alia, industrial diversification and value addition to commodities" and "Significantly increase access to information and communications technology and strive to provide universal and affordable access to the Internet in least developed countries by 2020".[18)]

As per the World Bank figures, Kazakhstan and Turkmenistan belong to upper-middle-income economies and the Kyrgyz Republic, Tajikistan, and Uzbekistan belong to lower-middle-income economies.[19)] This has implications for the kinds of

15) UNESCAP report. 2020. Realising Digital Potential in North and Central Asia. https://unece.org/sites/default/files/2020-12/E_Background_paper_-_Realizing_digital_potential_in_North_and_Central_Asia.pdf
16) Ibid.
17) United Nations SDG goals (2015). https://sdgs.un.org/goals. (13 May 2022).
18) Ibid.
19) CAREC 2022. Second Annual CAREC Institute's Research Conference.

challenges that face these countries, while Kazakhstan and Turkmenistan face problems of mismatch in the demand of the labor market, high unemployment rates of graduates, insufficient digital skills and teaching; Kyrgyz Republic, Tajikistan and Uzbekistan face problems which range from a lack of schools, teachers and digital related teaching and skills. According to World Bank's 2016 World Development Report up to 60% of the people in Central Asia either do not have access to internet and in Kyrgyz Republic and Tajikistan pay very high prices for often bad quality services.[20] This is not to say that internet penetration is not improving but compared to other parts of the world Central Asian countries with the exception of Kazakhstan are among the least connected in the world.

1) Kazakhstan

"Implementation of the "Digital Kazakhstan" program anticipates: expanding the coverage of communication network and ICT infrastructure; provision of BIA in rural areas: provision of access to 83% of the population by 2022; development of the new generation of mobile infrastructure (4G): network coverage of more than 80% of the population of Kazakhstan by 2022."[21] Kazakhstan is already the leader in terms of how many people use the internet in Central Asia and is also a front runner in the world in the spread of internet in its population. However, the quality and speed of the internet along with digital skills and education remain inadequate.

According to Turkyilmaz et al. Kazakhstan suffers from 'low integration' of academia-industry and government while at the same time there is a lack of innovation in industry. [22] Kazakhstan ranks 29 out of 139 countries in terms of ICT

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https://www.carecinstitute.org/wp-content/uploads/2022/05/CAREC-Institute-Newsletter-April-issue-35.pdf(13 May 2022).

20) International Finance Cooperation World Bank Group (IFC 2017), Countries in Central and South Asia to Improve Internet Connectivity and Grow Their Digital Economies https://pressroom.ifc.org/all/pages/PressDetail.aspx?ID=16064

21) Zakiyeva, Zhanat. "Problems and Perspectives of Digital Silk Road in Central Asia." ACM International Conference Proceeding Series (2020): 1-4. Web.

22) Turkyilmaz, A., Dinara Dikhanbayeva, Zhanybek Suleiman, Sabit Shaikholla, Essam ShehabIndustry, 2021. '4.0: Challenges and opportunities for Kazakhstan SMEs', Procedia

development but there is a genuine lack of infrastructure development and utilization of the same in the economy of Kazakhstan. Along with this concerns over data security, privacy and corruption continue to plague the digital transformation of Kazakhstan on a national level. State programs and government support for the internet and ICT have aided the growth of digital technologies and their use in Kazakhstan but there is still a long way to go in terms of seeing digital connectedness like that in developed countries. The country continues to rely on the extraction of natural resources while Kazakhstan's SMEs continue to rely on old technologies and suffer from a lack of trained personnel. Further discussion on the Kazakhstan's digital transformation will following in Chapter 6 of this report.

2) Kyrgyz Republic

The Kyrgyz Republic is one of the poorest countries in Central Asia. While it is considered the most democratic of the Central Asian republics it is also the most unstable with leadership change often following violence on the streets. Ethnic strife and violent clashes have taken place in 2005, 2010 and 2020.[23] Considering the political, economic and social conditions in the country there are numerous challenges on a number of fronts for the Kyrgyz Republic to undergo a digital transformation. The state programme on digital transformation is beset by challenges of low IT skills and education, limited resources for installing infrastructure like cables, fibre and telecommunications across the country, along with weak institutional governance.[24] Among EAEU countries and their ICT indicators which includes information on internet users, fixed and mobile phone internet users and the like. "From 176 countries, among EAEU members the lowest ranking belongs to Kyrgyzstan – 109, the highest belongs to Belarus – 32. Closer to Belarus's ranking is Russia; it has 45, then Kazakhstan with 52 ranking and Armenia with 75 ranking."[25] Furthermore out

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CIRP, Volume 96, 2021, Pages 213–218, ISSN 2212–8271, https://doi.org/10.1016/j.procir.2021.01.077

23) Russell 2020

24) UNDP and Effective Governance Through Socioeconomic Recovery Facility in Kyrgyzstan project report 2021

of 129 countries the Kyrgyz Republic ranks 90th in innovation.[26] While the Kyrgyz Republic has managed to overcome some challenges, the digital component of the republic's economy in the GDP is negligible and requires far more investment in specific infrastructural development to make the move towards Kyrgyz Republic's digital transformation. The challenges to overcome are bigger than improving just digital infrastructure and promoting digital inclusiveness, the republic requires economic transformation which can allow it to be a more integral part of the global economy.[27] Further discussion on the Kygyzstan's digital transformation will following in Chapter 5 of this report.

3) Tajikistan

Tajikistan is a mountainous region and one of the poorer republics in Central Asia. It has a young but overwhelmingly rural population and faces challenges of connectivity regionally and beyond. While Tajikistan's digital economy and the ICT sector specifically grew at a great pace between 2000-2015. The country was able to attract companies to bolster what the state was investing in and Tajikistan saw an average growth rate in ICT of 15%.[28] While the government recognizes this potential there are challenges especially in terms of economic growth of the entire economy, low IT skills and education, difficult terrain along with a migratory population that still seeks to go to Russia as migrant workers in large numbers.

4) Uzbekistan

The main challenges to the digital transformation and digital inclusiveness other than the lack of physical infrastructure (cables, networks etc) is low digital literacy and

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25) Enikeeva, Z (2019) Digital Agenda in the EAEU Countries: The Case of Kyrgyzstan. JEL F15 O38. doi:10.17323/2499-9415-2019-4-20-55-82. 60
26) Ibid. 62
27) Ibid. 77
28) Olters, J. (2020) Digital Transformation in Tajikistan as Central COVID-19 Response Policy. https://www.worldbank.org/en/news/speech/2020/10/14/digital-transformation-in-tajikistan-as-central-covid-19-response-policy

lack of human capital investment.[29] According to Mowlds, while the government of Uzbekistan is "leveraging technology for evidence-informed and participatory decision making" especially with its use of the government's Open portal, only 55% of the population used the internet in a World Bank survey over a period of three months.[30] She suggests that Uzbekistan still has a long way to create the infrastructure (physical and human) to build digital inclusivity especially for producing economic growth. Her recommendations include training for staff and personnel in the Ministry of Development of Information Technologies and Communications; increased access in regions from Karalkapastan to Andijan and other remote populations; knowledge sharing and interdepartmental training with a view to become a leader in the region to use new and innovative information technologies.[31] Further discussion on the Uzbekistan's digital transformation will following in Chapter 5 of this report.

2. Effects of Digital Transformation in Central Asia : Case Analysis

All Central Asian governments are committed to expanding and working towards digital inclusiveness with state programs and have signed up with international institutions ranging from the EU, UN, World Bank, ADB and even CAREC and the BRI to promote the digital transformation of their countries. The state and citizens are well on their way to provisioning for economic, social and cultural developments in the digital space. Survey after survey done in the region provides us with information on internet accessibility, increased internet users, broadband and mobile

29) Interview with Hannes Astok, International Consultant on Digital Governance. Entry points for digital transformation in Kyrgyzstan (2021) https://www.kg.undp.org/content/kyrgyzstan/en/home/presscenter/articles/2021/06/hannes-astok-interview.html

30) Mowlds, S. (2021) 'Evidence-informed Decision-making for Sustainable Development in Uzbekistan: Spatial Data', GCRF COMPASS Policy Paper, 8 February, https://www.kent.ac.uk/politics/rs-gcrf-compass/Sinead-Mowlds_Spatial-data_18-Feb-2021.pdf

31) Ibid. 2021, 11-12

users and their preferences, e-governance and digital economic portals, all provide a fairly comprehensive picture of the digital story in Central Asia. There is no doubt that the countries are using the internet for a variety of purposes and are more digitally connected every year.

However, there is also data that reveals that urban populations have more accessibility, and that costs for certain users, especially the Kyrgyz Republic and Tajikistan are too high, which means that a smaller than average population worldwide actually uses the internet and looks for information or is involved in a significant way with the digital world. From older demographics to young people who rely on adults for money; women; rural populations and the like find themselves at the periphery of this digital transformation. This is true not only for Central Asia but also for neighboring countries including India which has more to do with low GDP per capita, lack of education and IT skills, and even lack of important infrastructure like electricity. In late January 2022 millions of people in Uzbekistan, Kazakhstan, and Kyrgyz Republic were left without any electricity because of a power grid failure which dates back to the Soviet era.[32] The disruption included cutting of heat, transport grids, telephone lines and internet and lasted for five days.

3. Developing Better Digital Inclusiveness Index for Central Asia

In order to fully comprehend the mismatch between international institutions and various indicators that are used to gauge digital inclusiveness it is important to focus on the understanding of infrastructure development within which infrastructure necessary for digital connectedness resides. One of the most important aspects of Central Asia which makes it truly unique is its geographical location and subsequent constraints. The countries of Central Asia are all landlocked and in the case of Uzbekistan doubly landlocked. Considering that the bulk of international traffic is via submarine cables this adds a significant cost for the countries in the region in the

32) BBC 2022. Central Asia blackout leaves millions without power. https://www.bbc.co.uk/news/world-asia-60123178 (8 June 2022)

first place to access internet connectivity.[33] While Kazakhstan has managed to offset high transit prices, affordability for most of Central Asia at the user level is still an obstacle and is constantly under review. The extent to which digital inclusiveness is impacted by factors like infrastructure and institutional limitations are not always taken into account in analysis and recommendations.

In addition, it is important to consider the number of stakeholders in building said infrastructure is essentially peripheral in most discussions of digital inclusiveness which locates the state and citizens as a binary, often in conflict or competition with each other, in the Central Asian region. While digital inclusiveness is seen as an important goal for all nation states, there is fear of certain state types which makes infrastructure development by them (for instance China) and their use of digital technologies as suspect and thus problematic. Statements like "[T]he EU has also expressed concerns about some aspects of the BRI, seen as prioritising China's interests over those of partner countries," are not helpful in and tend to cause more harm especially in a scenario in which hard infrastructure like cables, satellites, cellphone towers, media and related material developments are essential to the digital inclusiveness project.[34] In work done by Plantin and Punathembekar have put together the multiplicity of stakeholders which include state, private companies, scientists and engineers along with citizens as the building blocks of understanding power relations in a bid to explain ideological implications of certain infrastructures, in their case the media including Facebook, Amazon and the like.[35]

Another limitation is the limited telecommunications landscape in countries like Uzbekistan. In many cases around the world digital inclusiveness and a growth in

33) Kunavut, Kunagorn & Okuda, Atsuko & Lee, Dongjung. (2018). Belt and Road Initiative (BRI): Enhancing ICT connectivity in China–Central Asia Corridor. Journal of Infrastructure, Policy and Development. 2. 10.24294/jipd.v2i1.164.

34) European Parliamentary Research Service (EPRS 2019) Connectivity in Central Asia, Reconnecting the Silk Road https://www.europarl.europa.eu/RegData/etudes/BRIE/2019/637891/EPRS_BRI(2019)637891_EN.pdf

35) Plantin, Jean–Christophe, and Aswin Punathambekar. "Digital Media Infrastructures: Pipes, Platforms, and Politics." Media, Culture & Society 41.2 (2019): 163–74. Web.

users is complemented by private telecommunications companies that tend to invest and increase efficient use of ICT services. The nature of the economies of Central Asia then have a role to play in how we understand the ICT development paths in the region. The neoliberal approach to economic growth considered from the developed nations which have had different experiences then ties both the analysis and any development paradigm with a particular approach. The post-Soviet countries of Central Asia which, for example, Uzbekistan, didn't follow shock therapy or have remained outside of the Euro-centric economic global supply chain (like Turkmenistan) suffer from the lack of understanding of how different economies might be able to achieve digital development without altering their economic trajectories. There is a danger of ideology seeping into provisioning for and analysing these processes. As Plantin and Punathembekar point out we must consider the specific environment in which certain types and forms of media and digital infrastructures have developed in the first case.[36]

4. Application of the Better Digital Inclusiveness Index in Central Asia

Digital inclusiveness in Central Asia is largely dependent on the challenges of geography and land-lockedness that are local impediments. Uzbekistan is a doubly landlocked country and all other Central Asian countries are landlocked which severely limits their access to undersea cables and increases their reliance on neighbouring countries. The recent conflict between Russia and Ukraine brings to fore the importance that geography plays for the countries of Central Asia. Central Asia has historically been connected to Russia, first Tsarist Russia and then the Soviet Union, which has created a symbiotic relationship with Russia that is not easily undone. In addition, Tajikistan and the Kyrgyz Republic suffer from having remote and mountainous regions which are difficult to get to and create problems for provision of internet for the population. In many cases the villages in mountainous

36) Ibid. 166

regions are remote and sparsely populated. These provide challenges that are often not fully captured by the metrics that determine whether countries are digitally inclusive. Another problem that is keenly felt in the region is one of language, while there is content in the Russian language there is hardly any content in the national titular language. In order for the metrics to capture the challenges of language related content specific metrics have to be included to realise that digital inclusiveness in Russian language in countries of Central Asia can in many ways subvert national titular language content. However, the binary that titular languages need to have the state's focus is also not a solution because these societies are multi lingual and the metrics that many international organisations apply originate in mono lingual cultures. The societies of Central Asia have long enjoyed being multi lingual and only with the advent of the nation state after 1991 have they voluntarily or in some cases been forced to choose one language over another. These are challenges that are difficult to convey especially in the current climate of antagonism towards Russia but also over the long term a problem that will cause these countries to fall behind on metrics that do nothing to capture the realities in these societies. The flip side of this is also that these nation states that fall fairly low on all development indices are not in a position to develop titular language content. These are developing societies with low to weak economic capacity and limited infrastructure development that severely limits the state's capacity to induce change. In summary, Central Asian countries have many challenges to overcome and digital inclusiveness while part of their development goals is one of many goals that need attention from the state. The promise of the market economy and democracy has not been a smooth road for any of the Central Asian countries and the nation states continue to be impacted significantly by global and financial crises often not of their own making.

Digital inclusiveness metrics then must include state capacity, problems related to remote regions and provision of access, spare populations severely limiting the possibility of using private companies to fill the gap, challenges of landlocked countries, over reliance on neighbours and language related content. These are all indicators which aren't fully captured in metrics that are seen as important to show

that a nation state is on its way towards digital inclusiveness. For Tajikistan and the Kyrgyz Republic the problems of sparsely populated mountainous regions should be included as one of the more important impediments to connectivity; Kazakhstan while being the most digitally inclusive is also heavily reliant on Russia and China for that digital connectivity; and Uzbekistan is doubly landlocked.

In addition, businesses in Central Asia range from large corporate style to small and medium sized which have different needs and attract customers in very different ways. The historic bazars and markets that Central Asian towns and cities are famous for, for example, Bukhara Samarkand, Ferghana, Merv etc, have centuries long experience of trade. Some of the most dynamic moments of global marketplaces took place on the Silk Road(s). These historic relationships have created specific ways of interacting and with the advent of the internet are subject to major challenges. Disruptions caused by digital connectivity have the potential to endanger whole societies and communities who rely on small trading and mobile traders. Communities in Uzbekistan and Tajikistan with links to Afghanistan and beyond are some of the most innovative people in the world when it comes to building and protecting old networks (Marsden 2021) and need to be taken into account when considering why certain technologies don't see the kind of uptake in this region that they do in other regions. Metrics on digital connectivity need to engage with academics, especially anthropologists and historians to see why certain communities hesitate more than others and what it would mean to comprehensively move to digital portals.

For most international organizations and companies seeking to improve digital inclusivity the main markers are– return on investments, percentage of annual budget for big projects; time to market apps; digital incentives; and technical workforce.[37] Engagement metrics focus on Pageviews, Likes, Shares, Subscriptions, Time spent on each page, Bounce rates and Top exit pages.[38] UNESCO's 2021 report

37) Fitzpatrick, Matt & Kurt Stovink (2021) How do you measure success in digital? Five metrics for CEOs, January 29, 2021 | Article. Accessed 23 December 2022 https://www.mckinsey.com/capabilities/mckinsey-digital/our-insights/how-do-you-measure-success-in-digital-five-metrics-for-ceos

on 'Achieving universal and meaningful digital connectivity Setting a baseline and targets for 2030' focuses on measuring household connectivity by looking at "Percentage of individuals using the Internet, total and by gender, age and urban/rural location; Percentage of households with access to the Internet, total and by urban/rural location; Percentage of businesses using the Internet, total and by size; Percentage of schools with Internet access, by education level (based on International Standard Classification of Education); Percentage of individuals using the Internet, by frequency of use; Active mobile-broadband subscriptions per 100 inhabitants; Fixed-broadband subscriptions per 100 inhabitants." They also consider affordability, speed of internet, population's ICT skills, infrastructure targets and gender parity. In measuring universal connectivity the report says that it looks at four categories: people, households, communities and businesses; and connectivity enablers like infrastructure, affordability, skills, device and security. These measures fail to take into account the role played by the state and state apparatus in the provision of the mega infrastructure installations which are essential for digital connectivity. Furthermore, an important indicator of digital connectivity needs to be the skills associated with challenges of internet crime and security challenges that are part of any digital landscape.

These above-mentioned metrics do not in many instances map on to what is needed specifically for Central Asia and its problems of digital connectivity. Being landlocked and doubly landlocked increases the cost of access to undersea cables which means that tariffs are inordinately higher for some of the poorest populations. The remote regions of Central Asia do not always map on to a urban/rural divide but in some instances are limited by meagre returns on investment because of the lack of population density. In these instances private businesses have no interest in providing services which further impedes digital connectivity and inclusivity. The state has no choice but to intervene in these instances. The broader understanding

38) Shekhar, S (2021) The Future of Connection: Metrics for Digital Communities. Accessed on 23 December 2022 https://medium.com/valuesmovement/the-future-of-connection-metrics-for-digital-communities-d789362df482 1

that can help find solutions for digital connectivity then require further analysis of the economic development in these countries and the limited scope of nation states as actors who can create sustainable communities. The regional factor which is exacerbated by geography and historical processes necessarily means that the nation state as a singular actor has posed significant challenges for these countries. Digital inclusiveness and a failure to appear higher on some metrics require studying economic factors related to the potential of the nation state to deliver prosperity to populations. In the first instance a roadmap that can actually clarify the challenges faced by these countries requires application. Local solutions need to be considered in the local context keeping in mind that communities worldwide require different solutions based on their needs. Universal solutions are limited and while needing cognizance cannot always provide the best solutions.

Ⅳ. Development and Application of Better Digital Inclusiveness Indicators for Uzbekistan

Uzbekistan is 447,400 square kilometers, and shares borders with Kazakhstan, Turkmenistan, Kyrgyzstan, Tajikistan and Afghanistan. Along with Liechtenstein, it is one of the world's only two double landlocked countries (that is, all of its neighbours are also landlocked). The landscape ranges from sandy deserts (Kara Kum and Kizil Kum) with dunes to intensely irrigated river valleys along the watercourse of the Amu Darya (in Ancient Greek – Oxus), Syr Darya (Jaxartes), and Zarafshon Rivers. High Chatkal and Kurama mountains surround the fertile Fergana Valley in the east of Uzbekistan, Tyan Shan Mountains in the north of the country, and Pamir Alay Mountain Range in the south.[39] With a population of approximately 35 million people, Uzbekistan is the most populous of the Central Asian countries.[40] Modern Uzbekistan's population is very young: the median age is around 27 years and over a quarter of the population is under 14, 50.1 % of the population is urban. Tashkent is the capital and largest city, with a population of 2.57 million. According to estimates, a large majority (80%) of Uzbekistan's population identify as ethnic Uzbeks. There are minority populations of Russians (5.5%), Tajiks (5%), Kazakhs (3%) and others. The state itself is avowedly secular, however, about 88% of the population nominally adhere to Islam. Uzbek, a Turkic language, is the country's sole official language and the first language of about three quarters of the population. Russian is designated as a language of inter-ethnic communication and is widely used in everyday technical, scientific, government and business life. It is the first language of about 14% of the population. Tajik, a variant of Persian, is spoken by minorities in Bukhara and Samarkand.[41].

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39) Edward Allworth. 2019. Uzbekistan. *In Encyclopædia Britannica.* https://www.britannica.com/place/Uzbekistan (September 22, 2022).

40) Uzbekistan Population. 2020. *Worldometer*. (n.d.). www.worldometers.info website: https://www.worldometers.info/world-population/uzbekistan-population/(September 22, 2022).

After dissolution of the Soviet Union and gaining independence economic diversification became a key policy objective of Uzbekistan; however, the structural economic transformation hindered during most of the country's independent history. Institutions and policies changed little with respect to those predominant under the planned economy. The government led in the distribution of resources and outputs among state –owned enterprises through the government budget, strict regulation, and public sector orders. Apart from mostly row materials exports that connected the country with global markets, the economy was closed and inward looking, with little competition and dynamism. The government provided limited basic services to all, typically without linking budget expenditures to outcomes. The past development model was dominated by heavy industry, great reliance on natural resources, a neglectful approach to job creation, and remarkable gaps in human capital development. Good jobs were scarce and wages low, the state was the main job provider in the country. Resources were misallocated and labor mobility restricted by different means including permanent registration of the citizens in their home towns. Some areas of the country, namely the capital of the country and surrounding regions were better developed than others. In other words, the government was too present in some areas, too little involved in others, and its role throughout the economy lacked adequate effectiveness, efficiency, and support for inclusive and sustained growth[42] (World Bank, 2022).

In 2016, Shavkat Mirziyoye was elected as the second president of Uzbekistan. The Mirziyoyev government implemented economic liberalization policies, including national digitalization and innovation strategies. In particular, in order to realize the potential of each citizen and accelerate the transition of the national economy to a market economy, the government also introduced the "Uzbekistan Development

41) Ibid.
42) Toward a Prosperous and Inclusive Future: The Second Systematic Country Diagnostic for Uzbekistan (English). Washington, D.C.: World Bank Group. http://documents.worldbank.org/curated/en/933471650320792872/Toward-a-Prosperous-and-Inclusive-Future-The-Second-Systematic-Country-Diagnostic-for-Uzbekistan (September 22, 2022).

Strategy 2017–2021", a comprehensive and market-oriented reform program. The program has set five priorities: first, improving national and public institutions; second, securing the rule of law and reforming the judicial system; third, promoting economic development and liberalization; fourth, promote job creation and social development; fifth, ensuring personal and public safety through racial and religious tolerance and constructive foreign policy. In addition, the government adopted the "Digital Uzbekistan 2030" strategy as the country's roadmap for digital transformation in 2020, and set digital infrastructure development, e-government, digital economy, digital technology market promotion, and ICT education and training as key priority areas.

This chapter begins with an overview of the current state of digital transformation in Uzbekistan and relevant government strategies using the Better Digital Inclusiveness Index as the analytical framework. The second section, then, discusses more specifically how the digital transformation has affected the country's education sector. Then, in the following section, we analyze the results from a field-survey and expert interviews to explore ways to expand digital inclusiveness in the education sector and suggest a coordination marker can help Uzbekistan build a more digitally inclusive society. The chapter concludes with a brief discussion on how the suggested marker could contribute to achieving a more inclusive digital transformation.

1. Current State of Digital Transformation

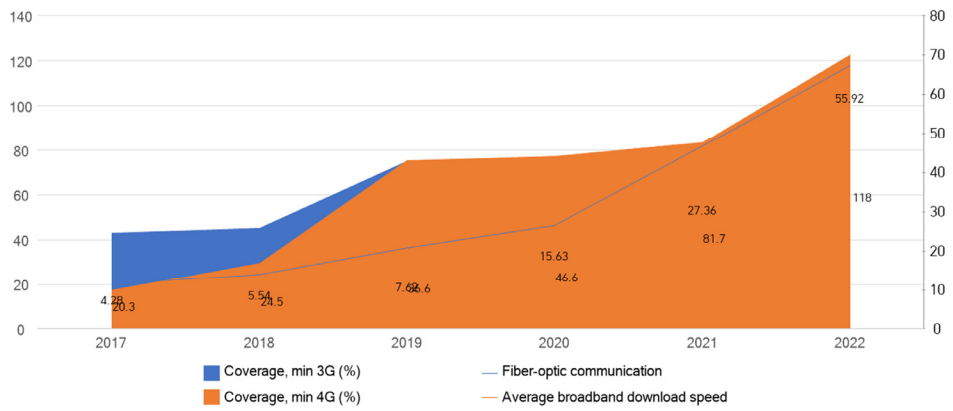
1) Technical Capability Transformation

Table Ⅳ-1. Technical Capability Transformation Indicator

Indicators	2021	2020	2019	2018	2017
Internet users (% of population)	100	88.1	79.7	76.3	0
Mobile Population Coverage (% of population)	100	90	80	20	0
Mobile-cellular subscribers (% per 100 inhabitants)	100	3.5	17.8	11.6	0
Fixed-line broadband subscribers (% per 100 inhabitants)	100	84.8	56.4	36.1	0
Fixed-broadband internet traffic (exabytes)	100	74.8	30.6	9.8	0
Mobile internet traffic (within the country, exabytes)	100	87.7	30.3	11.4	0

It is worth noting the huge work being done to develop telecommunications infrastructure, as the length of the installed fiber-optic communication lines increased by almost 6.6 times from 17.9 to 118 thousand km. As a result, currently 67% of settlements have fiber-optic communication lines. UzbekTelecom plans to continue the work on expanding the optical network and building additional 150 thousand km by the end of 2023. By owning major fiber infrastructure, the company has a dominant position in fixed broadband, especially in major cities.

Figure Ⅳ-1. Fixed broadband internet development in period of 2017-2022



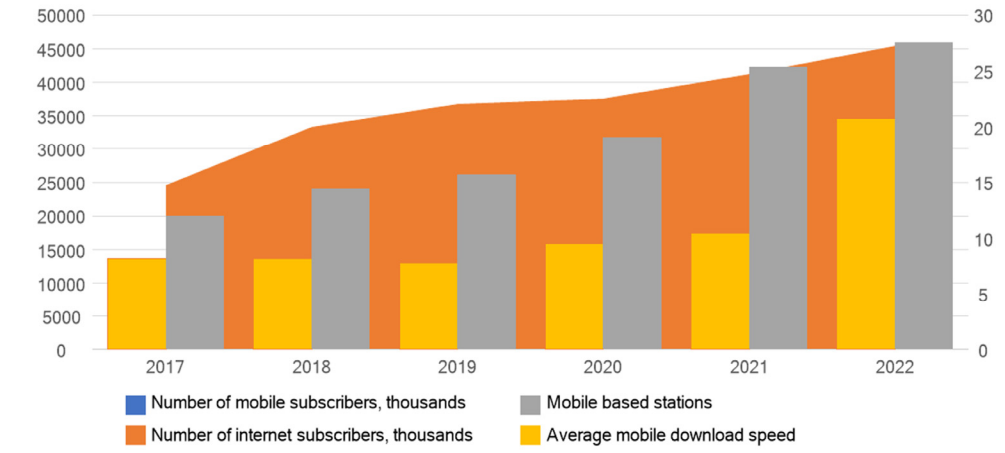
Source: data from MITC and Ookla websites

The number of mobile base stations increased 2.3 times from 19,9 to 45.9 thousand units, in period of 2020–2021 alone, more than 14000 new mobile telephone exchanges were installed and launched (fig.6.2). The expansion of the network of mobile base stations created enabling environment for the provision of services (by increasing the coverage) of mobile communications for 98% of the country's population, including high–speed communications up to 90%. Since 2016, the number of mobile subscribers has increased by 35% to 29 million people, and the number of Internet users has almost doubled to 27.2 million people.

Due to licensing requirements, MNOs have been encouraged to reach more rural, less profitable locales[43]. According to ITU statistics in 2021, network coverage expanded with almost full coverage of the population by 2G (99.2%) and 3G (80.7%) networks, and 4G coverage concentrated in larger cities and towns, reaching around 47.7% of Uzbekistan's population. Annual growth of the number of installed broadband Internet access ports highlights demand–based approaches for spreading broadband access in Uzbekistan. Particular efforts connecting pre–school entities, schools, libraries and other public institutions influence digital inclusion positively. In 2021, total number of ports has increased from 1.2 to 3.6 million since 2018.

43) DECA. 31 March 2022. *Uzbekistan Digital Ecosystem Country Assessment*. www.usaid.gov website: https://www.usaid.gov/digital–development/uzbekistan–digital–ecosystem–country–assessment (November 24, 2022)

Figure Ⅳ-2. Mobile internet expansion in period of 2017-2022

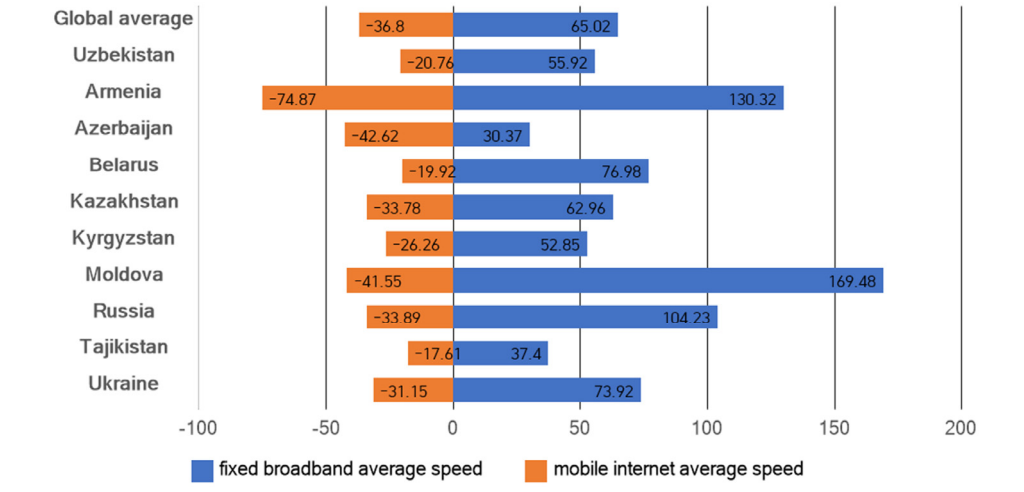


Source: Authors based on World Bank and Ookla Data

Provision of satellite and terrestrial digital channels assisted in expansion of access to international information networks, including the Internet and direct communications. Since 2016, the bandwidth (speed) of the international data transmission network has been increased by almost 28 times – from 64.2 to 1800 Gb / s. At the same time, the cost of tariffs for Internet services for providers decreased by 30 times from 91.5 to less than 3 dollars per 1 Mbps.

According to SpeedTest Global Index, the average internet speed in Uzbekistan in April, 2022 was 20.76 Mbps on mobile and 55.92 Mbps per second on fixed broadband download rankings. Only fixed broadband speed is 4 times lower than in Singapore, leading country in the world and more than twice as low as in Moldova, the leader among the CIS countries (fig.6.3.). Insufficient coverage of broadband Internet, low penetration of mobile Internet hinders the widespread use of digital services by the population and business, efficiency and effectiveness of innovative activity.

Figure Ⅳ-3. Average broadband and mobile internet download speed on April, 2022



Source: Ookla website speedtest, 2022

2) Human Capability Transformation

As widely acknowledged, along with the availability and affordability of ICT infrastructure, digital skills is a backbone of digital inclusion. The Uzbek government has focused on developing digital skills in school curricula, established IT specialized schools in all regions, and launched a project of "1 million Uzbek coders". In addition, the demand of the population for in-depth IT courses in IT academies has a steady growth trend. In terms of higher education, Tashkent University of Information Technologies and its regional branches, as well as Inha University in Tashkent, offer a wide range of undergraduate and graduate programs in IT. Other higher education institutions also offer ICT programs. In general, 5% of the total quota in higher education is allocated annually to ICT-related areas.

According to ITU statistics, in 2021, the gender gap in internet access was 15.1, which is still high, but admittedly much better than in previous periods. Gender gap in access to mobile phone in 2021 was 15.9, very similar gender gap in internet access. We can see that the age gap (30.5 in 2021) is wider compared to the gender gap, as the use

of the Internet is rapidly becoming popular among young people, and older adults are just getting acquainted with this area.

Table Ⅳ-2. Human Capability Transformation Indicators

Indicators	2021	2020	2019	2018	2017
Gender gap in internet access	15.1	26.1	42.5	27.3	n.a
Gender gap in mobile phone access	15.9	25.6	21.2	17.2	15.7
Age gap in internet access	30.5	n.a.	12.1	n.a.	n.a.

Social order in Uzbekistan has significant impact on the gender digital divide. Traditionally, majority parents of girls forbid or limit their use of mobile phone and internet to protect them from outside bad influences. Therefore, their digital skills are also less developed than those of boys. Despite the fact that some communities, especially in rural areas, see the active use of the Internet by women as a threat to the social order, there is an increasing recognition of the importance of digital literacy among women for employment.

3) Socio-cultural Capability Transformation

One of the socio-cultural barriers to expanding digital inclusion was the lack of information available in Uzbek language. Due to the expansion of ICT infrastructure and subscriber coverage in Uzbekistan, the number of websites covering news in the local language is also increasing. Online platforms have become impactful alternative to traditional television to broadcast entertainment and informational programs in Uzbek language, many young people have learned to popularize their talent online. Bloggers, who are expanding their audience on YouTube, Telegram, TikTok and other platforms, are emerging as an influential force in social life and have a good opportunity to increase their income through online advertising services. This can be traced in the increasing trust in government, non-government and social media websites and apps between 2018 and 2021 (see table 6.2). According to Economists 3I data Uzbek people trust in government websites and apps (48) is higher than non-government websites (36) and other social media (34).

Table Ⅳ-3. Socio-cultural Capability Transformation Indicators

Indicators	2021	2020	2019	2018
Trust in online privacy	58	50	54	54
Trust in government websites and apps	48	50	38	38
Trust in non-government websites and apps	36	28	28	28
Trust in information from social media	34	32	22	22

4) National Digital Transformation Policy and Strategy

From the first days of independence, Uzbekistan started to pay special attention to development of information and communication technologies and their application in all spheres of life of state and society. Over a short period after gaining independence, the authorities created the legal framework conducive to further formation and progress of market of IT-technologies. In particular, in 1992 the Law "On tele-communications" was adopted, which established general principles of progressive promotion of the industry. Issues of ICT legal regulation received further development in the Law "On Information" dated December 11, 2003, President's Resolution "The Comprehensive Program of Development of National Information and Communi-cation System of the Republic of Uzbekistan for the Period of 2013-2020s" dated on June 27, 2013 and several other documents. However, Uzbekistan also has a history of restricting access to certain websites for non-transparent reasons. For example, until relatively recently, multiple websites were unavailable, such as Buzzfeed, Lurkmore, Soundcloud, Voice of America, BBC Uzbek, Deutsche Welle, Reporters Without Borders, Eurasianet.org, and AsiaTerra. Before that, restrictions were removed from media sites like Fergana.ru, an independent media outlet, reporting about news from Central Asia. Komil Allamzhonov, the Head of AIMK at that time, reported on his Facebook page that "technical problems were identified and eliminated that prevented the full operation of these web resources in Uzbekistan" (DECA, 2022).

In recent years, the Government of the Republic of Uzbekistan indicated the need to

strengthen work on the accelerated introduction of digital technologies in the economy and social sphere and put development of the ICT sector on the priority agenda. The development of information and communication technologies has been recognized as an important factor in improving the welfare of the people and the country's economic growth. In particular, with the beginning of the policy of opening up to the global world and launching of the poverty reduction strategies from the late 2016 onwards, a significant progress has been made to expand digitization and digital inclusiveness across the country by improving the quality of the ICT infrastructure.

To help guide the country through the next decade of changes, the Government adopted the *Digital Uzbekistan 2030 Strategy* in October 2020. The Digital Uzbekistan Strategy sets out five priority areas for development: Digital infrastructure, e-Government, Digital economy, National IT sector and IT education. Analyzing development tendencies in Digital transformation dimensions in Uzbekistan, we observed sharp regional disparity in five key factors of digital inclusion, which calls for active government action to reduce it.

Recognizing the importance of such fundamental issues as digital network infrastructure and a comprehensive system for teaching digital literacy and skills throughout the country, the Strategy outlines more than 1,600 projects across all twelve regions of Uzbekistan plus the Autonomous Republic of Karakalpakstan and names 29 districts for piloting a variety of new projects in 2020-2022. These range from establishing e-hospitals, to integrating digital technologies into cotton textile production and systems for monitoring natural gas consumption, to creating "smart agriculture fields" using the Internet of Things (IoT)[44] (DECA, 2022). The Strategy also highlights legal and regulatory reforms needed to drive digital economy development. Digital and IT educational programs at the primary, secondary, and tertiary levels, along with digital skills training for government employees and citizens, are a primary focus for programs in every region.

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44) Ibid.

In order to support and lead digital reforms in Uzbekistan the government established IT Park on July 24, 2019. Mission of IT Park is to create an Eco-system to incubate and support innovations with "Technopreneurship" (terminology used by IT Park - Uzbekistan) across Uzbekistan resulting in wealth and employment creation through successful ventures. IT Park specializes in incubation and acceleration programs, government-supported and Private venture funds, IT Academy of International Standard, in 2022 it also has opened the IT Park University, modern and Comfortable co-working spaces and IT areas and support in legal, accounting and marketing spheres. Moreover, the residents of IT park enjoying the tax reduction, instead of paying standard 12% VAT, they pay only 9%.

A project of *Digital Uzbekistan 2030 Strategy* that demonstrated the most remarkable success was the creation of complex information systems and databases for electronic government (e-government). Instead of making personal visits to different governmental agencies, which usually was quite time consuming due to long queues, Uzbek citizens can now access and collect documents from various offices at home. It also improved communication between the public services bodies and private sector, which in turn helped to create transparent and convenient environment and better business conditions.

New important impulse to development digital sphere in general, and e-education in particular was 2020 when the COVID-19 pandemic spread swept through the country. The pandemic has drawn attention to the urgency of lessening the digital divide and further accelerated the development of the digital infrastructure including the revamping of the 3G-4G base stations and extension of the fiber optic cables throughout all of the regions of the country. However, our research has confirmed that the national digital strategy lacks a coordination marker similar to the one suggested in Chapter 2 that could manage the diverse needs and coordinate activities of multiple stakeholders of the digital transformation.

2. Effects of Expanding Digital Inclusiveness : Focusing on the Education Sector

Starting from April 2020 many education establishments in Uzbekistan rapidly turned towards organization of distance learning opportunities for their students due to COVID-19 pandemic. However, the quality of education in many institutions dropped significantly due to lack of digital infrastructure, low internet speed, specialists who were able to adopt their teaching methodology to online learning requirements, different assessment structure and many other drawbacks. Majority of schools just started to send tasks to the students via telegram channels and get back assignments the same way.

However, the single for all state schools online platform Kundalik, which was launched one year before pandemic, made the digital transformation much smoother and allowed to avoid collapse in school education. As for textbooks, all of them were available on the website www.eduportal.uz, launched by the Ministry of Public Education approximately 10 years ago. Moreover, to mitigate problems with internet infrastructure in the regions of Uzbekistan and inaccessibility of computers in vast majority of Uzbek families, many subjects started to translate as television programs.

Measures have been taken to provide special preferential traffic enabling free access to distance learning platforms and database systems at higher education institutions and the use of other educational resources by all telecommunication operators working in Uzbekistan. For example, the mobile operator Mobil.uz has introduced a new preferential tariff plan for students and teachers. Also, in a very short time government launched website "https://dist.edu.uz," which integrated the e-learning resources of all higher education institutions onto a single platform. Were organized webinars for academic and administrative staff of the universities about using this and other e-learning platforms and uploading teaching and learning materials for online learning. As a result of these efforts in a very short time more than 6,000 online resources were upgraded to a new level and more than 1,000 new ones were created.

It allowed to start 2020–2021 academic year in online format and also provide continues professional development for academic staff in development distance learning materials through a special website "http://mk.bimm.uz/." Another website "https://tube.edu.uz" has been launched on the TAS–IX network to present video lectures and master classes. Coursera and many publishing houses started to provide their resources for free to mitigate the loss of offline opportunities during lockdown.

Yet, COVID–19 also identified some pressing problems with development of IT sphere and further development of e–learning. The monthly salary of specialists working in state educational establishments is below the average market indicators, therefore, digital natives are not considered to stay there for a long time and looking for more attractive financial opportunities, therefore, qualification level of academic and administrative staff needs to be improved. Majority of Uzbek universities do not use single Learning Management System (LMS) and only some of them are developing their own one or started to use Moodle, as it is free of charge. There is a lack of multimedia studios and media centers that produce audiovisual educational content and multimedia educational products (audiobooks, 3D, VR technologies, etc.). Web metrics on the websites of higher education institutions are below international standards. Continues professional development of lecturers most of the time does not include teaching methodology for online learning or using of specialized for teachers and researches software; university laboratories also don't have specialized equipment to organize virtual experiments.

Digital divides along geographic and gender lines run deep in Uzbekistan. Higher–quality internet access packages and devices (computers, smartphones, tablets) are relatively affordable in Tashkent, where average incomes are higher, but they quickly become major budget items for people living in the regions, especially outside major urban centers. Basic digital literacy and skills, including digital financial literacy and knowledge of cyber– hygiene practices, is low for the entire population. Businesses offer digital literacy and skills classes, but these are concentrated in Tashkent. The Government is trying to address these gaps through

school programs and courses at its network of IT Centers in the regions. However, IT Center classes are designed for in-person attendance, so many still cannot access their resources, and only basic courses are free of charge. Social and cultural norms are a significant factor in the gender digital divide.

Women and girls are passed over when families must make financial choices about who has access to the internet or to paid digital literacy and skills-improvement programs. IT and tech are stereotyped as men's interest areas; women average less than ten percent of students. Women are especially rare in technical fields: only 16% of technical university students are women and only 11% of those who apply for startup incubation and acceleration programs are women. Some programs promoting women and girls in IT professions exist, such as UNDP's "Startup Initiatives" program, Technovation, Digital Generation Ladies, which aim to support young woman-led early stage startups by building skills and providing mentoring, training, networking, office space, and access to capital. Additional donor-supported initiatives such as TumarisTech30 and IT Women.UZ offer digital development education programs to women and girls. The Tumaris Tech project, developed by IT Park Uzbekistan with USAID support, launched free online courses for young women ages 16-35 years in all regions of the country.

High-quality online content development—a critical factor in bridging digital divides— faces numerous challenges. Critically, professional and educational online content is largely unavailable in Uzbek, Tajik or Karakalpak languages; this type of content is mostly in Russian. Despite these limitations, and driven in part by the COVID-19 pandemic, appetite for online content is growing. High, unmet demand for digital and IT talent and a weak digital startup ecosystem are critical bottlenecks to growing Uzbekistan's domestic IT sector and driving digital transformation across the economy. The Government is implementing digital knowledge and skills training, as well as specialized IT schools and university programs, across the education system, but for-profit and not-for-profit private-sector educational alternatives are needed to help meet existing and anticipated demand.

3. Developing the Better Digital Inclusiveness Index and Coordination Marker in the Education Sector

1) Survey and Interview Methodology

In the course of this study, large-scale population survey and qualitative interviews among experts were carried out in order to study the specific socio-cultural characteristics of digital transformation in Uzbekistan. The goal of the study is to explore the impact of digital technologies on the local society, and seek ways that local communities, national governments, and regional/international organizations could contribute to creating a more inclusive internet environment, especially in the education and e-learning sectors. The method chosen for gathering this information is an in-person survey of residents in Tashkent city and Tashkent region. The interviews has been conducted in both Uzbek and Russian. The object of the survey is the population aged 16-55 years, broken down by sex. The population under 16 and over 55 years of age are excluded from the sample. The sample size is set at 150 respondents for each region. The distribution by age categories and gender is presented in the table below. Margin of error is 5 %. The sample size is determined on the basis of the patterns of conducting sociological surveys and international recommendations[45].

The questionnaire consists of 34 questions divided into 4 parts. The first part consists of 7 questions grouped into the socio-demographic block, the second part - 11 questions aimed at determining the general use of the Internet and the level of satisfaction with it, the third part - 11 questions evaluating the level of use and satisfaction with digital services, and finally the fourth part - 4 questions that investigate the level of trust.

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45) A Guide to Planning and Conducting a Living Standards Survey (LSS). SIUZH. Working Paper No. 126 R. The World Bank. 1999
Methodological research. Series F No. 98. Sample Design for Household Surveys: Practical Guidelines. UN. 2010

Population survey on digital transformation in Tashkent and its region covered 300 respondents. In the analysis of the results of the survey, the number of observations in which all necessary questions were answered was 269. In this sample, the percentage of respondents by age groups and gender was kept proportional. 72 women and 66 men from Tashkent city, and 65 women and 66 men from Tashkent region took part in our surveys. The average age of women in the sample was 34.3, and that of men was 33.2.

75% of the participants are employed, 9% are students and 15% are unemployed, the share of those whose family income per capita is less than 500,000 soums is 7.9%, 500,001– 900,000 soums – 8.7%, 900,001– 1,500,000 soums – 26.4%, 1,500,001 – 3,000,000 - 32.8% and above 3,000,000 - 24.1%. According to the level of education of the respondents, 4.5% have not completed high school education, 14.2% have high school education, 32% have secondary special education, 36% have basic higher education and 13% have a master's degree or higher. Average size of their household is 5.

Results revealed that, the main language of the respondents in the family turned out to be Uzbek. 229 people speak Uzbek in their families, 162 of them speak only Uzbek, while 42 speak Russian along with their first language, 9 speak Tajik, and 8 speak Kazakh. 29 people speak only Russian, 4 only Kazakh and 1 Karakalpak.

We surveyed digital transformation peculiarities among different income groups, the first group's household income per person is under 500,000 UZS[46], 17% of respondents identified their income in this particular range. The second range (more than 500,001 up to 900,000 UZS[47]) constitutes 16% of total respondents, the third income group (more than 900,001 up to 1,500,000 UZS)[48] - 26%, the fourth income range (more than 1,500,001 up to 3,000,000 UZS)[49] - 33% and more than 3,000,000

46) Lower than 45 USD on survey time, households with income per person under this range can be considered as under the poverty line
47) 45 - 80 USD, lower middle income
48) 80 - 135 USD, average middle income
49) 135 - 270 USD, higher middle income

UZS[50] – 8%.

Table Ⅳ-4. Summary of Variables Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Case	269	135	77.7978	1	269
Age	269	33.76	10.6579	16	56
Gender	269	1.51	0.5008	1	2
Location	269	1.49	0.5008	1	2
Education	269	6.4	1.0548	2	8
Income	269	3.57	1.1770	1	5
Internet cost	269	3.58	1.4679	0	5
Internet language Uzbek	269	1.022	0.7867	0	3
Internet language Rus	269	1.070	0.7571	0	3
Internet language Eng	269	0.68	1.0963	0	3
Internet training	268	0.14	0.3532	0	1
e-government frequency	269	2.96	1.0973	1	4
Internet speed satisfaction	269	5.79	2.4929	1	10
Internet price satisfaction	269	6.34	2.4132	1	10
Internet place satisfaction	269	6.93	2.5098	1	10
Internet device satisfaction	269	7.36	2.4395	1	10
Internet connection satisfaction	269	6.37	2.2974	1	10
e-health satisfaction	190	5.65	2.6832	1	10
e-learning satisfaction	173	6.1	2.4661	1	10
e-government satisfaction	200	6.22	2.4661	1	10
Official web trust	264	2.41	1.5206	1	4
News trust	263	2.26	1.5144	1	4
Official app trust	259	2.1	1.5106	1	4
Social media trust	260	1.6	1.3207	1	4
Messenger trust	259	1.77	1.4210	1	4
Video (ex: YouTube) trust	255	1.68	1.4370	1	4

Source: Authors

50) More than 270 USD, high income

4.5% of respondents has incomplete secondary school education, 14.2 % – complete secondary school, 32% – vocational training education, 36 % – university education without degree (bachelor), 13% – university education with degree (master and PhD). Analyzing all background data, we concluded that the sample is representative.

In addition to the quantitative survey, we have also conducted interview with representatives of key educational organizations between August 21 to October 27, 2022. During the interview national consultants asked 18 questions related to the opinion of invited experts on infrastructure development, gaps and problems in digitalization. These interviewees were selected to best describe digital education transformation in Uzbekistan.

2) Survey Results Analysis

(1) E-Learning Services Use

According to the survey, the most popular service in the field of education services is conducting lessons with students via Zoom (33.2%). Regional divide is very high, while 65.4% of the respondents used this service in the city of Tashkent, only 20.5% of the people in the region gave a positive answer. The next most common type of service was the use of online educational materials (26.5%), the regional divide in this situation is +33.3%. noted, regional divide is quiet high in all types of digital education services.

Table Ⅳ-5. Digital Educational Services Use by Region, Gender and Age

	Total, %	City, %	Region, %
Doing an online course using educational websites	21.6	42.6	15.9
Using online learning material other than a complete online course	26.5	52.2	18.9
Communicating with instructors or students using Zoom	33.2	65.4	20.5
Online examination	11.9	23.5	6.1
Online school	14.2	27.9	10.6
Education pages on social networks	12.7	25.0	3.8
Online application	15.7	30.9	11.4

Source: Authors

In order to reveal who uses these three types of e-learning services, we performed regression analysis. Results are given in Table 6.13.

Table Ⅳ-6. Regression Results of Digital Education Services Determinants

e-learning	model 1 (online courses)	model 2 (separate learning materials)	model 3 (Learning via Zoom with instructors)
Age	-0.0013	-0.0048	-0.004
	(0.0027)	(0.0031)	(0.0031)
Gender	0.1844	-0.361	0.0966
	(0.0619)	(0630)	(0.068)
Location	-0.0726	-0.0776	-0.2014
	(0.0605)	(0.0667)	(0.6819)**
Income	0.0208	-0.0395	-0.2798
	(0.0240)	(0.0280)	(0.0264)
Education	0.05484	0.0218	0.0776
	(0.0325)**	(0.0323)	(0.033)***
Home_internet	0.1642	0.2164	0.0606
	(0.0563)***	(0.0604)***	(0.0674)
internetlanguage 47_English	0.1789	0.1519	0.2223
	(0.1756)**	(0.0731)**	(0.076)***
_cons	-0.4261	0.3678	0.0613
	(0.2279)**	(0.2821)	(0.2641)
R^2	0.12	0.14	0.21
N	219	219	219

* $p<0.1$; ** $p<0.05$; *** $p<0.01$

Source: Authors

Each e-learning service variable is equal to "1", if respondent answered "yes, I use this service" and "0", if he/she has not used the service. Analysis of factors affecting usage of main digital education services showed, that education level, availability of home_internet and knowledge of English language is important factors to active use of e-learning resources. It means the person with higher education level and knowledge of English, and has Internet connection at home more likely to take online educational courses. As to using separate learning materials, knowledge of English and availability of home internet is important factors, while for learners via Zoom location, English language and education are important factors. This means living in Tashkent city and higher education level along with English knowledge increases chances to learn from instructors using Zoom program.

Age, gender, income does not have statistically significant impact; which means digital divide by this characteristics is very small. Fortunately, digital learning opportunities work in favor of women in many places. Recently, various online courses and marathons for women on personal growth, self-esteem, cooking, and proper nutrition are becoming popular. From 1,000 to 5,000 women and girls study at these courses at the same time. In addition, there are many video materials to learn English and Arabic for the Uzbek audience on YouTube, Instagram and Telegram channels. Such opportunities are especially useful for women who do not work.

Even if age has shown statistically insignificant results, negative sign represents that older population use this services less than young people and it is natural, because young people are living in the period of active learning. Especially, youth are active in online applications and examination. Generally, the level of satisfaction with educational services was equal to 6.0, the ratings were almost close to each other in points such as efficiency, price, familiarity; and the level of satisfaction between the city and the region is almost equal.

From above-presented results, we can conclude that further development of e-learning services depends on connection access in terms of availability and price and availability of learning materials in local languages.

3) Expert Interview Analysis

We have conducted interviews with representatives from local educational organizations between August 21 to October 27, 2022. During the interview national consultants asked 18 questions related to the opinion of invited experts on infrastructure development, gaps and problems in digitalization. These interviewees were selected to best describe digital education transformation in Uzbekistan.

One of our respondents is the director of "Bilim Online", a non-governmental, non-profit organization, which is engaged in the localization of the Khan Academy platform into Uzbek language. The team believes that the youth of Uzbekistan should also have free high-quality education and has united to achieve this. The project is implemented with the help of donations, and everyone can contribute to its development.

According to the interviewee, Khanakademy.uz has a great role in the digitization of the education system. Currently, in the public education system, there are maktab.uz and library.uz platforms, advantage of Khanacademy.uz over them is the student support system with artificial intelligence. Respondent noted, that visual textbooks were being developed at the Unitary Enterprise of Innovations, Technologies and IT Center in Uzbekistan. There are many projects similar to Khanakademy in the world, but this is the only online platform in Uzbekistan, which interacts with learners.

Other participants also emphasized the high importance of their organizations in of digitalization processes in the country. In particular, representatives of higher education institutions on digitization play a major role in solving qualified personnel problems in this regard.

To the question on the progress of Digital Uzbekistan in the spheres of infrastructure building; internet affordability; digital literacy & skills promotion all respondents answered positively. They mentioned that speed and price affordability of internet has been rapidly improving during the last 4-5 years. They emphasized increasing

the availability of digital services, the development of e-commerce, access to the Internet, increasing the speed of the Internet connection, etc. They mentioned two significant problems, the first is underdeveloped infrastructure in remote areas, that is regional connection divide. Another problem is a lack of high quality specialists in digitalization. Digital literacy is very high among young people (population born in the 1990s and schoolchildren from 4th-5th graders). Despite being literate, they find it difficult to find the information they need.

To the question on gaps in digital development, respondents answered differently. Education representatives noted digital skills low development, lack of qualified IT specialists. This, in turn, is due to the fact that digital infrastructure (high-speed broadband Internet, mobile Internet, switches, etc.) is not distributed evenly across regions and districts and is concentrated to a greater extent in large regional centers. In this regard, the development of digital tools on the supply side is slowing down, respectively, is also slowing down. The director of "Bilim onlayn" expressed his concerns about lack of prioritization and coordination of tasks by government. It would be good if a scientific organization would deal with this. In addition, in the field of education, the content has become more suitable for Uzbek schools, and it is necessary to provide content in other languages like Kazakh, Tadjik and Karakalpak as well.

COVID-19 pandemic impact on Uzbekistan's digital transformation assessed both positive and negative, especially, in education system. One group of experts answered, that pandemic had a strong positive impact on the development of the digital economy both in the world and in Uzbekistan. The pandemic has given impetus to the acceleration and expansion of e-services and e-commerce. Demand for government digital services has also increased, which has also been the impetus for their faster development. COVID-19 pandemic has demonstrated to the whole world that almost all types of services that previously required a physical presence can be solved remotely without any loss of quality. Therefore, the pandemic in this planet has become a real positive shock and accelerated the processes of digitalization.

The other while acknowledging positive impact especially on education, they mentioned only one side effect that groups of children with lower knowledge appeared among students for whom was difficult to accept online information. In general, the positive effect is greater. Many meetings were moved online, for example, now we use zoom instead of meeting face-to-face. Although it fosters the development of e-learning and procedures. For example, at respondents' institutions all the application procedures were done on-line; moreover, they held some of examinations on-line and all applicants were quite capable of doing it in digital format, nobody had any questions.

Relatively higher level of satisfaction of the population with public services was confirmed both during qualitative and quantitative survey results. According to representative of Khanacademy.uz "…great work has been done in the field of public services. Information from state agencies such as banks, credit organizations, and the Ministry of Internal Affairs have been integrated. Notaries were not required to collect various documents either. Pandemic mainly gave impetus and time to this. Now public services have improved, the level of population satisfaction is good. Some corrupt cases have been reduced, and there is also a 10% discount for online applicants". Public office representatives said that "in Uzbekistan, the factors for the development of e-government were the policy pursued by the state and the desire to make the life of citizens better by providing the most convenient set of services, as they say, in your pocket. To date, the electronic services provided by the state do not reflect the entire list of services required by citizens. But this is due to the fact that the system is still developing and constantly improving. The number of services provided is increasing from year to year. I am sure that by 2030 any person will be able to receive the service he needs in electronic form and in 5-10 minutes." The other respondents' satisfaction with e-gov services is also very high, all of them mentioned government initiatives helped to promote e-gov services.

Respondents believe that the main factor that has played the greatest role in the development of e-learning in Uzbekistan is the coronavirus. If there were no

lockdowns and restrictions, then it is quite possible that this type of training would not be so relevant for another 5–10 years. Considering the current situation, in 2 years the e–learning system has passed, probably, a 10–year stage of development in an accelerated mode. However, they do not deny, that in that process there were both successes and failures. But in general, this approach has shown that it has the right to exist. For example, Khanacademy.uz has 6.3 million subscribers, about 800 thousand of them are active. E–learning has a lot of advantages if people have enough capability to learn independently.

Additionally, they proposed to start developing digital skills much before higher education stage, it is necessary to equip schools with WI–FI access and decent computers and also train school teachers to adopt the IT technologies in their classrooms. Covid–19 and on–line education showed that this is still on rudimentary level, and both parties students and teachers were complaining about fall in the education standards due to lack of information literacy from both sides and difficulties to adapt learning materials to on–line mode.

Majority of respondents answered that citizen engagement in digital policy–making works well in Uzbekistan. Today, the participation of citizens in the development of digital policy occurs through the expression of opinion and the provision of comments on the legislative acts and legal documents being developed through the state regulation portal, where ministries and departments post draft documents for general discussion before their adoption. Also, by providing their vision and opinion through the people's reception rooms of the president and ministries and departments, the population participates in the development of state policy. Mechanisms they mentioned include people's appeal to the state bloggers, teachers, polls on social networks, public platform “Xalq qabulxonasi”, presidential portal, public opinion platforms. One respondent has a controversial opinion on this question, he answered “There is very little or no involvement of citizens not only into development of digital policies or any other policies developed in Uzbekistan, they are quite passive. There are two main reasons. First, there is no accountability of the government in front of

the people; therefore, citizens do not trust to the government in terms of inclusion of their voices into policies. Second, there is no associations or coalitions which could represent the voice of citizens."

Respondents mentioned existence of public private partnerships in public services, for example in taxation. More and more private sector is developing in e-Learning now, but partnership in high school is low, mostly PPP works in preschool education development. Yet, the government-private partnership in a sphere of higher education is extremely important as it is the future of the country. Regarding cooperation of Uzbekistan with foreign countries, we have fewer answers, according to them cooperation is more expressed in the provision of advice and support from countries with a developed digital economy. For example, South Korea has a wide range of issues and directions for the digitalization of the economy of Uzbekistan: from e-government to smart city technologies. We got several suggestions on mutually beneficial collaboration with South Korea from interviews. One of them is about smart city. Using the experience of South Korea, we can make our cities safer and more advanced through the implementation of smart digital solutions. Another strand of suggestions is related to education, respondent expressed his wish the Ministry of Public Education would become familiar with online education and health care systems in Korea. He asked Korean partners to teach how to prepare additional content for schools, collect statistics on human diseases in health care, and correctly calculate which drugs are needed and how much in the pharmaceutical industry

4. Conclusion: Application of the Better Digital Inclusiveness Index Metrics and Its Impact

When the COVID-10 pandemic hit the country, educational institutions in Uzbekistan have moved quickly to offer remote learning opportunities to students. However, many schools struggled to provide quality education due to technological problems such as lack of digital infrastructure and slow internet speeds. This problem was particularly noticeable in rural areas, where students in rural areas often had

difficulty accessing information necessary for learning despite high digital literacy. The digital education gap between regions was also revealed in the survey. Despite the rapid digital transformation of education due to the COVID-19 pandemic, the experience of using e-learning services among rural residents was significantly lower than that of cities.

The digitalization of education further exacerbated the problem of the lack of professional manpower endemic in Uzbekistan's education system. In Uzbekistan, where the number of skilled educators is absolutely lacking due to low wages, e-learning, which can provide quality education to many at the same time, is emerging as an alternative to compensate for this. Ironically, however, the lack of educational personnel leads to a lack of experts who can modify teaching methods to meet the online learning requirements, and has acted as an obstacle to building quality online educational content.

Therefore, the researchers propose the introduction of a coordination mechanism through which various stakeholders such as teachers, education experts, information and communication technology experts, and education-related government departments can communicate and cooperate in the process of digital transformation of education, and examine the existence and operation of such a mechanism. We suggest using it as an adjustment index for the BDI-Index. The top-down education digitization promoted by the central government of Uzbekistan does not sufficiently reflect the difference in technological and human capacity between provinces and cities, and has failed to introduce appropriate technology suitable for the local reality. In other words, even though Wi-Fi and computers are secured in local educational institutions, there are frequent cases where digital technology is not used in education due to defects in communication infrastructure or teachers' lack of understanding of digital textbooks. Therefore, it is important to involve teachers who know the reality and difficulties of the local education field best in the digital education dissemination process. Through this, it will be possible to reduce the widening digital and educational gaps between regions that occur as a side effect of

the digital transformation process. In addition, digital technology utilization and online teaching methods must be provided so that teachers can provide digital classes suitable for students' digital literacy level and school's level of digital technology, so that digital technology can be actively used in the learning field.

Ⅴ. Development and Application of Better Digital Inclusiveness Indicators for Kyrgyzstan

Kyrgyzstan is the one of the smallest and the most mountainous countries among the five Central Asian republics and the most remote country from the sea. The country borders Kazakhstan on the north, China on the east, Uzbekistan on the west, and Tajikistan on the south. The total population is 7 million (2022) with population density of 34 people per sq. km of land area (World Bank, 2020).[51] Mountainous terrain, continental climate, and the fact that it is the most remote landlocked country in the world present unique challenges to ICT infrastructure development within and outside Kyrgyzstan's national borders. The following are some of the challenges posed Kyrgyzstan's natural environment.

- Landlocked: the long distance adds to more cost to access undersea cables
- Extreme continental climate: the construction season is only a few months of the year to lay fiber-optic lines or to build mobile towers
- Mountainous: difficult terrain such as the mountains increases the cost of connectivity
- Relatively small population: content-generation in local language is more difficult

All these factors make it more expensive and more time-consuming to build communications infrastructure, to develop relevant content, and to increase digital skills.

In terms of population, Kyrgyzstan is an ethnically diverse country. Ethnic Kyrgyz make up around 73% of the country's population, while 15% of population identifies

51) World Bank. "Population Density." *Data.* https://data.worldbank.org/indicator/EN.POP.DNST

as ethnic Uzbek, 5% identify as ethnic Russians, and 1% as ethnic Dungans (National Statistics Committee, 2020)[52]. Other ethnic minorities include Kazakhs, Koreans, Germans, Uighurs, and Tatars. Due to the historically-significant multi-ethnic composition of its population, the Kyrgyz government officially recognizes both Kyrgyz and Russian as the state and official languages respectively. In 2010 the distribution of the number of students in daytime general education organizations by language of instruction was 73% in Kyrgyz and 18% in Russian.[53] In 2021 it was 75% in Kyrgyz and 23% in Russian. The primary language of communication people use influences the digital resource available and accessible to them.

According to the World Bank[54] classification, Kyrgyzstan is a lower-middle-income country. Unlike its neighbors, it does not have carbon resources such oil and gas. Yet, the country is well endowed with minerals (especially gold), water resources (glaciers), forests and pastures. The COVID-19 pandemic had a severe impact on the Kyrgyz economy, with unemployment rising to over 30% according to the Bank's estimates, and economic output expected to return to pre-pandemic levels only after 2023. So far the economy of Kyrgyzstan has withstood the negative impact of COVID, the war in Ukraine, and subsequently the sanctions on Russia. The World Bank[55] forecasts a 4% GDP growth in 2022. However, the poverty rate is expected to reach 25.5 percent in 2022 compared to 18.7 percent in 2020.

Digital development has been identified as a priority sector by the Government and is expected to be a cornerstone of the country's long-term economic recovery. For economic growth, the country is focusing on developing its human capital through digitalization. The pandemic accelerated digital transformation in both public and private sectors. Furthermore, due to the current conflict between Russia and Ukraine,

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52) See National Statistical Committee of the Kyrgyz Republic. *Naselenie.* http://stat.kg/ru/statistics/naselenie/
53) See National Statistical Committee of the Kyrgyz Republic. *Obrazovanie i Kul'tura.* http://stat.kg/ru/statistics/obrazovanie/
54) World Bank. *The World Bank in the Kyrgyz Republic.* https://www.worldbank.org/en/country/kyrgyzrepublic/overview#1 (1 December 2022)
55) Ibid.

many Russian IT-firms and specialists have relocated to Kyrgyzstan. The Kyrgyz government is seeking to benefit from the sudden increase of IT-related manpower for its digital transformation efforts and is creating convenient conditions for the IT specialists. Recently, the government introduced a "Digital Nomad" status for relocating specialists and established favorable conditions for residing and working in the country.

This chapter begins with an overview of the current state of digital transformation in Kyrgyzstan and relevant government strategies using the Better Digital Inclusiveness Index as the analytical framework. The second section, then, discusses more specifically how the digital transformation has affected social inclusiveness in Kyrgyzstan to explain why the role of non-government organizations is important in enhancing digital inclusiveness in the country. Then, in the following section, we analyze the results from a field-survey and expert interviews to explore ways to expand digital inclusiveness especially in the rural areas of Kyrgyzstan by promoting effective grass-root NGO activities with local communities. The chapter concludes with a suggestion for a coordination marker and a brief discussion on how the suggested marker could contribute to achieving a more inclusive digital society in Kyrgyzstan.

1. Current State of Digital Transformation through the Lenses of the Better Digital Inclusiveness Index

1) Technological Capability Transformation[56)]

Table Ⅴ-1. Technical Capability Transformation Indicator

Indicators	2021	2020	2019	2018	2017
Internet users (% of population)	n/a	72.00	64.10	62.80	8.20
Mobile population coverage (%, min 2G)	n/a	99.30	99.30	99.20	99.05
Mobile subscribers (%)	n/a	132.47	136.35	140.36	138.34
Fixed-line broadband subscribers (%)	n/a	4.50	4.26	4.03	4.22
Fixed-broadband internet traffic (exabytes)	n/a	n/a	0.37	0.25	0.17
Mobile internet traffic (exabytes)	n/a	n/a	0.56	0.31	0.14

In terms of digital connectivity, Kyrgyzstan is the middle among the Central Asian countries. 72% of Kyrgyzstan's population uses the internet while over 99% of Kyrgyzstan's population is connected via a mobile-cellular network (2020). 91% of Kazakhstan's population is covered by at least a 3G mobile network, while 85% is covered by at least an LTE/WiMax network. Mobile-cellular telephone subscription has reached 132.5 per 100 inhabitants in 2020. Fixed-broadband subscription has reached 4.5 per 100 inhabitants and 87% of households have the access to the internet. The fixed-broadband internet traffic increased from 1.20 EBs in 2017 to 4.24 EBs in 2021, while the mobile internet traffic within the country increased from 0.17 EBs in 2017 to 0.37 EBs in 2019. While the international bandwidth has also over the recent years, there is no readily available figures. Similarly, there is no information on the gap in the internet accessibility between the urban and rural areas with information on the percentage of households having the internet access.

Although the quality of the internet services has improved in the recent years, Kyrgyzstan is in the middle of the list in the Ookla Speedtest Data. The average fixed

56) This section provides a brief summary of the current state of digital transformation of Kyrgyzstan based on ITU data. Key data not covered in this section is available in Appendix X

broadband download speed 46.08 Mbps as of November 2022 (#84 out of 180 countries). The average mobile download speed is 20.92 Mbps (#94 out of 141 countries).[57]

2) Human Capability Transformation

ITU measures the levels of ICT skills of populations of different countries. However, no such data was available for Kyrgyzstan. Overall, the Kyrgyz Government is putting much efforts to improve digital literacy and ITC skills among its population by providing ICT-related training programs for the adult population and integrating ICT-related training programs in the primary and secondary school education.

Some of the activities are provided through the support of the development partners. For instance the World Bank allocated $50M for Digital CASA Project and $50M for Learning for the Future Project. Both projects have significant components related to digital capacity building. The European Union also actively supports digital skills through Sanarip Insan (Digital Citizen) project, implemented by the Internet Society-Kyrgyz Chapter together with European Neighborhood Council (ENC), and DigiKonush (Digital Neighbors) project.

3) Socio-cultural Capability Transformation

The Economists 3I data measures socio-cultural capability transformation in different countries. Unfortunately, Kyrgyz Republic is not covered by the publication.

4) National Digital Transformation Policy and Strategy

Digital transformation in the Kyrgyz Republic made it a main priority the openness and transparency of government based on open data. Thus, the digital transformation strategy was named "Taza Koom" or "Transparent Society", which in turn gave the name to the government's national long term sustainable development strategy "Taza

57) Speedtest Global Index https://www.speedtest.net/global-index

Koom–2040". The first phase of the Taza Koom strategy named "Sanarip Kyrgyzstan" will be completed in 2023 by laying the foundations for digital economy. The government is now preparing the next phase of the digital transformation strategy – building the Data Ecosystem to be launched in 2023.

To reach the goals of digital transformation the following key priorities were highlighted:

- Infrastructure
  - Building a modern digital infrastructure with access to broadband Internet (backbone and last mile network, data centers, etc.) for citizens, businesspeople, and public servants
  - Building sustainable smart cities and smart villages with comfortable conditions for living
  - Promoting co–deployment and sharing of infrastructure
  - Installing and using smart devices for disaster resilience, environmental protection, and climate change monitoring
- Enabling Environment
  - Improving the regulatory environment and regulatory framework for accelerated digital development and ensuring the safety of the public in the digital space, including enhancing the independence of the telecom regulatory authority
  - Developing and supporting fintech, digital payment and e–commerce platforms, as well as conducting information campaigns among the country population on their use (digital trading development)
  - Introducing innovative solutions and digital platforms based on data analytics, both in the public sector and in business and various sectors of the economy
  - Strengthening the institutional capacity of government agencies responsible

for digital development, coordinated implementation of priorities and ensuring cyber security

- Help revenue-generating agencies such as the Tax Service and Customs Service raise revenue collection targets
- Help expenditure agencies such as Education, Health, Social Protection Ministries spend budget funds more effectively
- Help Ministries, such as Transport, Energy, Disaster Relief, Agriculture, better manage assets under their realm

• Skills

- Educating the public about the effective use of digital technologies for obtaining services and conducting business, as well as learning cybersecurity skills and protecting personal data
- Developing local educational content in Kyrgyz, Russian, and other languages
- Reforming education sector to train people for the jobs of the future, with focus on critical and creative thinking
- Protecting citizens from the harmful effects such as mis/disinformation, hate speech, bullying, fraud, phishing, fake/deep fake content
- Preparing for such breakthrough concepts such as Artificial Intelligence, Machine Learning, Augmented Reality, IPv6, Automation and Jobs, 5G and Internet of Things

The Kyrgyz Government is implementing several digital projects that would help close the digital divide and to achieve inclusive digital development. Some of these projects include the following:

• Tunduk Interoperability Platform (Multiple Donors)

• Budget Support for Digital Development (EU)

- Digital Central Asia–South Asia (WB)
- Learning for the Future (WB)
- EU–funded digital skills in rural areas includes projects such as Sanarip Insan (Digital Citizen), DigiKonush (Digital Neiborhood), and Digital Ishker (Digital Worker)
- Projects by the Internet Society, such as the Community Internet Networks, IlimBox Education Portal, Sanarip Insan Digital Skills, and Tech4Society Cyber Protection
- Other projects by development partners, including KOICA, JIKA, the US Embassy and USAID, UN Agencies, OSCE, and many others

To sum, however, our research has confirmed that the existing national digital strategy lacks a coordination marker similar to the one suggested in Chapter 2 that could potentially manage the diverse needs and coordinate activities of multiple stakeholders of the digital transformation, and thus contribute in building a more inclusive digital society.

2. Effects of Expanding Digital Inclusiveness: Focusing on the Urban-Rural Divide

Since 2017 digital development has been one of the main priorities for the Kyrgyz Republic with the launch of the Taza Koom (Transparent Society) Digital Transformation Strategy. Based on the Taza Koom Strategy, the Government adopted "Sanarip Kyrgyzstan 2019-23" (Digital Kyrgyzstan) Program and a Road Map for implementation. Furthermore, a Strategy for Cybersecurity has been developed with an Implementation Plan for 2019-2023.

Kyrgyzstan has progressed significantly in the recent years in ensuring good connectivity and enabling economy and people to benefit from digital development. However, there is still a long way to go. Nearly half the population is not digitally connected, and many of the unconnected live in rural and remote areas. This is below the global average in terms of the number of individuals using the internet.

Lack of access is not the only problem. An internet connection in Kyrgyzstan is still expensive, and of poor quality. All of the Central Asian countries are near the bottom of the global ranking on the average time taken to download a 5GB film or a three-hour full HD (1080p) educational lecture on YouTube. Among Central Asian countries, the Kyrgyz Republic scored highest and yet reached only 146th place globally, 12 minutes ahead of Kazakhstan.[58)]

At present, KR lags comparator countries in fixed broadband adoption and speed, with limited use of fiber optic broadband services. Despite growth in recent years, the Kyrgyz fixed broadband sector remains small with low household fixed broadband penetration rates[59)] and speeds[60)] compared to Kazakhstan and other comparator countries. KR is dependent on Kazakhstan for international bandwidth, with Kazakhstan entirely dependent on Russia.

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58) Cable.co.uk. https://www.cable.co.uk/ (1 December 2022)
59) TeleGeography. https://www.telegeography.com/ (1 December 2022)
60) Speedtest Global Index. https://www.speedtest.net/global-index (1 December 2022)

Broadband access and affordability are constrained by limited competition in the market. The market is concentrated. State-owned incumbent KT has maintained the leading position in the retail ISP market[61]. This is due to the KT's dominance of the wholesale backbone connectivity market, with internal cross-subsidies and the ability to discriminate against competitors charging prices for access to its infrastructure not based on underlying costs.

The Kyrgyz Republic has built foundation necessary for the further development of the data ecosystem. In the recent E-Government Survey-2022, Kyrgyzstan improved its position from 83 to 81 with a high EGDI - 0.6977[62]. Digital CASA - Kyrgyz Republic Project supported the development of (a) Regional Digital Connectivity Infrastructure; (b) Government Cloud; and (c) Enabling Environment for Digital Economy. The Digital CASA-Kyrgyz Republic Project: Cyber Resilience Program strengthened the Kyrgyz Republic's ability to understand, recognize, identify, monitor, and respond effectively to cybersecurity threats and support digital resilience.

The country has done relatively well in opening government data, though the situation should be further improved, focusing on impact to be produced. Open Data Action Plan funded by World Bank's multi-donor Trust Fund for Statistical Capacity building (TFSCB) in 2018-2019 supported the creation of a national open data platform online populated with pilot open data sets and related activities to raise capacity among the public to access and use this data.

Various government information systems have been implemented across agencies in Kyrgyzstan, "has further implemented digital initiatives and moved more than 80 government services online through the Tunduk initiative."[63] According to surveys and surveys conducted by the government of Kyrgyzstan, in 2021-2022, more than 150 information systems have been developed in the country, which are used in more

61) Teleography. *GlobalComms Database: Kyrgyzstan. https://www2.telegeography.com/en/globalcomms-database-service* (1 December 2022)
62) United Nations. 2022. *The UN E-Government Survey for 2020-2022*
63) Ibid.

than 70 government bodies (ministries, departments, agencies, subordinate departments). However, state information systems do not appear adequately interconnected to ensure seamless services to external and internal users. There is a persistent lack of unified state register of information systems.

Despite continued efforts, the Kyrgyz Republic is among the laggards in terms of "digital maturity" in ECA. At present, the country lags the comparator countries in fixed broadband adoption and speed, and there is a notable underuse of fiber optic broadband services. Even when available, the quality of service remains low. The Kyrgyz Republic along with other Central Asian countries is in the bottom half of the range of median mobile and broadband speeds across ECA countries. Certain populations remain unconnected despite having internet coverage due to lack of availability of devices, interest/ awareness and affordability.

In addition, the war in Ukraine highlighted dependency in international connectivity on Russia given that Kyrgyz Republic almost exclusively relies on bandwidth transited from Russia to Kazakhstan and into Kyrgyzstan. The current situation poses a serious vulnerability of digital economy and society in Kyrgyzstan and calls for a need to enhance resilience and redundancy in telecom infrastructure. The current situation reinforces the need for urgent and concerted efforts to diversify cross-border routes and strengthen collaboration among Central Asian countries for improved regional connectivity.

The regulatory framework is currently not at par with international best practice. Previously independent regulatory body in Kyrgyzstan, was turned into a subsidiary of the sector government agency (MDD) and was renamed from the State Communications Agency (SCA) to the Service for Regulation and Oversight of Communications (SROC). The legal framework for the electronic communications sector is outdated. Kyrgyzstan's basic sector law was drafted and approved in 1998. The law is largely obsolete compared to good international practices in this fast-changing field, where more advanced countries pass a new sector law every decade if not more frequently.

3. Developing the Better Digital Inclusiveness Index and Coordination Marker for Non-governmental Organization Contribution

1) Survey and Interview Methodology Overview

To measure the digital inclusiveness in the Kyrgyz Republic, a survey was conducted to study the digital progress and internet inclusiveness in Central Asian countries. The project team procured the services of the "Erfolg Consult" LLC to conduct the survey in the Kyrgyz Republic. The goal of the study was to research the impact of digital technologies and explore the ways that local communities, national governments, and regional/international organizations could contribute to creating a more inclusive internet environment and thus bridging the digital divide within and across national borders.

The method chosen for gathering this information is an in-person survey of residents in Bishkek city and Chui region. The interviews will be conducted in both Kyrgyz and Russian. This report describes the study methodology.

The object of the survey is the population aged 16-55 years, broken down by sex. The population under 16 and over 55 years of age are excluded from the sample. The younger population is incapable of making a decision, and the older generation is less likely to use any electronic services other than calls due to age characteristics. The sample size is set at 150 respondents for each region. The distribution by age categories and gender is presented in the table below. Margin of error is 5%. The sample size is determined on the basis of the patterns of conducting sociological surveys and international recommendations[64].

The survey was be conducted in August, 2022 by 6 interviewers. Interviewers worked in pairs and all data was collected by using tablets. All ethical issues related to data

64) World Bank. 1999. A Guide to Planning and Conducting a Living Standards Survey (LSS). SIUZH. Working Paper No. 126 R. The World Bank Group.
Methodological research. Series F No. 98. Sample Design for Household Surveys: Practical Guidelines. UN. 2010

confidentiality and informed consent was ensured.

According to the World Bank classification, the Kyrgyz Republic is a lower middle income country with an annual per capita income of $1276 or about $106/month. In the Survey of 300 respondents, a third declined to answer. Of those who responded half live on less than $100/month, and 86% of the respondents live on less than $200/month. Just 9 respondents make more than $300/month.

Meanwhile, expert interviews were selected based on the following background. As more than 60% of Kyrgyzstan's population lives in rural areas, promoting digital connectivity in the countryside is important to strengthen digital inclusion. In other words, it is essential to provide better Internet infrastructure and better Internet literacy education services for local residents. Kyrgyzstan has a number of grassroots initiatives and non-governmental organizations, sponsored by national governments and international organizations, working with local communities to increase internet connectivity and digital literacy in the provinces. NGO actors often provide key insights and experience in adapting national digital policies to local conditions in a top-down fashion. Therefore, from September to October 2022, the researchers conducted interviews with NGOs representative working mostly in the rural areas to investigate policy proposals to secure better digital inclusion.

2) Survey Results Analysis

The statistical information of the main variables extracted through the survey can be summarized as follows. First, there are 300 total survey cases, and the respondents' education level is in the range of above average higher education, and the average income level is in the range of 15,501-18,500 Kyrgyzstan Som, centering on the average range. The average level of satisfaction is very impressive, and most of the average values are above the median value. For example, the average value of satisfaction with Internet prices is 7.957, greatly exceeding the median value of 5, and the average value of satisfaction with Internet places is also 8.73, greatly exceeding the median value of 5.

Table Ⅴ-2. Summary of Variables Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Age	300	4.346667	2.123248	1	8
Gender	300	1.5	0.5008354	1	2
Location	300	1.5	0.5008354	1	2
Education	299	5.16388	1.627129	0	7
Income	300	4.65	3.609839	1	9
Internet cost	300	3.417508	1.488956	1	6
Internet language_Kyr	300	0.46128	0.49934	0	1
Internet training	300	0.076667	0.2665064	0	1
E-government frequency	109	2.972477	1.092557	1	4
Internet Satisfaction	300	7.74	2.495293	1	10
Internet speed satisfaction	300	6.83333	3.187358	1	10
Internet price satisfaction	300	7.956667	2.650447	1	10
Internet place satisfaction	300	8.73	2.098837	1	10
Internet device satisfaction	293	5.82	3.30515	1	10
E-health satisfaction	110	6.9	2.664583	1	10
E-learning satisfaction	144	7.173611	2.728584	1	10
E-government satisfaction	109	7.027523	2.529305	1	10
Internet Trust	299	5.424749	2.493654	1	10

Source: Authors

In terms of internet spending, more than 2/3 of respondents spend less than 900 KGS (~$10) on Internet service per month, regardless of gender and location (urban/rural). This is about 5% of the average salary. The average monthly salary was 18940 soms (~$222) in 2020.[65] The income level and the cost of internet are important factors for digital inclusion in measuring affordability of internet connectivity and devices. The survey results show that as share of average monthly income connectivity can be costly to families in Kyrgyzstan.

In regards to nationality of the respondents, 88% of respondents are Kyrgyz and 10% are Russian. In addition, there were other nationalities including Kazakh, Korean,

65) National Statistical Committee of the Kyrgyz Republic. 2021. "Average Monthly Salary." *National Statistical Committee of the Kyrgyz republic.* (1 December 2022) http://www.stat.kg/en/opendata/category/112/

Uighur, Tajik, and Turk. There is also a significant Uzbek community in Kyrgyzstan, which mainly resides in the south of the country. As for the language, 74% of respondents listed the Kyrgyz as the main language of communication, 14% – Russian, and 9% speak both. Among other languages, the Turk and the Uighur languages were mentioned. 40% of respondents, use the Kyrgyz language online; 85% use Russian; and 6% use English. Language is a significant factor in terms of Internet accessibility. The content online is mainly in Russian and English, whereas the majority of population in Kyrgyzstan do not speak these languages.

9 out of 10 respondents access internet from home. Every 10^{th} user access internet from work. When accessing internet from public places, $1/5^{th}$ of users access internet through public wi-fi, $1/5^{th}$ from restaurants and cafes, and another $1/5^{th}$ from government offices. Airports are also popular access point for 13% of users.

Predominantly, users access internet from mobile devices - 95%. Although, fixed broadband internet is not widely available. The rapid growth of mobile broadband internet allowed many users access internet from their mobile devices. This highlights the importance of creating digital content following "mobile-first" principle. The content should be convenient for accessing in small mobile screens.

The results of the survey can be analyzed as follows

(1) Digital Training and Digital Transformation

As mentioned above, this chapter is particularly interested in the activities of NGOs and their influence on the digital transformation in the rural areas of Kyrgyzstan. Therefore, a statistical review was conducted to see how the provision of education to residents, the main area of NGO activities, actually had an impact on digital transformation. As a result of the analysis, it can be confirmed that the respondents had high satisfaction with digital devices when they had experience in digital education, and especially, the frequency of use of e-government was high. Therefore, it can be assumed that digital education is at least helping to facilitate the use of

related devices and contributing to the actual use of e-government. The dependent variable of Model 1 below is satisfaction with digital devices, and the dependent variable of Model 2 is the frequency of using e-government. Models 1 and 2 show that training has a positive and significant effect on satisfaction with digital devices and frequency of e-Government use.

Meanwhile, the dependent variable of model 3 is the reliability of digital information, and the dependent variable of Model 4 is satisfaction with online education. Models 3 and 4 show that training does not have a significant effect on trust in online information, nor does it have a significant effect on satisfaction with online education. However, through Models 1 to 4, respondents living in rural areas showed higher satisfaction with digital devices, less frequent use of e-government, and higher reliability of online information and satisfaction with online education.

Table Ⅴ-3. Impact of Internet Training

	Model 1	Model 2	Model 3	Model 4
Age	-0.038	0.036	-0.049	-0.083
	-0.087	-0.058	-0.068	-0.112
Gender	0.889	-0.004	0.526	-0.097
	(0.361)**	-0.214	(0.288)*	-0.437
Location	1.938	-0.713	0.64	1.54
	(0.365)***	(0.255)***	(0.287)**	(0.459)***
Income Level	-0.131	0.045	0.021	-0.069
	(0.051)**	-0.028	-0.04	-0.065
Language_int_Kyr	0.061	-0.197	0.364	-0.035
	-0.426	-0.193	-0.335	-0.43
Internet Training	1.21	0.436	0.036	0.661
	(0.653)*	(0.260)*	-0.444	-0.475
_cons	2.211	3.693	3.476	5.853
	(0.960)**	(0.553)***	(0.816)***	(1.209)***
R^2	0.13	0.13	0.04	0.09
N	300	109	299	144

* $p<0.1$; ** $p<0.05$; *** $p<0.01$

Source: Authors

(2) Factors Influencing Digital Satisfaction Level

The results of the analysis of the factors that affect the digital conversion satisfaction of survey respondents can be summarized into the following six categories by extracting significant factors. Model 1 is satisfaction with Internet prices, Model 2 is satisfaction with places to use the Internet, Model 3 is satisfaction with digital devices, Model 4 is satisfaction with online health, Model 5 is satisfaction with online education, Model 6 is electronic Satisfaction with the government is the dependent variable.

As a result of the analysis, the older the age, the lower the satisfaction with the Internet price and the place where the Internet is used (Models 1 and 2), and the more rural people live, the higher the satisfaction with all items except online health (Models 1, 2, 3, 5, 6). Meanwhile, according to Model 3, income level was analyzed to have a significant correlation with satisfaction with digital devices in a negative direction.

Table Ⅴ-4. Factors that Influence Digital Satisfaction

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Age	-0.188	-0.16	-0.038	-0.126	-0.083	0.018
	(0.069)***	(0.059)***	-0.087	-0.118	-0.112	-0.127
Gender	0.484	0.242	0.889	0.846	-0.097	-0.199
	-0.296	-0.237	(0.361)**	-0.548	-0.437	-0.495
Location	1.315	0.768	1.938	0.784	1.54	1.246
	(0.295)***	(0.236)***	(0.365)***	-0.623	(0.459)***	(0.531)**
Income Level	-0.08	-0.03	-0.131	0.086	-0.069	-0.079
	(0.042)*	-0.032	(0.051)**	-0.073	-0.065	-0.073
Language-Int_Kyr	0.037	0.133	0.061	0.545	-0.035	0.065
	-0.314	-0.221	-0.426	-0.727	-0.43	-0.455
Internet Training	0.342	-0.297	1.21	0.39	0.661	0.667
	-0.479	-0.478	(0.653)*	-0.709	-0.475	-0.682
_cons	6.393	7.955	2.211	4.192	5.853	5.789
	(0.806)***	(0.624)***	(0.960)**	(1.465)***	(1.209)***	(1.278)***
R^2	0.1	0.07	0.13	0.08	0.09	0.08
N	300	300	300	110	144	109

* $p<0.1$; ** $p<0.05$; *** $p<0.01$

Source: Authors

(3) Factors Influencing Digital Information Trust

All of the analytical models use the reliability level of online information as a dependent variable. According to Models 1 and 2, with respect to the reliability of online information, it was shown that overall gender and region, that is, more women and residing in rural areas, more likely to trust online information. However, in the case of people who use the Kyrgyzstan language through Model 5, it was confirmed that the reliability was high.

Table Ⅴ-5. Factors Influencing Trust in Online Information

	Model 1	Model 2	Model 3	Model 4	Model 5
Age	-0.049	-0.041	0.014	-0.093	-0.165
	-0.068	-0.065	-0.092	-0.093	-0.11
Gender	0.526	0.51	0.526	0.21	0.358
	(0.288)*	(0.283)*	-0.366	-0.419	-0.403
Location	0.64	0.578	-0.359	0.625	0.389
	(0.287)**	(0.282)**	-0.545	-0.43	-0.493
Income Level	0.021	0.031	0.048	0.058	-0.003
	-0.04	-0.04	-0.056	-0.054	-0.06
Language_Int_Kyr	0.364	0.264	-0.333	0.333	0.955
	-0.335	-0.329	-0.521	-0.444	(0.351)***
Internet Training	0.036	-0.045	0.246	-0.047	0.032
	-0.444	-0.475	-0.528	-0.564	-0.579
Internet Satisfaction		0.189			
		(0.057)***			
E-Health Satisfaction			0.268		
			(0.086)***		
E-Health Satisfaction				0.138	
				(0.078)*	
E-Government Satisfaction					0.117
					-0.094
_cons	3.476	2.144	3.011	3.287	3.522
	(0.816)***	(0.897)**	(1.352)**	(1.162)***	(1.419)**
R^2	0.04	0.07	0.16	0.08	0.1
N	299	299	109	143	108

* $p<0.1$; ** $p<0.05$; *** $p<0.01$

Source: Authors

When satisfaction with Internet line, satisfaction with online health, and satisfaction with online education were high, the reliability of online information was high. On the other hand, it was confirmed that satisfaction with e-government did not significantly affect the reliability of online information.

(4) Factors Influence Expectation towards the Government

Significant research results were derived for the following five items among the roles expected of the government in digital transformation targeting survey respondents. Models 1 through 5 deal with the expected roles of the government, such as providing infrastructure for Internet use, activating the use of Internet services, providing Internet security, providing accurate information, and managing open data. In other words, each model deals with which factors have a significant impact on the most important item suggested by respondents as the role expected of the government, and the frequency of use of e-Government is controlled in all models.

As a result of the analysis, in Model 1, it can be confirmed that the more respondents living in the capital city, the more they expect the role of providing infrastructure to the government as the most important role. According to Model 2, the younger the respondents, the more Kyrgyzstan-speaking respondents, and the more experience of online education, the more they answered that the government expects to activate the use of Internet services the most. Model 3 shows that the younger the respondents, the more important they expect a role in Internet security. According to Model 4, those who are older and have experience in online-related education responded that providing accurate information is the role they most expect from the government. Model 5 shows that older, rural respondents are calling for open data management to be the most important role for government.

Table Ⅴ-6. Expectation towards Government Role

	Provide Infra	Increase Access	Security	Trustworthy Information	Open Data
Age	0.007	-0.047	-0.033	0.029	0.03
	-0.016	(0.021)**	(0.016)**	(0.016)*	(0.015)**
Gender	0.015	-0.065	0.022	-0.022	0.013
	-0.057	-0.083	-0.067	-0.046	-0.039
Location	-0.11	0.05	-0.05	0.026	0.13
	(0.057)*	-0.089	-0.087	-0.058	(0.062)**
Income Level	-0.003	0.019	0.013	-0.006	-0.003
	-0.007	-0.013	-0.01	-0.006	-0.006
Language_Int_Kyr	-0.024	0.194	0.024	0.001	0.014
	-0.039	(0.078)**	-0.059	-0.037	-0.029
Internet Training	0.05	-0.31	-0.115	0.2	0.107
	-0.086	(0.077)***	-0.093	(0.114)*	-0.088
e-Government Frequency	-0.068	0.03	-0.042	0.001	0.028
	(0.029)**	-0.035	-0.034	-0.025	-0.021
_cons	0.397	0.141	0.356	-0.056	-0.36
	(0.185)**	-0.252	-0.288	-0.141	(0.164)**
R^2	0.09	0.13	0.07	0.09	0.12
N	109	109	109	109	109

* $p<0.1$; ** $p<0.05$; *** $p<0.0$

Source: Authors

3) Expert Interview Analysis

Because more than 60% of the Kyrgyz population live in rural areas, it is important to promote digital connectivity in the rural areas to enhance digital inclusiveness. This entails providing better internet infrastructure and strengthening digital literacy of rural population. In Kyrgyzstan, there are several grassroot initiatives and non-governmental organizations sponsored by the national government and international organizations to work with the rural communities to expand internet connectivity and digital literacy in the rural areas. Often these NGO activists offer valuable insights and experiences that are crucial for adjusting top-down national digital policy to local conditions. Therefore, we have conducted extensive interview

with about a dozen NGOs from March to December 2022 in Bishkek and other locations in the Kyrgyzstan. The NGOs include civil society organizations working in the field of digital development. This section summarizes comments made by the interviewees.

In terms of internet infrastructure development, we have found out that fixed broadband internet is not widely available in Kyrgyzstan. Computers are also not widely available in households and even in schools in the Kyrgyz Republic. Mobile phones on the other hand are very affordable and majority of the population own smartphones, regardless of age, gender, and location. Thus, when connecting to the Internet, people do so through mobile phones. To help children get access to educational resources, even if there is no internet, an ilimBox (internet-in-a-box) initiative was launched. As more school got connected to the Internet, particularly during the pandemic, ilimBox has evolved into an online educational portal. It became apparent that even if schools and communities connect to the Internet, there has to be relevant content available. Thus, in close cooperation with the Ministry of Education of the Kyrgyz Republic, the ilimBox project team uploaded available electronic educational resources and developed additional educational materials for the use of students and teachers. Azhybek Nurlanov, manager of the online education platform ilimBox.kg explains that when creating online content, a "mobile-first" principle must be followed. This means that the content must be comfortable for viewing from the small screens of mobile phones. Furthermore, given that traffic can be expensive, heavy files must be reformatted to weight less in terms of megabites, so that users do not have to spend a lot on paying for internet service.[66]

In addition, much of the content in the Kyrgyz internet is in Russian language. There are a couple of challenges related to that. First, the communities in rural areas do not speak Russian and thus cannot fully benefit from online resources. Second, due to the crisis in Ukraine, there is a reduction of western online entertainment and educational content in Russian language (Netflix, Hollywood films)[67] and a potential

66) Interview with Mr. Azhybek Nurlanov, manager of the online education platform ilimBox.kg, 16 December 2022

67) See Ruslan Kharizov. 9 March 2022. "Mnotge Ozhidaemye Mipobye Kinoprem'ery v

increase of non-licensed digital content (e.g. software, games, movies). Therefore, more local language contents should be created "Progressive Public Union of Women "Mutakalim"[68] is an example of a NGO that reaches out to women in rural areas with a relevant content in multiple languages. Jamal Frontbek Kyzy, co-founder of the organization, shares her experience of reaching out to different stakeholders. For instance, women in conservative communities are hard to reach from one hand and are in need of information from the other hand. Mutakalim establishes trustful relations with different stakeholders and helps share relevant content in different languages through multiple channels including youtube[69] on variety of topics and issues that are of importance to youth, women, and conservative segments of the society.[70]

Other NGO representatives point to the importance of increasing public wi-fi access especially in the rural area. Internet wi-fi hotspots in public spaces like schools can be safe-spaces for girls and women in rural areas. In villages, there are many opportunities for outdoor activities for men, but not for girls and women. Sapargul Abdinabieva, manager of Sanarip Insan (Digital Citizen) EU-funded project explains that in in conservative communities in rural areas girls are expected to stay home and if they go outside, they can only do so in groups. Thus, when a school in Zardaly village in Batken province became a wi-fi hot-spot, girls in the village found a safe-space where they could go together to explore internet.[71] The Sanarip Insan team works closely with the Ministry of Youth of the Kyrgyz Republic. Under the request of the Ministry of Youth, training programs on e-commerce, e-tourism, and other digital

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Kyrgyzstane Ne Pokazhut." *24.Kg*: https://24.kg/obschestvo/226735_mnogie_ojidaemyie_mirovyie_kinopremeryi_vkyirgyizstane_nepokajut/ (3 December 2022). As an example, Sony shut down users from countries, such as Kazakhstan, Uzbekistan, Georgia, and Moldova, from it PS stores as users from these countries had no other option but to choose Russian as the only available language (https://repost.uz/a-mi-prichem-tut)

68) For more details, see: Mutakalim. http://mutakallim.kg/

69) For example, visit *Poozh Mutakalim.* https://www.youtube.com/@user-lk3ni1rl7h/about

70) Interview with Ms. Jamal Frontbek Kyzy, co-founder of Mutakalim NGO, 20 September 2022

71) Interview with Ms. Sapargul Abdinabieva, manager of Sanarip Insan (Digital Citizen) EU-funded project, 7 October 2022

opportunities were developed for the youth and women in rural areas of the country. Further goal is to work with the Ministry of Agriculture to develop training programs on e-agriculture.

Similarly digital literacy training in rural areas could enhance the rural users' economic and social potentials of the rural communities. Ms. Banur Abdieva conducts trainings for communities in rural areas on creating digital content through DigiKonush (Digital Neighborhood) EU-funded project. She explains that the majority of the people in rural areas mainly use the internet just for messaging and for entertainment.

However, people rarely use the internet for business or education-related activities. This is also reflected in our survey result which indicates that only a quarter of the total respondents used the internet to send or receive email, while all respondents used it for instant messaging while 2/3rd used it for social networking activities. Through her project, Ms. Abdieva teaches people how to use the Internet for productive purposes - to find educational materials, to create digital content, and to conduct business online.[72)]

DigiKonush established Digital Skills Training Centers across the country with all the necessary high-tech equipment and materials that are freely available to users. Ms. Abdieva and her team conducts regular trainings on digital skills by bringing leading experts to remote and local communities and as well as by brining participants to the Trainings Centers. Furthermore, digital literacy training could be used as a means for empowering traditionally underprivileged groups in the Kyrgyz society.

For example, Kyzzhibek Batyrkanova, Head of the Girls Satellite Program in Kyrgyzstan, describes her project as the first attempt to launch Kyrgyz Satellite into space. However, this is not the only goal. The main goal of the Girls Satellite Program is to motivate and to give confidence to the girls in the Kyrgyz Republic that they can

72) Interview with Ms. Banur Abdieva manager of DigiKonush (Digital Neighborhood) EU-funded project, 29 April 2022

work with software and hardware despites the stereotypes in the society that girls should focus on "soft" professions.[73)]

NGOs groups are also working in the areas overlooked by the government. The disregard for personal data protection by both the government and the user is a worrying signal. This is also reflected in our survey result which suggests that the least priority is given to personal data projection. The users of the internet should be given information about the importance of personal data protection and the impact of cyberthreats. Nurbek Arzymbaev manages a cybersecurity helpdesk for citizens, activists, and journalists under the Tech4Society Project funded by Soros Foundation-Kyrgyzstan. Many people become victims of cybercriminals and hackers. Therefore, it is important to users to maintain basic cyber-hygiene by using such tools as strong passwords, not disclosing personal data, and installing two-factor authentication.[74)]

His colleague, Altynai Baktybekova, explains that first-time internet-users can be very trustful of the Internet. They can be manipulated by the disinformation and misinformation online. Therefore, it is important to conduct trainings on critical thinking for users so that they do not fall prey of the harmful online content.[75)]

Tech4Society Program builds on the international experience of organizations in Europe, the US, and Korea, where cybersecurity and personal data protection are well developed. To deliver to people the information in a easy-to-understand language, traditional storytellers are involved in trainings to explain complex technical notions in simple and engaging ways.

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73) Interview with Ms. Kyzzhibek Batyrkanova, Head of the Girls Satellite Program in Kyrgyzstan, 7 October 2022

74) Interview with Mr. Nurbek Arzymbaev manager of Tech4Society Project funded by Soros Foundation-Kyrgyzstan, 16 December 2022

75) Interview with Ms. Altynai Baktybekova, Cyber Security Expert of Tech4Society Project funded by Soros Foundation-Kyrgyzstan

4. Conclusion: Application of the Better Digital Inclusiveness Metrics and Its Impact

To sum, comprehensive efforts are needed to improve digital inclusiveness in Kyrgyzstan as the country implements digital transformation. Most importantly, there is lack of reliable data on the current state of digital transformation in Kyrgyzstan. In addition, there is a difference in national and international statistics. For instance, Internet users statistics: 88% according to government statistics while according to the internationally recognized statistics 51% of the Kyrgyz Population are internet users. There is also a difference in statistics among different international sources (e.g. there are varying statistics from different sources: WB, ITU, UN E-Government Survey, Telegeography, etc.). Therefore, both the national government and international organizations should coordinate their efforts to collect reliable statistical data.

There is a need for concerted efforts to diversify cross-border routes (including through the Trans-Caspian submarine cable[76] as well as through China and Afghanistan) and strengthen collaboration among Central Asian countries for improved regional connectivity. Establish contacts with Satellite-Internet companies (OneWeb, Starlink, etc.). Realizing the dependency on Russia for internet traffic, Central Asian governments and different stakeholders should look into possible alternatives such as low-orbit satellite companies, which could provide an option to connect remote and hard to reach areas. In addition, competition within the country should also be encouraged. Infrastructure sharing and co-deployment on a public-private partnership basis would expedite and substantially reduce the cost of building communications infrastructure such as significantly fiber optic lines, mobile towers, etc. This would help connect rural and hard to reach areas much faster, cheaper, and easier.

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76) Prokladku "optovolkna" po dnu Kaspiya Poobeshchali Zavershit' v 2021-2022 gody. 20 September 2022. *Tag.News.* https://kaztag.kz/amp/news/prokladku-optovolkna-po-dnu-kaspiya-poobeshchali-zavershit-v-2021-2022-gody (10 October 2022)

Furthermore, the Kyrgyz government should adapt enabling policies and regulations such as “Infrastructure Sharing”, “Co-Deployment”, “Dig Once”, “Cloud First”, “Open by Default”, and “Cybersecure by Design”, etc. Policies and regulations for urban and rural areas should be differentiated, with the ones for rural areas simplified or waived. From one hand the remote and rural areas are difficult to connect leading to high capital expenditures. From the other hand, the population in these areas is sparse and the incomes are not very high. As a result, the investments take a lot of time to recovers. The governments in developing countries might lack extra resources to bring internet connectivity to every settlement in the country. Due to these factors, the private sector companies do not see hard-to-reach communities as priority areas. Therefore to incentivize internet providers to operate in rural areas, policies and regulations should be easier. So that the capital expenditures (CapEx) and operating expenditures (OpEx) could be lowered and the return on the investment would be faster.

Another option that could help connect the unconnected is called the Community Networks (CNs). Internet Society-Kyrgyz Chapter implemented this model in villages of Suusamyr and Zardaly. Halil-Ibrahim Bilgich helps build such CNs. As he explains[77], this is a model where the local community builds and owns the internet infrastructure. Internet service provider (ISP) leases the infrastructure from the community and pays a certain fee. Since the ISP does not have to invest in capital expenditures and does not have to spend time on connecting the last-mile subscribers, it saves substantially on capital and operating expenses. As a result, ISP can offer internet service as much cheaper rates.

In terms of content, local language content development needs to be encouraged. This is especially important in Kyrgyzstan since language may increase the digital divide between urban and rural areas. Increasing local language content also means more educational opportunities and training programs are required to expand digital

77) Interview with Halil-Ibrahim Bilgich, Manager of the Community Networks projects at the Internet Society-Kyrgyz Chapter, on 23 December 2022

literacy. In addition, enhancing digital literacy of the rural population could also empower the rural community and close the digital divide between the urban and rural areas. Visits and discussions with communities demonstrate that the level of digital skills in rural areas need to be increased. Basic skills such as establishing email accounts can be seen as complex. Some of the activities to improve digital skills in rural areas includes projects supported by the EU such as Sanarip Insan (Digital Citizen), DigiKonush (Digital Neiborhood), and Digital Ishker (Digital Worker).

Digital development is one of the top priorities of the Kyrgyz Government. It is making major efforts to reach the goals listed in the Taza Koom and Sanarip Kyrgyzstan programs. NGOs are working on different activities within the digital transformation strategies and the government is collaborating with NGOs and civil society on this common goal. One way the government is supporting the civil society and activists' efforts is by creating an enabling legal and regulatory environment. For example, just recently the government supported the idea of activists on launching creative industries park with a special simplified regulatory and tax regime. Before that High-Technology Park received simplified operating regime from the government.

Another way the government works with NGOs is by setting priorities and developing special programs. The Kyrgyz Government and the Ministry of Culture and Youth launched the Kelechek (the Future) Program to help young people with skills and knowledge necessary for bright future. Under the Kelechek program, several NGOs are providing trainings and know-how transfer to the communities in rural areas of the country, such as Sanarip Insan, DigiKonsuh, and Enactus. Therefore, we recommend the introduction of a mechanism for the government to communicate and collaborate with the non-governmental agencies would contribute to bridge the digital divide between the rural and urban population, thus enhancing digital inclusiveness in the process of digital transformation.

Ⅵ. Development and Application of the Better Digital Inclusiveness Indicators for Kazakhstan

Kazakhstan is the largest county among the five Central Asian republics, stretching from the Altai Mountains on the east and the Caspian Sean on the west. The country borders Russia on the northwest, China on the east and Kyrgyzstan, Uzbekistan, and Turkmenistan on the south. The total population is 18 million (2020) while its population density is 7 people per sq. km of land area, which makes Kazakhstan one of the least densely populated country in the world (World Bank, 2020).[78] Kazakhstan's large territory, sparse population distribution, and the fact that it is landlocked present unique challenges to ICT infrastructure development within and without its national border. Kazakhstan is also the most ethnically diverse country in Central Asia. Ethnic Kazakhs make up around 70% of the country's population while 18.4% identify themselves as ethnic Russians (Committee on Statistics, 2019.[79] Other ethnic minorities include Koreans, Germans, and Tatars. Due to the historically-significant multi-ethnic composition of its population, the Kazakh government officially recognizes both Kazakh and Russian as the state languages. According to a 2009 estimate, the Russian language was used in everyday communication by 94.4% of the population while the Kazakh language was used by 64.4% of the population. The number of Kazakh speakers is on the rise, however, reaching 83.1% by 2017 (Committee on Statistics, 2017). The primary language of communication people use influences the digital resource available and accessible to them.

Kazakhstan is a resource-rich country that has experienced rapid growth since the early 2000s with its average annual GDP growth rate of 6.52 %. With neighboring

78) https://data.worldbank.org/indicator/EN.POP.DNST

79) Committee on Statistics. 2019. *Demographic statistics. The population of the Republic of Kazakhstan by individual ethnic groups at the beginning of 2019*. Astana: Committee on Statistics of the Ministry of National Economy of the Republic of Kazakhstan.

Turkmenistan, Kazakhstan is classified as an upper-middle income country in Central Asia. However, with one of the world's top 10 largest oil reserve, Kazakhstan's economy is reliant on the hydrocarbon fuel industry. Approximately 21% of Kazakhstan's GDP and approximately 70% of its exports come from carbon energy output.[80] Therefore, Nur-Sultan has adopted industrial diversification as its priority and has invested in developing the ICT industry as an alternative driver of economic growth. The recent COVID-19 pandemic presented both challenges and opportunities for the country. In 2021, Kazakhstan yielded -2.5% GDP growth, but by the second half of 2021, it yielded 4% real GDP growth. The pandemic also accelerated digital transformation in both public and private sectors. In addition, due to the current conflict between Russia and Ukraine, many Russian IT-firms and specialists have relocated to Kazakhstan. The Kazakh government is seeking to benefit from the sudden increase of IT-related manpower for its digital transformation efforts.

As a founding member of the two major regional integration initiatives—the Eurasian Economic Union (EAEU) and the Shanghai Cooperation Organization (SCO)—Kazakhstan is working closely with regional partners including Russian and China in promoting ICT infrastructure building, R&D and innovation, cybersecurity, internet governance, and e-commerce. As the biggest economy in Central Asia, Kazakhstan can spearhead digital transformation, promoting international dialogues for regional ICT cooperation and provides best practice for its neighbors in ICT infrastructure and system development.

Experts point out that the government's effective partnership with private and semi-private IT companies was the key to Kazakhstan's success in accelerating digital transformation during the COVID-19 crisis. During the pandemic, the government collaborated closely with IT-companies to provide efficient e-government and public digital services ranging from online tax-payment to vaccination certificate apps. It is expected that such partnership will expand, leading

80) World Bank. *The World Bank in Kazakhstan.* https://www.worldbank.org/en/country/kazakhstan/overview#1 (1 March 2022)

to possible privatization of a wide-range of e-government and public services in the process of further digital transformation.

This chapter begins with an overview of the current state of digital transformation in the country and its national digitalization strategy, followed by a discussion on whether and how digital transformation is contributing to expanding digital inclusiveness in Kazakhstan. Ultimately, the aim of this chapter is to explore and to propose a marker/indicator that needs to be considered when analyzing how the people's experience of and satisfaction with using digitalized public services such as e-health, e-learning, and e-government are influenced by digital divides in gender, place of residence (urban or rural), income-level, and education-level. This chapter focuses especially on Kazakhstan's e-government and the government's effort to create more convenient e-government services for its citizens by collaborating with private enterprises and whether such efforts are contributing to closing the digital and social gaps that exist in the local society. We have also survey people's expectation on what areas should the government priority to create a more inclusive digital environment in Kazakhstan.

1. Current State of Digital Transformation through the Lenses of the Better Digital Inclusiveness Index

1) Technical Capability Transformation

Kazakhstan's telecommunication infrastructure is built based on the Soviet-era constructed telecommunication network which was concentrated in densely populated urban areas along the country's southern territory. To modernize the country's telecommunication infrastructure and to provide its population with wider and more stable access to the internet, the Kazakh government began investing on fiber-optic and mobile broadband network construction since the early 2010s with the adoption of *Information Kazakhstan-2020* in 2013. Under this strategy, the government has completed 20,000 km of fiber-optic cable attached to the National Information Superhighway (NISM).[81]

Today the biggest fixed-broadband internet provider is KazakhTelecom (KazTel), a state-run telecommunication company who operates the NISM linked to the Trans-Asian-European fiber-optic communication system (Shanghai-Frankfurt on Mine). KazTel dominates 93% of the fixed voice service, 74% of fixed broadband service, and 61% of mobile connection service market according, operating more than 2.8 million fixed broadband units, more than 2 million from urban areas and more than 800 thousand units from rural areas.[82]

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81) Prime Minister of the Republic of Kazakhstan. 2021. "In Kazakhstan, 20 Thousand Kilometers of Optical Fiber Laid to Villages." *Official Information Source of the Prime Minister of the Republic of Kazakhstan.* https://primeminister.kz/en/news/interviews/v-kazahstane-k-selam-prolozheno-20-tys-kilometrov-optovolokna-621050 (1 March 2022)

82) Fitch Rating. 2021. *Fitch Affirms KazakhTelecom at 'BBB-'; Outlook Stable.* Accessed at https://www.fitchratings.com/research/corporate-finance/fitch-affirms-kazakhtelecom-at-bbb-outlook-stable-10-12-2021#:~:text=company%20in%20Kazakhstan.-,By%20the%20company's%20assessment%2C%20its%20subscriber%20market%20share%20was%2093,total%20telecom%20market%20by%20revenue (1 March 2022)

Table Ⅵ-1. Technical Capability Transformation Indicators

Indicators	2021	2020	2019	2018	2017
Internet users (% of population)	90.92	85.94	81.87	78.90	76.42
Mobile population coverage	N/A	98	98	96.6	96.6
Mobile-cellular subscriptions (% per 100 inhabitants)	126.71	128.00	137.13	140.61	145.75
Fixed-broadband subscriptions (% per 100 inhabitants)	14.39	13.81	13.40	13.28	14.07
Fixed broadband traffic (exabytes)	n/a	4.24	2.79	2.26	1.20
Mobile internet traffic (within the country, exabytes)501	n/a	2.85	2.01	1.45	0.90

Kazakhstan is the most digitally-connected country in Central Asia. 90.92% of Kazakhstan's population uses the internet while 98% of Kazakhstan's population is connected via a mobile-cellular network (2021). 93.40% of Kazakhstan's population is covered by at least a 3G mobile network, while 81.30% is covered by at least an LTE/WiMax network. Mobile-cellular telephone subscription has reached 126.71 per 100 inhabitants in 2021, with 91% of population owning a mobile phone. Fixed-broadband subscription has reached 14.39 per 100 inhabitants. 82.97% of households have a computer while 94.45% of households have the access to the internet. The fixed-broadband internet traffic increased from 1.20 EBs in 2017 to 4.24 EBs in 2021, while the mobile internet traffic within the country increased from 0.90 EBs in 2017 to 2.25 EBs in 2021. International bandwidth has also increased from 0.8 million Mbit/s in 2017 to 1.58 million Mbit/s (0.96 million Mbit/s per user). According to the ITU data, there is no significant gap in the internet accessibility between the urban and rural areas with approximately 92% of households in both areas having the internet access.

The quality of the internet services has also improved greatly in the recent years. The average fixed broadband upload speed and download speed increasing from 20.39 Mbps/21.32 Mbps respectively in 2017 to 42.00 Mbps / 42.86 Mbps respectively in 2021. The average mobile upload and download speed has also improved with 7.36

Mbps/12.62 Mbps respectively in 2017 and 9.86 Mbps/18.42 Mbps in 2021.[83] The internet service is more readily affordable in Kazakhstan compared to in the other Central Asian countries. An entry-level fixed-broadband basket costs around 0.81% of GNI per capita. Mobile data and voice low-consumption basket cost on average costs around 1.0% of GNI per capita while mobile data and voice high-consumption basket costs around 1.4% of GNI per capita. A Kazakh household spends about 4.7% of its total monthly expenditure on ICT goods and services. There is a gap in the internet accessibility between the urban and rural areas. In 2020, while 88% of urban residents had the access to the internet while 83% of rural residents had the access to the internet. However, this gap has narrowed from 2017 when only 72% of the rural population had the access while 80% of the urban population had the access.

2) Human Capability Transformation

According to ITU, 32 % of the Kazakh internet users have at least basic ICT skills, 24% have standard skills, and 6% have advanced skills. The Kazakh government strives to improve digital literacy and ITC skills among its population by providing ICT-related training programs for the adult population and integrating ICT-related training programs in the primary and secondary school education.

The internet penetration level is much higher in the relatively younger age groups. 87% of the country's population between the ages 25 and 74, 96% of the population between the ages of 15 and 24, and 86% of the population younger than age 15 are using internet. However, the penetration level drops significantly to 11% in the age 75-and-above group. In terms of gender, 87% of the total male population use internet while 85% of the total female population use the internet. Therefore, the generational gap, which is measured by the number of individual internet users whose ages are between 15-24 minus the number of individual internet users whose ages are above 75 is greater than the gender gap in the internet access.

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83) Speedtest Global Index. https://www.speedtest.net/global-index (1 September 2022)

Table Ⅵ-2. Human Capability Transformation Indicators

Indicators	2021	2020	2019	2018	2017
Gender gap in the internet access	4.9	-2.7	0.0	4.2	N/A
Gender gap in the mobile phone access	4.3	-2.2	2.2	3.3	2.2
Age gap in the internet access	n/a	34.42	17.84	26.75	60.12

3) Socio-cultural Capability Transformation

According to the Economists 3I data, local online news media serves speakers of both Kazakh and Russian languages by publishing local news content at least weekly. The data also suggests that e-government service websites available in Kazakhstan are written in all major local languages, but transactional services are not available. e-Finance, e-commerce, e-education, e-health, and e-education contents are readily available. Among the different types of contents, e-entertainment is valued the most (3I score of 80%) while e-finance and e-health contents are valued the least (3I score of 30%).

Table Ⅵ-3. Socio-cultural Capability Transformation Indicators

Indicators	2021	2020	2019	2018
Trust in online privacy	36.0	28.0	16.7	36.0
Trust in government websites and apps	44.0	44.0	48.1	56.0
Trust in non-government websites and apps	30.0	18.0	27.8	36.0
Trust in information from social media	26.0	18.0	16.7	32.0

Regarding trust, the Economist 3I data indicates that Kazakh internet users in general trust government websites and apps (44%) more than they trust non-government websites and apps (30%). The users trust information circulated via social media the least with only 26% respondents replying that information from SNS are reliable. Overall, Kazakh internet users' trust in the information or services provided via the internet has improved since the last year. Trust in online privacy is also relatively low, with the score of 36%. Yet this figure reflects an increase in the users' trust towards online privacy protection. However, it is important to note that the 3I

data on online services and content usage and trust are based on a relatively small national sample, and are different from the results of the country survey conducted for this project. The survey methodology as well as differences in data results will be discussed in following sections (refer to Section 5.2).

4) National Digital Transformation Policy and Strategy

National broadband plan (NBP) is "a strategic vision for a country's ICT development" that "[sets] out objectives and aspiration for the ICT sector over the medium- to long-term" (A4AI, 2020, 19).[84] The plan is important because it allows governments to have "clear, time-bound targets" and intervene to reduce broadband cost or increase penetration (A4AI, 2020, 19).[85] It also helps governments to effectively manage public investment in digital development, utilize various policy instruments to meet the targets, and better coordinate different stakeholders including private sector, civil society, and individual users. Overall, a national broadband plan contributes to making internet more affordable and more inclusive.

Kazakhstan has a comprehensive digital development plan which covers infrastructure building to digital skills development. In 2017, the Kazakh government adopted Digital Kazakhstan program modelled after Singapore's Smart Nation Initiative. The program's overall objectives are "to accelerate the pace of the republic's economy development and improve quality of life for population through the use of digital technologies in medium terms," and "to enable the economy of Kazakhstan to move on a fundamentally new development trajectory, ensuring creation of digital economy in a long-term perspective" (Government of the Republic of Kazakhstan m 2017a).[86] The program includes five implementation areas:

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84) Alliance for Affordable Internet (A4AI). 2020. *Affordability Report 2020*. Accessed at. https://1e8q3q16vyc81g8l3h3md6q5f5e-wpengine.netdna-ssl.com/wp-content/uploads/2020/12/Affordability-Report-2020.pdf (1 September 2022)

85) Ibid, p. 19

86) Government of the Republic of Kazakhstan. 2017. *State Program Digital Kazakhstan*. https://digitalkz.kz/wp-content/uploads/2020/03/%D0%93%D0%9F%20%D0%A6%D0%9A%20%D0%BD%D0%B0%20%D0%B0%D0%BD%D0%B3%D0%BB%2003.06.2020.pdf (1

Table Ⅵ-4. Key Objectives of Digital Kazakhstan Strategy

Main Area	Objectives
Digitalization of the economy sectors	Transforming traditional economy sectors using breakthrough technologies and opportunities that will enhance productivity and increase capitalization
Transition to a digital state	Transforming the state functions as an infrastructure for delivering services to public and business, in anticipation of its needs
Implementation of the digital Silk Road	Developing a high-speed and secure infrastructure for data transmission, storage, and processing
Human capital development	Promoting change, encompassing the creation of a so-called creative society to ensure the transition to the knowledge economy
Creating an innovative ecosystem	Creating conditions for the development of technological entrepreneurship and innovation, with sustainable horizontal linkages between business, scientific sphere, and state. State will act as a catalyst for an ecosystem capable of generating, adapting, and incorporating innovation into production

The government has allocated approximately 142 billion tenge of public fund and expects more than 169 billion tenge in investment for the implementation of the program constated of 17 initiatives and more than 100 activities.[87] Target indicators include:

Table Ⅵ-5. Key Targets of Digital Kazakhstan Strategy

Indicators	Targets
Mining and quarrying section productivity growth in 2022	38.9%
Transport and warehousing section productivity growth in 2022	21.2%
Agriculture, forestry, and fisheries section productivity growth in 2022	49.8%
Share of e-commerce in the total volume of retail trade in 2022	2.6%
Growth of jobs created by digitalization in 2022	300,000 employees
Share of public services received electronically from the total volume of public services in 2022	80%
Share of Internet users in 2022	82%
Population digital literacy level in 2022	83%
Improvement in the rating of the GEF WEF by the indicator "Growth of innovative companies" in 2022	104th place
Amount of investment attracted in start-ups in 2022	67 billion tenge
Information and communication development index in 2022	30th place

September 2022)

87) Ibid.

According to the Digital Kazakhstan Program, the government plays a key role as the facilitator of digital transformation. The government takes initiatives in both hard and soft infrastructure development. In addition, the Kazakh government introduced creative ways to broaden accessibility and usage of e-government services. The first e-government platform eGov.kz was created between 2005 and 2007 with the goal of improving the quality of public services and enhancing transparency, thus reducing prevalent corruption in the public sector. The eGov.kz has developed into a centralized platform that provides a wide-range of services including document issuance, tax payment, and petition submission. The portal is also connected to an open government platform from which citizens could access open data, comment on government policies, make suggestions for new policies, and engage in a dialogue with national- and local-level government officials. In total, around 400 public services are available on the eGov.kz platform. To access these services, a user must apply for his or her individualized digital signature key codes, or alternatively use QR-code signatures. eGov.kz is also available in a mobile app version which is used by 2.4 million Kazakh citizens per month (eGov.kz, 2022).[88] Recently the Ministry of Digital Development, Innovation, and Aerospace Industry of Kazakhstan announced that it has updated the eGov mobile app so that the users can log-in using biometric data such as face features and fingerprints. The government also engages with citizens via Telegram, one of the most widely-used social media platforms in Kazakhstan, not only to communicate with its citizens. The EgovKzBot 2.0 Telegram page was created to provide a wider access to e-government services for citizens without access to a computer. Services available via EgovKzBot 2.0 include:

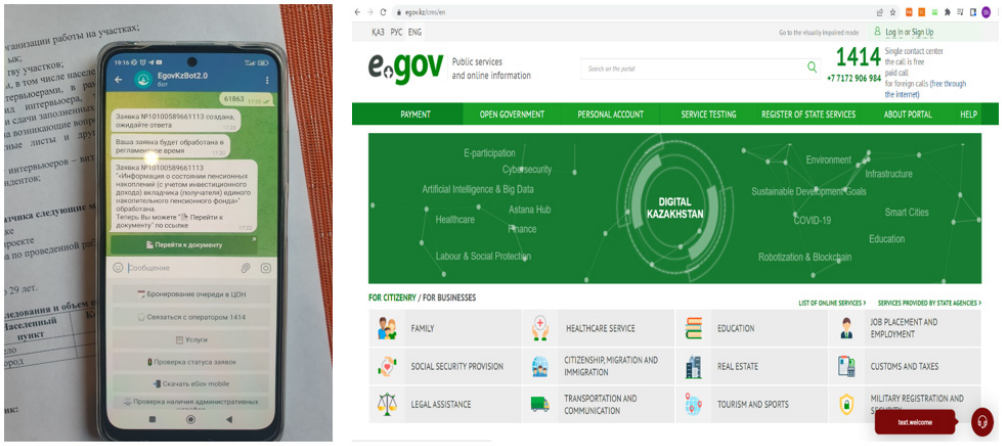
88) "Vkhod v Mobil'noe Prilozhenie eGov Mobile Dostupen Cherez Biometpiyu." 20 July 2022. E-Gov.kz Portal. https://egov.kz/cms/ru/news/egov_biometrics (1 September 2022)

Table Ⅵ-6. Services Accessible via EgovKzBot 2.0 (as of June 2022)

Request for the confirmation on registration of permanent residency	Issue a certificate from narcological dispensary
Issue a certificate of legal entity and representation	Issue a certificate from psychoneurological dispensary
Issue a certificate of criminal record	Issue a certificate from anti-tuberculosis dispensary
Issue a certificate of real estate ownership	Access information on pension and other welfare funds
Issue a certificate of encumbrances of immovable property (incl. property technical specifications)	Access information on accrual from the United Pension Savings Fund
Issue a pension certificate (incl. benefit amount)	Access information from the debtors registry regarding prohibition to leave the country
Make a reservation to Citizen Service Centers	Request a verification on an individual's civic offence
Access information regarding a registered legal entity, affiliation, or branch office	Register a pledge of movable property
Access information regarding branches and representative offices of a legal entity	Register a vehicle
Search the location of the nearest PSC	Register an agricultural machinery

Source: Author based on e-gov.kz and eGov.kz Telegram

Figure Ⅵ-1. Egov.KzBot2.0 Telegram and eGov.kz Portal



Source: Authors based on eGov.kz

As a part of the Digital Kazakhstan program, the Kazakh government has also introduced ways to enhance digital skills of its civil servants. The program coordinates training workshops designed to help chief digital officers and IT specialists at all government levels to enhance their capacities to provide ICT-related support and skills development training for other government employees. Kazakh civil servants could participate in training courses offered at Nazarbayev University, Academy of Public Administration, e-Governance Academy in Estonia, and the e-Government Leadership Centre in Singapore. The objective of the program is to strengthen digital capacities at the individual level so that individual civil servants can nurture the strategic mindset and skills to better adapt to the digital transformation bringing substantial and complex changes to the Kazakh society. The Kazakh government has made some significant progress in building an interactive e-government system. In the 2020 edition of the United Nations E-government Development Index, Kazakhstan ranked 29th. It scored highest in Online Service Index (0.9235 out of 1), that measures the level and quality of e-government development.

To sum, however, our research has confirmed that the existing national digital strategy lacks a coordination marker similar to the one suggested in Chapter 2 that could potentially manage the diverse needs and coordinate activities of multiple stakeholders of the digital transformation, and thus contribute in building a more inclusive digital society.

2. Effects of Expanding Digital Inclusiveness : Focusing on the e-Government

As in the case of other Central Asian countries, the government of Kazakhstan plays a significant role in promoting innovation technology and building an information society. The substantial role the government plays in the national digital transformation is inevitable in a transitional economy such as Kazakhstan where there is a weak private sector and R&D base. In other words, the only public sector has the financial means and resources to renovate the country's communication infrastructure and create an environment for digital innovation. Therefore, the pattern commonly observed in the Western economies where the private sector leads and the public sector catches-up in adopting new innovative technologies, the reverse can be observed especially in the earlier stages of digital transformation in transitional economies of the CIS region. This made e-government and digitalized public services essential for digital transformation in Kazakhstan. In addition, e-government and digitalized public services promise to improve the quality of public services by making them more assessable, convenient, effective, and cost-efficient. Digitalized public services can also contribute to enhancing social inclusiveness by delivering services to individuals who previously face difficulties accessing the services and connecting citizens to an online public forum. By making information more readily available and encouraging citizen engagement to public affairs and policy making, e-government helps promoting government transparency and accountability, ultimately contributing to the establishment of good governance.

E-government was introduced to improve the quality, efficiency, and transparency of public services in Kazakhstan. Thanks to the automatization of essential public services, the citizens could access public services anytime and anywhere. In the earlier years of e-government development, the Kazakh government aimed at creating a single access point for providing information regarding policies and administrative procedures.

Figure Ⅵ-2. Opportunities and Benefits of Technology-enabled Public Service Delivery in Developing and Transitional Economies

E-government Opportunities for Developing and Transition Countries	Examples	Benefits for Whom?
Cost reduction and efficiency	• Solution for shortage of personnel and inadequate facilities (Bwalya and Mutula 2014; Makoza 2016); • Decrease of document processing cost (Ndou 2004a); • Cost and efficiency for citizens and other users (Madon 2009).	Supply and demand side
Improved transparency, accuracy, accountability	• Facilitation of information transforming between government and customers (Alshehri and Drew 2010); • Decreased corruption (Lupu and Lazăr 2015; Nam 2018)	Supply side
Network and community creation	• Network and interoperability between different levels and departments of government and improved decision-making (Alshehri and Drew 2010; Bwalya and Mutula 2014); • Forums, and network between users (Ndou 2004a).	Supply and demand side
Improved democratic processes	• Increased citizen participation through voting, organizing campaigns, and fundraising events online (Netchaeva 2002; Brown 2005).	General benefit for the society
Social benefits	• Access to healthcare, education, employment opportunities, funding sources, etc., thus achieving poverty reduction in communities (Makoza 2016).	Demand side

Source: Kuldosheva 2021

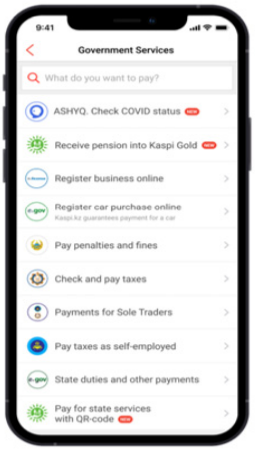
This early version of e-government provided a one-way stream service and did not include an interactive component. During the later phases of the e-government development, the Kazakh government focused on building a mechanism for user identification and authorization, installing a receptive services and implementing user-friendly content and delivery. A mobile version of the e-government was also created for greater accessibility. More recently, the e-government has been integrated with fintech services so that citizens could make tax transactions and payments for public services directly via e-government websites and apps or from their own online banking platforms and mobile apps.

Experts have observed that Kazakhstan's rapid digitalization is driven by an effective private-public partnership. One of the most successful examples is the collaboration created between the government and financial technology (fintech) companies such as Kaspi Bank. Originally established as a traditional bank in 2002, Kaspi Bank has emerged as one of the systemically important banks of Kazakhstan especially in the country's retail sector by expanding its Kaspi.kz mobile app user base. The bank operates three platforms which include online payment, marketplace, and fintech

that are all integrated to the Kaspi mobile app. The mobile app offers personal banking, online payment, P2P transfers, online shopping and delivery, GPS and map services, and messaging. As of September 2022, the Kaspi.kz mobile app has 12 million users which is approximately 63% of the entire Kazakh population (Okasov, 2022).

The partnership between the government and fintech companies such as Kaspi.kz began in 2020 during the COVID-19 crisis. In March, 2020, the government commissioned Kaspi.kz and other online bank platforms to assist the government's effort to distribute emergency social support to the citizens who lost their jobs or had to take unpaid leaves from work due to the lock-down. Through the Kaspi.kz application, Kazakh citizen's received 4.4. million tenge. Ashyq, the national vaccination pass app linked to the Ministry of Health's PCR test and vaccination databases, was also linked to the Kaspi.kz mobile app. In October 2020, the Ministry of Digital Development, Innovation, and Aerospace Industry of Kazakhstan announced its partnership with Kaspi.kz to provide remove registration and verification services for start-up companies and small business owners. Using Kaspi.kz mobile app, private entrepreneurs can register their businesses, verify documents, and make changes to the business registration. Kaspi.kz also launched car registration service through the app in collaboration with the Ministry of Digital Development and the Ministry of Internal Affairs. Starting from the spring of 2022, Kaspi collaborates with the Ministry of Digital Development, and National Information Technology JSC to offer easy access to personal electronic documents via the app. Today, Kaspi.kz mobile app users can use the following e-government services through the apps. Similar services are also provided by Halyk Homebank app, an online banking platform created by the Halyk Bank, the second largest commercial bank in Kazakhstan. The monthly active users of Halyk Homebank app have reached 4.2 million in 2021 (Halyk Bank, 2021).

Table Ⅵ-7. E-Government Services Available on the Kaspi.kz Mobile App

Accessing identity card and other official documents including COVID-19 vaccination passport Register automobile Renew driver's license Issuing birth certificate Requesting maternity support Request and receive social welfares payments Register private enterprise Make changes to the private enterprise registration Ashyq pass for entering indoors during the COVID-19 quarantine Pay taxes (private and business) Pay fines Request tax deduction for self-employed Pay court fees Access other eGov.kz services	

Source: Kapsi.kz

While it is undoubtable that Kazakhstan made significant advancement in digitalizing public services and overall process of national digital transformation, there are also shortcomings. In 2016, the Kazakh government passed the law "On Fingerprint and Genomic Registration," which authorized the government to collect citizens' biometric data such as fingerprint and DNA, and build an electronic database (Republic of Kazakhstan, 2018).[89] Although the new law was passed to enhance public security and public services convenience, the possibility of government surveillance and personal data protection issues are causing concerns among the citizens (Buralkieva, 2022).[90] The Kazakh government is criticized for paying not enough attention to personal data and privacy protection, making the new system vulnerable to cyber-attacks and data leaks. A recent report by the Davis Centre on digitalization in Central Asia observes that "the current state-centric approach needs to change and put center stage the personal data protection and the democratizing potential of

89) Government of the Republic of Kazakhstan. 31 January 2018. "On Approval of the Rules for Fingerprint and Genomic Registration. *Adilet.* https://adilet.zan.kz/eng/docs/P1800000036

90) Dana Buralkieva. 16 November 2022. "Sbor Biometricheskikh Dannykh." *Cabar.* https://cabar.asia/ru/sbor-biometricheskih-dannyh-s-kakimi-riskami-mogut-stolknutsya-kazahstantsy (1 December 2022)

the digitalization."[91]

Furthermore, many Western observers have criticized the government's online surveillance efforts. For example, the *Freedom on the Net* report published annually by Freedom House (2021), describes Kazakhstan's internet environment as 'not free,' scoring 33 points out of 100 points for free internet. According to the report, the government may remove, block, suspend or restrict access to illegal materials that may "damage the interests of a private person, society, or the state; disseminate information that disrupts the legislation on elections of the Republic of Kazakhstan; contain calls to extremist and terrorist activities, riots, as well as participation in mass (public) events held in violation of legal procedure" (*Zakon Respubliki Kazakhstan*, 2004). Under this law, the Ministry of Information and Social Development in charge of monitoring media contents, blocked 3,765 webpages in 2020, among which 2,242 were blocked for violent, pornographic or suicidal contents, 206 for terrorist and extremist contents, and 31 for copyrights violation (Freedom House, 2021). The Google Transparency Report (2021) also reports that Google has received 66 requests from the Kazakh government to remove more 93,077 YouTube videos for violating the country's counterterrorism law during the second half of 2021. Out of 260,049 removal requests, only 532 contents were removed (Google 2021).

During the January 2022 protests, internet services were shut down for 5 days in Nur-Sultan and Almaty, the country's most populated city. During the internet blackout, the cities' residents experienced difficulties managing their everyday life due to their dependence on digital services. For example, reports suggest that the people struggled to buy food because online payment system was down while many did not carry any hard currency. The government explained that the purpose of the shutdown was to stop violence and spread of misinformation. According to a local commentator, the internet shutdown had the opposite effect, causing outrage among citizens and contributing little to suppressing violent riots (Keegan. 2022).[92]

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91) Ibid.

92) Quoted in Katrina Keegan. 2022. "Information Chaos in Kazakhstan." *The Diplomat* https://thediplomat.com/2022/01/information-chaos-in-kazakhstan/ (1 December 2022)

We conducted a survey to find out whether there is a digital divide in gender, age, income level, education level, and place of residence (location) in Kazakhstan. In addition, we also explored how the people's internet satisfaction level and trust in online services are affected by this digital divide. The survey also asked the respondents what they think were the roles of the government in promoting digital transformation.

3. Developing the Better Digital Inclusiveness Index and Coordinator Marker in the e-Government Sector

1) Survey Methodology

The survey was conducted from July to September in the Almaty city and villages located at the outskirts of the Almaty region. Almaty is the second largest metropolitan city of Kazakhstan located at the heart of the Almaty region. Information was collected through in-person survey of randomized sample of 300 respondent, with 50% of the respondents from the Almaty city and the other 50% from the rural parts of the Almaty region. A summary of variables used in this analysis is also presented below.

Table Ⅵ-8. Summary of Variables Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Case	300	150.5	86.74676	1	300
Age	300	34.64667	11.07176	15	63
Gender	300	1.52	0.500435	1	2
Location	300	1.5	0.500835	1	2
Education	299	5.100334	1.157105	1	7
Income	298	2.137584	1.188269	1	6
Internet cost	297	3.417508	1.488956	1	6
Internet language_Kaz	297	0.46128	0.49934	0	1
Internet language_Rus	297	0.52862	0.500023	0	1
Internet language_Eng	297	0.010101	0.100164	0	1
Internet training	299	1.90301	0.29644	1	2
E-government frequency	293	3.406143	0.845352	1	7

Variable	Obs	Mean	Std. Dev.	Min	Max
Internet speed satisfaction	299	5.22408	3.022281	1	10
Internet price satisfaction	300	4.75	2.73846	1	10
Internet place satisfaction	299	5.61204	3.041655	1	10
Internet device satisfaction	298	6.781879	2.749241	1	10
Internet connection satisfaction	293	5.334471	2.886685	1	10
E-health satisfaction	293	4.83959	2.950192	1	10
E-learning satisfaction	147	6.904762	2.405283	1	10
E-government satisfaction	131	7.48855	2.031924	1	10
Official web trust	263	1.969582	0.809666	1	4
Online news trust	265	2.226415	0.844804	1	4
Official e-gov apps trust	264	2.329545	0.931758	1	4
Social media trust	261	2.666667	0.94054	1	4
Messenger trust	262	2.671756	0.974328	1	9
Video (ex. YouTube) trust	257	2.657588	0.930952	1	4

Source: Authors

Table Ⅵ-9. Education Level Distribution of Respondents

Education	Code	Freq.	Percent
Incomplete Elementary School	1	1	0.33
Graduated from Elementary School	2	5	1.67
Junior Highschool	3	22	7.36
Graduated from Junior Highschool	4	57	19.06
Acquired Secondary Special Education	5	87	29.1
Higher Education without a Degree	6	104	34.78
Higher Education with a Degree or Higher	7	23	7.69
Total		299	100

Source: Authors

Table Ⅵ-10. Income Level Distribution of Respondents

Income (1,000 tenge = 2.3 USD)	Code	Freq.	Percent
Below 47,000 tenge (app. 110 USD)	1	105	35.23
47,470-141,000 tenge (app. 111 USD-326 USD)	2	110	36.91
141,470-235,000 tenge (app. 327 USD-541 USD)	3	39	13.09
235,470-329,000 tenge (app. 542 USD-756 USD)	4	30	10.07
329,470-423,000 tenge (app. 757 USD-972 USD)	5	9	3.02
Above 423,470 tenge (app. 973 USD)	6	5	1.68
Total		298	100

Source: Authors

Table Ⅵ-11. Spending on the Internet of Respondents

Internet Cost (1,000 tenge = 2.3 USD)	Code	Freq.	Percent
Below 2,350 tenge (app. 5 USD)	1	18	6.06
2,820-4,230 tenge (app. 6 USD- 10 USD)	2	84	28.28
4,700-6,110 tenge (app. 11 USD -14 USD)	3	64	21.55
6,580-7,990 tenge (app. 15 USD-19 USD)	4	59	19.87
8,460-9,870 tenge (app. 20 USD-23 USD)	5	31	10.44
Above 9,871 tenge (app. 24 USD)	6	41	13.8
Total		297	100

Source: Authors

In total, 144 males (71 urban residents, 73 rural residents) and 156 females (78 urban residents, 78 rural residents) participated in the survey. The age range was between 15 to 63 and the average age was 34.6. On average, the respondents received at least secondary special education which included specialized vocational schools. More than 42% of the respondents answered that they have received higher education without degree and above. In terms of the monthly income level distribution, the average income was between approximately 111 USD (47,470 tenge) and 326 USD (141,000 tenge), with the largest number of the respondents fall within the same bracket.[93] On the other hand, the average monthly internet service fee the respondents paid was

93) 1000 tenge is approximately 2.3 USD (according to the annual average exchange rate of 2021)

3.42, which fall between the ranges 3 (4,700–6,110 tenge or app. 11 USD –14 USD) and 4 (8,460–9,870 tenge or app. 20 USD–23 USD). The largest number of the respondents paid between 2,820–4,230 tenge (app. 6 USD–10 USD) as monthly internet service fee.

Based on the survey, we aimed at exploring the following questions: 1) who frequently uses e-government services; 2) who is satisfied with these services; and 3), who trusts digital services and information. Based on out exploration of the questions, we propose a new indicator that would help the Kazakh government build a digital environment that is more readily accessible to a wider population, and offers more reliable, satisfactory, and trusted services and information.

2) Survey Results Analysis

(1) E-Government Services Use Frequency

To identify the factors that influence the frequency of e-government services use by individual respondents, we used the respondents' age, gender, place of residence (location), income, and education level as control variables. The following table (Table 11) summarizes the result of the analysis. Model 1 shows the result of analysis using only the control variables. Model 2 demonstrates whether any previous experience on participating in an internet-use training program affects the frequency of e-government services use; Models 3 and 4 demonstrate whether the language used most often when using the internet has any influence on the frequency of e-government services use, with Model 3 representing the Russian language as the primary language used when online and Model 4 representing the Kazakh language as the primary language used when online.

Table Ⅵ-12. Factors Influence the Frequency of E-Government Service Usage

E-gov Frequency	Model 1	Model 2	Model 3	Model 4
Age	0.007	0.007	0.006	0.006
	(0.004)*	(0.004)*	-0.004	-0.004
Gender	-0.163	-0.157	-0.163	-0.159
	(0.097)*	-0.099	(0.097)*	-0.098
Location	0.061	0.035	0.06	0.038
	-0.127	-0.127	-0.128	-0.127
Income	-0.115	-0.123	-0.11	-0.117
	(0.040)***	(0.041)***	(0.040)***	(0.040)***
Education	-0.103	-0.1	-0.109	-0.107
	(0.061)*	(0.061)*	(0.059)*	(0.059)*
Internet Training		0.162		0.143
		-0.229		-0.237
Internet Language: Russian			0.155	0.158
			-0.097	-0.099
_cons	4.09	3.815	4.056	3.812
	(0.471)***	(0.637)***	(0.472)***	(0.653)***
R^2	0.08	0.08	0.08	0.09
N	292	292	290	290

* $p<0.1$; ** $p<0.05$; *** $p<0.01$

Source: Authors

The results indicate that the age, gender, income, and education level of the respondents exert significant influence on the frequency of e-government services use, with the gender difference affecting the frequency more than any other factors. Meanwhile, the place of residence and participation in an internet training program have no significant impact on the frequency of e-government service use. Males more than females use e-government services more frequently. Furthermore, lower a respondent's income and education level, it is more likely that the respondent would use e-government services in a higher frequency.

(2) Digital Public Services Satisfaction Level

Satisfaction with digitalized public services was also surveyed. We measured satisfaction with digitalized services in the sectors that had traditionally been thought of as public service sectors. These include e-health (Model 1), e-education (Model 2), and e-government (Model 3) services. The level of satisfaction with each service is measured in the score range of 1 to 10, with score 1 representing not-at-all satisfied and score 10 representing fully satisfied. For the average satisfaction scores, refer to Table 7 Summary of Variables Statistics. Age, gender, place of residence (location), income, and education of the respondents are used as control variables. Because the survey only asked how frequently the respondents used the e-government services rather than how frequently they used the internet, all models derive the factors that affect the level of satisfaction under the condition that the frequency of e-government use (e-gov_frequency) is the same.

Table Ⅵ-13. Analysis of Factors Affecting Digital Services Satisfaction

	E-health (Model 1)	E-learning (Model 2)	E-gov (Model 3)
E-gov Frequency	-0.59	-0.137	0.203
	(0.217)***	-0.192	-0.231
Age	0.016	0.006	-0.008
	-0.015	-0.018	-0.02
Gender	0.881	-0.07	-0.547
	(0.328)***	-0.349	-0.353
Location	-1.08	-1.844	0.509
	(0.419)**	(0.531)***	-0.456
Income	0.401	0.132	0.442
	(0.182)**	-0.153	(0.133)***
Education	-0.048	0.234	0.073
	-0.141	-0.172	-0.163
_cons	5.933	8.341	5.925
	(1.521)***	(1.760)***	(1.356)***
R^2	0.16	0.25	0.11
N	285	147	130

* $p<0.1$; ** $p<0.05$; *** $p<0.01$

Source: Authors

According to Model 1, the factors that affect e-health satisfaction are e-government use frequency (e-gov_frequency), gender, location, and income. The respondents who are women are more satisfied with e-health services. In addition, the respondents who live in urban areas, have higher income level, and use e-government services less frequently tent to be more satisfied with online health care services.

According to Model 2, the only factor affecting e-government satisfaction is the income level of the respondents. The higher the income, the higher the satisfaction with e-government. According to Model 3, the only factor affecting the level of satisfaction with online learning services is the respondents' place of residence with the people who live in the city tend to be more satisfied with online education.

(3) Digital Services, Contents, and Information Trust Level

According to Models 1 and 5 presented in Table 13, the level of trust on official government websites is higher among the people who live in rural areas and have lower income and education level. In addition, according to Model 2, the respondents who primarily use the Russian language when using the Internet tent to display lower trust in official government websites compared to the people who mainly use the Kazakh or other languages. Higher the satisfaction with internet speed (Model 3) and internet price (Model 4), higher the respondents' trust in the official government website. Finally, Model 7 indicates higher a respondent's age, higher the trust in the government official websites.

Table Ⅵ-14. Factors Affecting Trust: Government Websites

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Age	0.001	0	0.002	0.001	0.001	0	0.011
	-0.004	-0.004	-0.004	-0.004	-0.004	-0.004	(0.006)*
Gender	-0.055	-0.025	-0.078	-0.064	-0.048	-0.096	-0.155
	-0.097	-0.098	-0.095	-0.096	-0.097	-0.097	-0.134
Location	-0.217	-0.217	-0.112	-0.15	-0.242	-0.181	-0.215
	(0.115)*	(0.117)*	-0.124	-0.121	(0.122)**	-0.112	-0.174
Income	-0.132	-0.12	-0.106	-0.136	-0.13	-0.134	-0.172
	(0.046)***	(0.047)**	(0.046)**	(0.047)***	(0.046)***	(0.048)***	(0.064)***
Education	-0.11	-0.1	-0.135	-0.122	-0.104	-0.111	-0.163
	(0.047)**	(0.048)**	(0.047)***	(0.047)***	(0.049)**	(0.046)**	(0.051)***
Lang_Rus	-0.154	-0.174	-0.113	-0.096	-0.146	-0.143	-0.208
	-0.094	(0.095)*	-0.095	-0.097	-0.095	-0.096	(0.120)*
E-gov_freq		0.07					
		-0.054					
Speed_ Sat			0.035				
			(0.018)*				
Price_Sat				0.041			
				(0.020)**			
Device_Sat					-0.014		
					-0.021		
Connection_Sat							
E-gov_Sat							
E-health_Sat						0.022	
						-0.018	
E-learning_Sat							0.032
							-0.03
_cons	3.26	2.934	2.953	3.011	3.344	3.192	3.228
	(0.378)***	(0.450)***	(0.409)***	(0.403)***	(0.399)***	(0.379)***	(0.533)***
R^2	0.07	0.08	0.09	0.09	0.07	0.08	0.15
N	259	255	258	259	257	255	134

* $p<0.1$; ** $p<0.05$; *** $p<0.01$

Source: Authors

The survey also investigated the level of trust in social media, online news, and public applications through which respondents access e-government services. The data shows that the internet language is a factor that influences the respondents' level of trust in social media, with Russian-speaking respondents' trust in the media tends to be higher than the Kazakh-speaking respondents' trust. This result is displayed under Models 1 to 3. According to Model 4, only age has a significant effect on the respondents' level of trust in online news with older respondents displaying higher trust in online news. On the other hand, only the level of education has a significant effect on the respondents' level of trust in government e-gov applications. According to Models 5 and 6, however, higher the level of education of a respondent, lower his or her trust in government applications.

Table Ⅵ-15. Factors Affecting Trust: SNS Messages, Online News, and Official Apps

	SNS_ Trust (Model 1)	SNS_ Trust (Model 2)	SNS_ Trust (Model 3)	News_ Trust (Model 4)	Official App_ Trust (Model 5)	Official App_ Trust (Model 6)
Age	-0.002	-0.002	-0.003	0.01	-0.003	-0.003
	-0.007	-0.007	-0.007	(0.006)*	-0.005	-0.006
Gender	-0.181	-0.157	-0.191	-0.08	-0.048	-0.022
	-0.124	-0.127	-0.122	-0.137	-0.114	-0.116
Location	0.187	0.007	0.158	0.192	0.22	0.141
	-0.149	-0.166	-0.143	-0.174	-0.138	-0.147
Income	-0.058	-0.062	-0.069	-0.003	-0.066	-0.076
	-0.06	-0.058	-0.056	-0.071	-0.054	-0.055
Education	0.008	0.034	0.016	-0.092	-0.097	-0.104
	-0.055	-0.057	-0.055	-0.061	(0.057)*	(0.057)*
Lang_Rus	0.226	0.174	0.232	-0.109	0.02	0.046
	(0.135)*	-0.123	(0.131)*	-0.132	-0.116	-0.113
Speed_Sat	0.021				0.002	
	-0.024				-0.02	
Device_Sat		-0.057				
		(0.030)*				
Connection_Sat						-0.012
						-0.025
E-learning_Sat				0.019		
				-0.029		

	SNS_ Trust (Model 1)	SNS_ Trust (Model 2)	SNS_ Trust (Model 3)	News_ Trust (Model 4)	Official App_ Trust (Model 5)	Official App_ Trust (Model 6)
E-health_Sat			0.013			
			-0.023			
_cons	2.585	3.232	2.714	2.075	2.784	2.975
	(0.547)***	(0.554)***	(0.504)***	(0.568)***	(0.452)***	(0.471)***
R^2	0.04	0.05	0.04	0.06	0.07	0.07
N	258	256	253	136	259	253

* $p<0.1$; ** $p<0.05$; *** $p<0.01$

Source: Authors

(4) Respondent's Expectation of Government Role in Digital Transformation

We asked respondents what they expect the government to prioritize in order to improve the digital environment in Kazakhstan. The government priority areas suggested by the questionnaire were as follows:

① "Build and maintain a telecommunications infrastructure for a stable connection";
② "Make Internet services accessible to the majority of citizens";
③ "Protect of the Internet from external or internal cybersecurity threats";
④ "Protect personal data and private information online";
⑤ "Provide accurate information about laws, policies, and legislatures";
⑥ "Provide reliable information about emergencies";
⑦ "Provide and manage open data";
⑧ "Protecting the Internet from malicious contents," meaning it should provide content monitoring;
⑨ "Provide effective and efficient e-government services";
⑩ "Other (Specify)."

Then we analyzed the results to find out whether the respondents' levels of satisfaction with e-government, e-health, or e-learning services exert any significant influence on their expectations of the government's role in promoting digital transformation.

Table Ⅵ-16. Expectation towards Government Role and Satisfaction

	Infra (Model 1)	Access	Security	Open Data	Content Monitoring	E-Gov Services
Age	0.005	0.003	-0.002	0	-0.001	-0.003
	-0.004	-0.002	-0.002	-0.001	-0.001	(0.001)**
Gender	-0.073	-0.042	0.054	0	-0.011	0.013
	-0.079	-0.049	-0.044	-0.017	-0.02	-0.038
Location	0.169	-0.015	-0.093	0.047	-0.038	0.001
	(0.088)*	-0.05	(0.049)*	(0.020)**	(0.023)*	-0.039
Income	0.013	-0.023	0.01	0.007	0.016	0.006
	-0.035	-0.022	-0.023	-0.005	-0.015	-0.019
Edu	0.075	0.027	-0.036	-0.003	-0.002	0.014
	(0.030)**	-0.022	-0.023	-0.006	-0.007	-0.017
Lang-Rus	-0.095	-0.047	-0.057	-0.015	-0.027	0.081
	-0.081	-0.052	-0.04	-0.017	-0.021	(0.040)**
Egov_freq	-0.13	0.015	-0.013	0.02	0.012	0.007
	(0.040)***	-0.025	-0.028	(0.008)**	-0.01	-0.008
Speed_sat		-0.014				
		(0.008)*				
Connect_sat						
E-gov_sat	0.049					
	(0.017)***					
E-health_sat			-0.012	0.004	-0.008	
			(0.007)*	(0.002)**	(0.005)*	
E-learning_sat						-0.024
						(0.013)*
_cons	-0.419	0.157	0.578	-0.124	0.119	0.153
	-0.272	-0.19	(0.241)**	(0.065)*	-0.081	-0.099
R^2	0.22	0.03	0.05	0.04	0.05	0.12
N	127	286	281	280	280	142

* $p<0.1$; ** $p<0.05$; *** $p<0.01$

Source: Authors

Table Ⅵ-16 indicates that the respondents who live in rural areas than those who live in urban areas are more likely to answer that the government should prioritize on building better internet infrastructure and providing efficient and effective e-government services. The respondents who live in urban areas are more likely to prioritize providing protection against cybersecurity and monitoring possible harmful content should be the areas the government should prioritize In terms of the correlation between satisfaction and government role expectation, the respondents who are generally satisfied with e-government services are more likely to answer that the government should prioritize in infrastructure building. The respondents who have relatively lower satisfaction level with e-health services suggested that the government should prioritize cybersecurity and content monitoring. E-learning services satisfaction level did not influence the respondents' expectation on the government, except that the respondents who are not satisfied with the services may answer that the government should prioritize providing efficient and effective e-government services.

We also analyzed if the level of trust on different online media impacts the respondents' expectation towards the government role. Below Tables 6-17 and 6-18 summarize the results. The results confirm that rural residents are more likely to think that the government should prioritize improving e-government services and building better internet infrastructure, while urban residents are more likely to think that the government should prioritize in providing cybersecurity and personal data protection.

Table Ⅵ-17. Expectation towards Government (E-gov Services) and Trust

	E-Gov Services	E-Gov Services	E-Gov Services	E-Gov Services	E-Gov Services
Location	0.107	0.095	0.087	0.083	0.096
	(0.037)***	(0.040)**	(0.038)**	(0.036)**	(0.038)**
Lang-Rus	0.062	0.076	0.05	0.069	0.068
	(0.031)**	(0.032)**	(0.030)*	(0.029)**	(0.031)**
Egov_freq	0.025	0.011	0.018	0.018	0.013
	(0.014)*	-0.013	-0.012	(0.010)*	-0.012
Official web_trust	-0.037				
	(0.018)**				
Officialapp_trust		0.046			
		(0.025)*			
SNS_trust			0.079		
			(0.020)***		
News_trust					
_cons	-0.064	-0.241	-0.337	-0.286	-0.31
	-0.109	(0.131)*	(0.142)**	(0.136)**	(0.138)**
R^2	0.08	0.08	0.08	0.14	0.13
N	252	252	250	247	251

* $p<0.1$; ** $p<0.05$; *** $p<0.01$

Source: Authors

In terms of the correlation between trust level and expectation towards the government, respondents who are more likely to trust official application and social media are more likely expect effective and efficient e-government services as the government's priority area (Table Ⅵ-17). The respondents who have higher level of trust in official apps are more likely prioritize personal data protection as the government's role (Table Ⅵ-18). The respondents who have lower level of trust in official apps are more likely to prioritize cybersecurity as the government's role. In addition, People who trust online news are more likely to prioritize data protection.

Table Ⅵ-18. Expectation towards Government (E-gov Services) and Trust

	Personal Data	Personal Data	Security	Infra	Infra	Infra
Age	-0.002	-0.003	-0.001	0.005	0.005	0.005
	-0.002	-0.002	-0.002	-0.003	(0.003)*	(0.003)*
Gender	0.057	0.073	0.044	-0.049	-0.057	-0.057
	-0.052	-0.052	-0.045	-0.052	-0.052	-0.051
Location	-0.311	-0.307	-0.084	0.227	0.212	0.213
	(0.059)***	(0.058)***	(0.049)*	(0.061)***	(0.060)***	(0.058)***
Income	-0.034	-0.042	0.005	0.022	0.015	0.023
	-0.03	-0.029	-0.023	-0.026	-0.026	-0.024
Education	-0.044	-0.042	-0.051	0.062	0.066	0.055
	-0.027	-0.027	(0.023)**	(0.025)**	(0.025)***	(0.025)**
Lan_Rus	0.099	0.114	-0.077	0.04	0.045	0.005
	(0.051)*	(0.051)**	(0.044)*	-0.054	-0.054	-0.052
Egov_freq	-0.011	-0.006	0.033	-0.091	-0.085	-0.088
	-0.029	-0.029	-0.032	(0.029)***	(0.028)***	(0.028)***
Official web_trust						
Official app_trust	0.062		-0.056			
	(0.029)**		(0.024)**			
SNS_trust						
News_trust		0.061				-0.074
		(0.031)*				(0.027)***
_cons	0.823	0.842	0.565	-0.063	-0.093	-0.043
	(0.277)***	(0.278)***	(0.264)**	-0.228	-0.221	-0.224
R^2	0.14	0.15	0.07	0.15	0.14	0.15
N	252	253	253	248	252	254

* $p<0.1$; ** $p<0.05$; *** $p<0.01$

Source: Authors

To sum, the survey results draw a very complex picture of the current state of digital transformation and digital inclusiveness in Kazakhstan. The results have revealed that gender, income, and education level influences how often a person uses e-government services, with males, low-income earners, and persons with low-level of education tend to use the services more frequently. The place of residence did not

influence how frequently a person uses e-government services.

However, regarding the people's satisfaction level with online services such as e-government, e-health, and e-learning that had previously been supplied by the public sector in Central Asia, the place of residence does exert significant influence, with urban residents are more likely be satisfied with e-government, e-health, and e-learning services. In addition, high-income earners are more likely be satisfied with e-government and e-health services. Gender only exerts influence on e-health services satisfaction level, with females rather than males more likely be satisfied. In addition, the majority of survey respondents answered that the reason they may be satisfied with e-government and e-learning services are because online services are easier to access and use; faster and more efficient; and cheaper compared to in-person services. However, the majority of respondents answered that the reasons they may be dissatisfied with e-health services are because the services are difficult to access and use; slower and less efficient; and more expansive than person-to-person services. The respondents also remarked that the e-health apps often "freeze" and provide "incorrect or expired information."

In terms of trust, our survey confirmed the 3I results with the respondents displaying relatively higher level of trust on official public internet resources. In addition, people who are older, live in rural areas, and have low-level of education tend to have higher level of trust on government websites while people with low-level of education regardless of their place of residence or age tend to show higher level of trust in government apps. On the other hand, Russian-speakers are more likely show lower level of trust towards official websites compared to Kazakh-speakers.

The survey also indicated that respondents who live in rural areas than those who live in urban areas are more likely to think that the government should prioritize on building better internet infrastructure and providing efficient and effective e-government services. The respondents who live in urban areas are more likely to prioritize providing protection against cybersecurity and monitoring possible harmful content should be the areas the government prioritizes. In addition, respondents who

are more likely to trust official application are more likely to expect that the government should prioritize providing effective and efficient e-government services. They also expect that the government should prioritize personal data protection. However, the respondents who have lower level of trust in official apps are more likely to prioritize cybersecurity as the government's role. Interestingly, many respondents also responded that the government should censor obscene adds or ban pop-ups and adds entirely.

4. Conclusion: Application of the Better Digital Inclusiveness Index Metrics and Its Impact

Overall, we may speculate that the higher satisfaction level is due to better internet services provided by better internet infrastructure, especially in the urban areas, and by individual's financial capability which determines his/her accessibility to better internet services. However, this is only a part of the picture. Recently, the Kazakh government reported that there has been complaints by e-government users which led the government to introduce new log-in technology such as face-recognition and figure print-recognition. In the words of Rostislav Konyashkin, Chairman of the National Information Technologies JSC, the semi-government agency in charge of digitalizing government services,

> "Previously we received complaints from users that refusal from one-time SMS password causes certain inconveniences during authorization and they do not want to undergo biometrics process. However, Digital ID provides Kazakhstani citizens with more capabilities for service obtainment compared to one-time password. Moreover, authorization process using biometrics became easier and time-efficient. We are also concerned with personal data protection of Kazakhstani citizens and this authorization option has a lot of advantages"[94]

94) "Access to eGov Mobile app available through the biometrics." 22 July 2022. *E-gov.kz Portal*. https://egov.kz/cms/en/news/egov_biometric (10 September 2022)

The government referred to the same issue and repeated complaints when introducing QR-code technology as an alternative to the EDS in November 2022.[95] Installing new technology such as biometric data to e-government services certainly enhances efficiency and convenience. In addition, it also helps promote new digital innovation since the government rather than the market serves as the key investor in technology innovation that eventually trickles down to private businesses. According to the Vice Minister of

Yet, these technological updates on the e-government services happen too fast and does not allow enough time for citizens to adapt to the new technology. This is confirmed by the oral responses collected from the survey. Many respondents complained that the QR-code and electronic digital signature (EDS) password system, used to identify individual users and grant them access to the e-gov applications, often freeze, or repeatedly ask for the log-in information without granting the access. Some respondents also expressed frustration and confusion with not knowing the extent of the e-government services available online. Others said that they agreed that privatization of public services adds efficiency and convenience, but they are also concerned that the private companies may compromise service quality, transparency, and personal data protection. Overall, Kazakh citizens feel that they don't have any other options than to rely on online services and information, but do not feel that they are safe or reliable unless provided by the government or the public sector. This suspicion undermines the people's trust in online resources. Therefore, some respondents suggested that the government should monitor the internet and strengthen measures against online scams and virus attacks.

To conclude, we propose that the government introduces a mechanism or a marker as a part of its Digital Strategy which evaluates national users' adaptability to new technologies before upgrading or introducing them to e-government and other online public services platforms. This is especially important when the government

95) "Kazakhstan introduces digital signature alternative." 12 November 2022. *Jibek Joly News*. https://www.youtube.com/watch?v=Mcn6o1dTNKc (1 December 2022)

collaborates with private technology companies and fin-tech enterprises with the goal of enhancing convenience and efficiency of e-government services. In the course of the study, we have discovered that while local and global IT and fin-tech companies offer impressive innovations to win the government investment, these technologies may contribute to widening the existing digital gap as a side-effect if they are not tested for adaptability before wider implementation. Furthermore, it is crucial that the government implements personal data protection laws and regulations for both public and private sector digital services. The level of confidence and trust the Kazakh users have towards online services depend on the providers ability to protect the data and services from possible cybersecurity threats such as data leakages, scams, and fake information.

Ⅶ. Use of the K-BDI Index in South Korea's Digital ODA Strategy for Central Asia

1. South Korea's ODA to Central Asia

1) South Korea's Cooperation with and ODA to Central Asia

From January to April 1992, right after the official dissolution of the Soviet Union, South Korea established official diplomatic relations with the five Central Asian countries and developed them through multilateral and bilateral cooperation systems.[96)]

In 2006, South Korea set up *A Plan to Enter Central Asia* and established the Korea-Central Asia Cooperation Forum to carry out the plan.[97)] The Korea-Central Asia Cooperation Forum is a venue for multilateral cooperation where foreign ministers and vice-minister level delegations from Korea and five Central Asian countries, as well as key figures from the business, academia, and cultural fields, participate in to build a human network and discover joint public-private cooperation projects. As of 2020, a total of 13 meetings have been held.[98)] In 2007, the 'Northern Economic Cooperation Committee' (directly under the president) was established to materialize the 'New Northern Policy,' and South Korea's Central Asia policy is known to have developed from a secondary nature of North Korea's unification policy to an independent geo-economic nature.[99)]

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96) Specifically, official diplomatic relations were established with Uzbekistan and Kazakhstan in January 1992, Kyrgyzstan in February, and Turkmenistan and Tajikistan in April 1992.

97) Koh, Jae-nam. 2009. *"Korea's Diplomacy to Central Asia." Korea's Diplomacy to Large Developing Countries: Past, Present, and Future*. Hanul. 101-159.

98) Please refer to the website of the Ministry of Foreign Affair. https://www.mofa.go.kr/www/wpge/m_21617/contents.do (June 3, 2022)

99) This is an interpretation of South Korea's policy towards Central Asia in the context of the Northern Policy.' Although the five Central Asian countries were regionally included as the target of the Northern Policy proposed in 1988, the five Central Asian countries that were part of the Soviet Union at the time were not included at the strategic level

In addition to the multilateral level, diplomatic relations between South Korea and the five Central Asian countries have also developed through bilateral relations. The bilateral relationship between South Korea and Uzbekistan was upgraded to a "strategic partnership" in 2006 and to a "special strategic partnership" in 2019.[100] South Korea and Kazakhstan were developed a "strategic partnership" in 2009, and South Korea and Turkmenistan, a "reciprocal partnership" in 2008.[101] During this process, 18 Korea-Uzbekistan summits, 15 Korea-Kazakhstan summits, 5 Korea-Turkmenistan summits, 2 Korea-Kyrgyzstan summits, and 2 Korea-Tajikistan summits were held.[102]

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of the Northern Policy. Even in the subsequent Northern Policy, Central Asia had a strong character as a secondary diplomatic target for resolving North Korean and unification issues. Then, around 2006, when resource security emerged as an important issue in the international community, five Central Asian countries rich in resources began to emerge as independent diplomatic targets. Jung, Ki-woong. 2021. "Northern Policy of Successive Governments after the Roh Tae-woo Administration: From Unification Policy to National Strategy." *International Area Studies*, 25(1) 243-268.

100) South Korea Policy Briefing
https://www.korea.kr/news/policyNewsView.do?newsId=148860204 (October 1, 2022.)

101) Data on each country. the Ministry of Foreign Affairs
https://www.mofa.go.kr/www/wpge/m_21617/contents.do (June 3, 2022)₩

102) Reference was made to the website of the Ministry of Foreign Affairs
https://www.mofa.go.kr/www/wpge/m_21617/contents.do (June 3, 2022)

Table Ⅶ-1. Diplomatic Relations b/w South Korea and 5 Central Asian Countries

	Diplomatic Relations	Summits
Kazakhstan	1992. Establishment of Diplomatic Relations 1993. Establishment of South Korea's diplomatic missions abroad in KAZ 1995. Establishment of Kazakhstan's diplomatic missions abroad in KOR 2009. Strategic Partnership	15 summits 1995 (KOR), 2003 (KOR), 2004 (KAZ), 2008 (Beijing Olympic), 2009 (KAZ), 2010 (KOR), 2011 (KAZ), 2012 (KOR), 2012 (KAZ), 2013 (G20 Summit), 2014 (KAZ), 2014 (ASEM Summit), 2016 (KOR), 2019(KAZ), 2021 (KOR)
Kyrgyzstan	1992. Establishment of Diplomatic Relations 2007. Establishment of South Korea's diplomatic missions abroad in 2008. Establishment of Kyrgyzstan's diplomatic missions abroad in KOR	2 summits: 1997 (KOR), 2013 (KOR)
Tajikistan	1992. Establishment of Diplomatic Relations 2015. Establishment of Tajikistan's diplomatic missions abroad in KOR 2021. Establishment of South Korea's diplomatic missions abroad in TJK	2 summits 2005 (KOR) 2015 (KOR)
Turkmenistan	1992. Establishment of Diplomatic Relations 2007. Establishment of South Korea's diplomatic missions abroad in TKM 2008. Reciprocal partnership 2013. Establishment of Turkmenistan's diplomatic missions abroad in KOR	5 summits 2008(Beijing Olympic), 2008(KOR), 2014(TKM), 2015(KOR), 2019(TKM)
Uzbekistan	1992. Establishment of diplomatic relations 1993. Establishment of South Korea's diplomatic missions abroad in UZB 1997. Establishment of Uzbekistan's diplomatic missions abroad in KOR 2006. Strategic partnership 2019. Special strategic partnership	18 summits 1992 (KOR), 1994 (UZB), 1995 (KOR), 1999 (KOR), 2005 (UZB), 2006 (KOR), 2008 (KOR), 2008 (Beijing Olympic), 2009 (UZB), 2010 (KOR), 2011 (UZB), 2012 (KOR), 2014 (UZB), 2015 (KOR), 2017 (KOR), 2019 (UZB), 2021 (Video Conference), 2021 (KOR)

Source: Ministry of Foreign Affairs
https://www.mofa.go.kr/www/wpge/m_21617/contents.do (June 1, 2022.)

Along with the development of cooperative relations between South Korea and the five Central Asian countries, ODA policies to Central Asia were also systematized. Increase in foreign aid projects' was included as one of the measures to develop cooperative relations between Korea and Central Asia in the 'Comprehensive Measures to Advance into Central Asia' prepared in 2006, and the 'Mid-term Comprehensive Support Plan for Each Country (2007-2009)' included a plan to implement comprehensive grant aid to Uzbekistan and Kazakhstan.[103] In addition, in 2007, the ODA Mid-term Country-by-Country Aid Strategy (2008-2010), which included Uzbekistan and Kazakhstan, was prepared.[104]

For reference, the ODA mid-term country-by-country aid strategy was prepared to integrate priority partner countries individually selected by the Ministry of Foreign Affairs and Trade and the Ministry of Strategy and Finance for grant and concessional aid. At that time, the Ministry of Foreign Affairs and Trade selected 18-19 priority partner countries from among grant aid partner countries from 2005, and the Ministry of Strategy and Finance selected priority partner countries for concessional aid (loan) from 2007 based on the 'Guidelines for Operating the External Economic Cooperation Fund'.[105]

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103) Koh, Jae-nam. 2009. *Korea's diplomacy toward Central Asia, Korea's diplomacy toward developing countries: past, present, and future*. Hanul. 156.

104) Collaboration with related ministries. 2008. *Establishment of ODA mid-term country aid strategy (draft) (2008~2010)*, report materials of the 3rd International Development Cooperation Committee, 4.

105) Park Bok-young et al. 2013. *A Study on the Criteria and Methods for Selecting Priority Partner Countries*. ODA Policy Research 13-03, KIEP Institute for International Economic Policy, 24-25

Table Ⅶ-2. Prior to 2010, Changes in Central Asia's priority partner countries for loans and grants and countries that established cooperation strategies for each country

		Grants	Grants	Grants	Loans	ECSEC
CIS	Common	Uzbekistan				
		Kazakhstan			-	Kazakhstan
	Addition	-	-	-	Azerbaizan	-
	Total	2	2	2	2	3

Note: It is known that priority partner countries for loan aid in 2011 and 2008/09 were also selected, but they were not included because they were not disclosed.

Source: Collaboration with related ministries. 2008. *Establishment of ODA mid-term country aid strategy (draft)* (2008~2010), Report of the 3rd International Development Cooperation Committee, p. 4.; Park, Bok-young et al. 2013. *A Study on the Criteria and Methods for Selecting Priority Cooperation Countries*, ODA Policy Research 13(03), KIEP Institute for International Economic Policy. 24-25

Later, in accordance with the Framework Act on International Development Cooperation enacted in 2010, the selection of priority partner countries was further systematized. In this process, Uzbekistan was continuously included, and Kyrgyzstan and Tajikistan were included in the 3rd priority partner countries (2021-2026).

Table Ⅶ-3. Priority Partner Countries in Central Asia since 2010

		1st (2011-2015)	2nd (2016-2020)	3rd (2021-2026)
Central Asia	Common	Uzbekistan		
		Azerbaijan		
	Addition	-	-	Kyrgyzstan Ukraine Tajikistan
	Total	2	2	4

Source: Collaboration with related ministries. 2021. *Re-selection of ODA Priority Partner Countries*, resolution agenda of the 36th International Development Cooperation Committee 36 (3). 1-3.

Accordingly, the Uzbekistan Country Partnership Strategy has been prepared twice. The 1st Uzbekistan Country Partnership Strategy (2012-2015) sets high-level goals to 'enhancement of industrial competitiveness, improvement of national welfare, economic reform, policy capacity building and efficiency by 2015' in response to Uzbekistan's '5-year industrial development plan'. In order to achieve this goal, 'human resource development,' 'health/medical care,' and 'public administration' were selected as priority areas for cooperation, and more than 70% of the total amount of support was focused on these areas. As a result, the proportion of the budget spent by sector was 57% (USD 6,400) for education, 15% (USD 16.81 million) for health, and 4%-6% for the rest of the sectors.[106)]

The 2nd Uzbekistan Country Partnership Strategy taking into consideration Uzbekistan's 'Vision 2030', is to achieve the following goals, 'strengthening national competitiveness through human resource development', 'enhancement of public welfare through improvement of water management and health care system', 'e-government and public sector's efficiency enhancement through capacity building.' In order to achieve those goals, education, water management and sanitation, and public administration were selected as key areas. Later, as the New Uzbekistan National Development Strategy ('17-'21) was prepared by the new president of Uzbekistan, the regional development sector was added to the Uzbekistan

106) Collaboration with related ministries. 2016. *Uzbekistan Country Partnership Strategy.*

Country Partnership Strategy to reflect this, and the 'e-government support plan using ICT technology' was supplemented.[107)]

Meanwhile, the Country Partnership Strategies for Kyrgyzstan and Tajikistan were prepared in 2022. The Kyrgyzstan Country Partnership Strategy reflecting the 'Kyrgyzstan National Development Strategy (2018-2040)' pursues the following goals, 'reducing the impact of climate change and supporting entry into a green economy', 'supporting income increase through environmental improvement and productivity increase in rural areas' , 'enhancement of administrative transparency and efficiency through support for digitalization in the public sector', 'improvement of national health through improvement of the health care system and strengthening of the ability to respond to infectious diseases'. Based on this, the environment sector, public administration sector, health and sanitation sector, etc. have been set as priority support directions.[108)]

In consideration 'Tajikistan National Development Strategy 2030', the Tajikistan Country Partnership Strategy includes the following goals, 'strengthening of human/physical infrastructure to foster comparative advantage industries', 'nurturing future talents by strengthening access to technical education by industry and supporting basic and higher education'. The support goals were set to increase energy accessibility and efficiency through the establishment and advancement of eco-friendly energy infrastructure, and to increase farm household income and strengthen food security through agricultural technology support. Based on this, industry, education, energy, agriculture, forestry and fisheries, and transportation were set as the priority support directions.[109)]

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107) Collaboration with related ministries. 2020. *Amendment of Country Partnership Strategy for 5 Priority Cooperation Countries (Azerbaijan, Uzbekistan, Myanmar, Cambodia, Philippines).*

108) Collaboration with related ministries. 2022. *Kyrgyz Republic Country Partnership Strategy.*

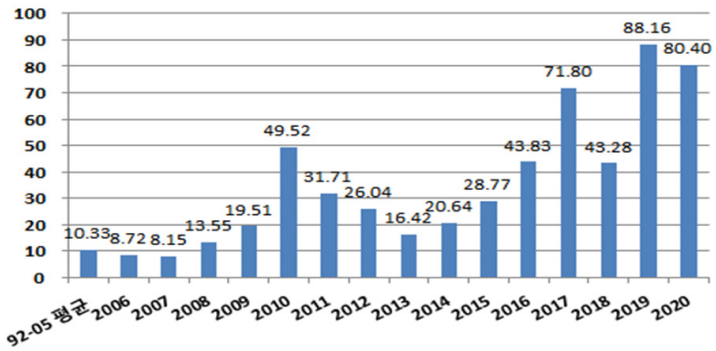
109) Collaboration with related ministries. 2022. *Tajikistan Country Partnership Strategy.*

2) Distribution of Korea's ODA to Central Asia

Following these policy developments, Korea's ODA to the five Central Asia countries, which began in 1992, gradually increased from less than $100,000 to about $80 million in 2020. The share of Korea ODA to Central Asia in all of Korea ODA also increased from 2.21% in 2006 to 4.18% in 2020. The fact that the average share of ODA to Central Asia across DAC member countries was less than 1% during the same period suggests that Korea's ODA policy to Central Asia is being dealt with relative importance.

Figure Ⅶ-1. Trends in South Korea's Total ODA to Central Asia (1992-2020)

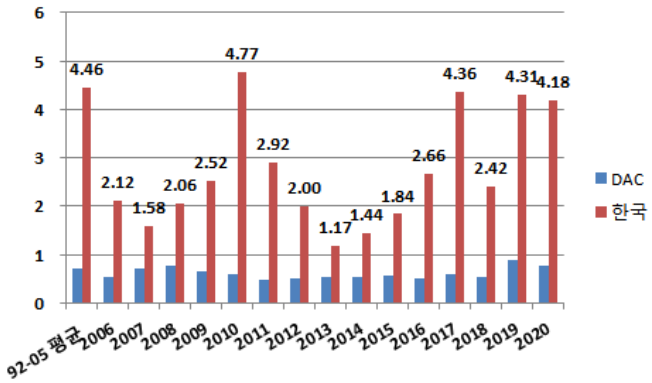
(Unit: USD million, constant value in 2020)



Source: OECD DAC QWIDS extract composition

Figure Ⅶ-2. Trends in ODA share in Central Asia (1992-2020)
(DAC Member States vs. South Korea)

(unit: %)

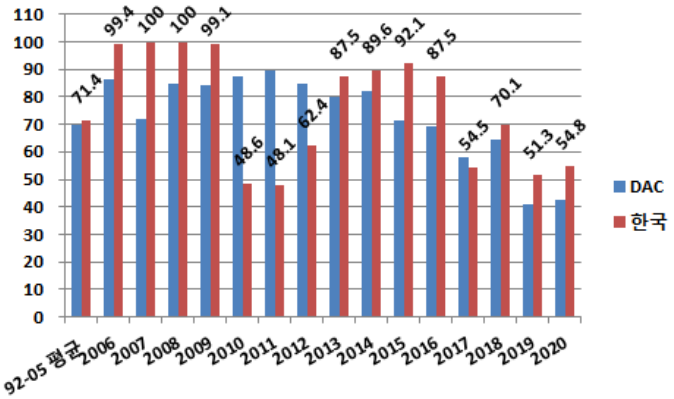


Source: OECD DAC QWIDS extract composition

Looking at the grant aid ratio among Korea's ODA to Central Asia, it was about 71% before 2006, and it was almost 100% from 2006 to 2009. After that, the share started to decline gradually and reached about 54.8% in 2020, but it was higher than the average of DAC member countries.

Figure Ⅶ-3. Trends in the Share of Grants in Central Asia (1992-2020)
(DAC Member States vs. South Korea)

(unit: %)

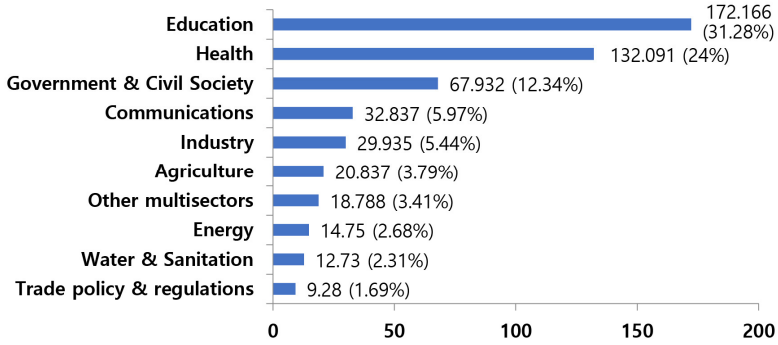


Source: OECD DAC QWIDS extract composition

On the other hand, when South Korea's ODA to Central Asia is classified by sector and summing up the size of ODA from 2006 to 2020, ODA for 'education' (31.28%) and 'health' (24%) is higher than other sectors. The next highest ODA sectors are 'government and civil society' (12.34%), 'communications' (5.97%), and 'industry' (5.44%). 'water and sanitation' and 'trade policies and regulations' that are included in the top 10 major sectors.

Figure Ⅶ-4. South Korea's ODA volume by sector in Central Asia (2006-2020 total, top 10 sectors)

(Unit: USD million, constant value in 2020)



Source: OECD DAC CRS database extract composition

The share of South Korea's ODA by sectors differs depending on the period. First of all, the South Korea's ODA for education sector has been the largest share since 2006, and it also accounted for 78.19% in 2011. Since then, the share has decreased and maintained at 20%-30%. In 2015, the education sector accounted for about 9%, while support for 'government and civil society' accounted for 38.9%. Along with the education sector, ODA to the health sector accounted for a high proportion. In particular, it accounted for about 25% in 2008, and from 10% to 30% after 2012, about 38% in 2017 right after Corona 19, and about 45% in 2020. In addition, the communications sector occupied a large share for four years after 2006, then showed a decreasing trend, but in 2018, right before Corona 19, it expanded to 13.58%. In addition, in the case of public administration and civil society, it has steadily expanded since 2014, reaching 21% right before COVID-19. Until just before COVID-19, support for the industrial sector was on the rise, and agriculture, energy and other multi-sectors accounted for a large share in the middle.

Table Ⅶ-4. Trends in ODA share in Central Asia by sector (2006-2020, top 10 sectors)

(Unit: %)

	Educa-tion	Health	Government & Civil society	Communi-cations	Industry	Agricul-ture	Other multi-sectors	Energy	Water & Sanitations	Trade Policies & regulations
2006	44.30	11.91	18.06	12.89	0.86	1.15	0	0.67	0	4.71
2007	45.77	9.19	4.31	25.71	5.87	0.00	0.70	0.17	0	5.12
2008	29.15	24.56	11.89	10.51	0.43	7.43	0.16	0.63	0	3.08
2009	28.83	5.92	19.52	21.19	0.82	0.02	2.08	5.91	1.30	7.04
2010	65.42	9.40	1.54	2.52	0.16	0.09	2.20	10.27	4.42	1.30
2011	78.17	3.77	2.39	2.86	0.83	2.03	2.84	2.52	0.72	0.95
2012	35.40	28.34	2.52	3.33	0.81	13.70	7.34	3.37	0	0
2013	27.19	14.58	5.98	3.67	2.05	8.88	11.15	8.67	0	4.01
2014	26.12	21.25	18.90	5.33	4.54	3.57	3.45	2.41	0	0.81
2015	23.27	10.08	32.75	4.57	7.95	3.66	3.97	1.30	1.71	0.91
2016	19.21	11.63	18.23	9.49	11.04	2.37	5.10	0.66	1.52	1.51
2017	8.92	38.13	16.94	8.30	10.46	3.47	2.76	0.42	2.70	1.99
2018	20.19	10.20	21.00	13.58	14.89	6.19	3.40	0.95	2.11	0.14
2019	31.64	33.51	9.53	1.75	6.74	3.07	2.28	2.27	3.24	0.29
2020	25.62	45.38	8.05	0.60	0.39	4.12	3.75	1.71	3.97	2.77

Source: OECD DAC CRS database extract composition

Looking at South Korea's ODA to Central Asia by country and period, the proportion of ODA to Uzbekistan is higher than to others. Specifically, Korea's ODA to Uzbekistan was 5 million dollars (61.7%) in 2006, exceeded 10 million dollars (53.09%) in 2009, and reached about 38 million dollars (78.05%) in 2010. After that, it fell for a short period, but since 2017 it has surged to about 56.8 million dollars (79.22%), and reached about 58.45 million dollars (72.70%) in 2020. The country that received the second largest amount of ODA after Uzbekistan in Korea's ODA to Central Asia was Kazakhstan (maximum 40.18% to minimum 4.64%) until 2012, and then Kyrgyzstan (maximum 15.63%, minimum 8.31%).

Table Ⅶ-5. South Korea's ODA volume and proportion to five Central Asian countries (1992-2020)

(Unit: USD millions, constant value in 2020, %)

		KAZ	KGZ	TJK	TKM	UZB	Total
92-05 average	Size	2.59	1.65	0.16	0.01	5.92	10.33
	Share	(25.03)	(15.98)	(1.56)	(0.12)	(57.32)	(100)
2006	Size	2.71	0.63	0.07	0.02	5.29	8.72
	Share	(31.08)	(7.22)	(0.80)	(0.23)	(60.67)	100
2007	Size	2.63	0.15	0.22	0	5.15	8.15
	Share	(32.27)	(1.84)	(2.70)	(0)	(63.19)	(100)
2008	Size	4.84	0.81	0.2	0.13	7.57	13.55
	Share	(35.72)	(5.98)	(1.48)	(0.96)	(55.87)	(100)
2009	Size	7.84	0.91	0.19	0.21	10.36	19.51
	Share	(40.18)	(4.66)	(0.97)	(1.08)	(53.10)	(100)
2010	Size	5.05	2.03	2.67	1.12	38.65	49.52
	Share	(10.20)	(4.10)	(5.39)	(2.26)	(78.05)	(100)
2011	Size	2.98	1.27	0.78	0.73	25.95	31.71
	Share	(9.40)	(4.01)	(2.46)	(2.30)	(81.84)	(100)
2012	Size	1.2	1.06	0.5	0.34	22.94	26.04
	Share	(4.61)	(4.07)	(1.92)	(1.31)	(88.10)	(100)
2013	Size	0.62	1.36	0.69	0.11	13.64	16.42
	Share	(3.78)	(8.28)	(4.20)	(0.67)	(83.07)	(100)
2014	Size	0.94	2.3	0.62	0.03	16.75	20.64
	Share	(4.55)	(11.14)	(3.00)	(0.15)	(81.15)	(100)
2015	Size	1.19	8.05	0.84	0.3	18.39	28.77
	Share	(4.14)	(27.98)	(2.92)	(1.04)	(63.92)	(100)

		KAZ	KGZ	TJK	TKM	UZB	Total
2016	Size	2.75	9.46	0.31	0.14	31.17	43.83
	Share	(6.27)	(21.58)	(0.71)	(0.32)	(71.12)	(100)
2017	Size	1.82	11.63	1.08	0.4	56.87	71.8
	Share	(2.53)	(16.20)	(1.50)	(0.56)	(79.21)	(100)
2018	Size	1.19	5.46	0.36	1.24	35.03	43.28
	Share	(2.75)	(12.62)	(0.83)	(2.87)	(80.94)	(100)
2019	Size	1.91	9.37	3.49	3.97	69.42	88.16
	Share	(2.17)	(10.63)	(3.96)	(4.50)	(78.74)	(100)
2020	Size	2.62	12.56	5.32	1.45	58.45	80.4
	Share	(3.26)	(15.62)	(6.62)	(1.80)	(72.70)	(100)
Total	Size	76.49	90.16	19.59	10.36	498.54	695.14
	Share	(11.00)	(12.97)	(2.82)	(1.49)	(71.72)	(100)

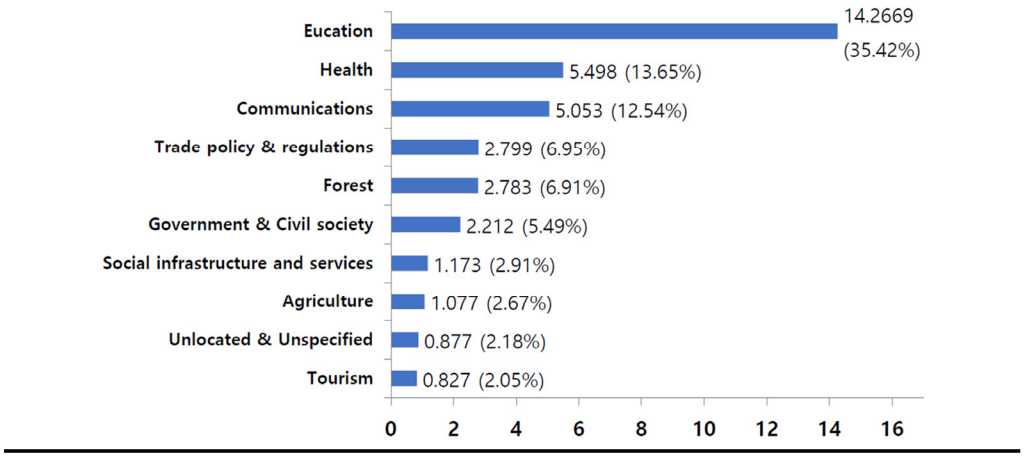
Source: OECD DAC QWIDS extract composition

When looking at ODA by country by sector, ODA for education occupies a large portion, but there are some differences.

First of all, the sector that accounts for the largest share of South Korea's ODA to Kazakhstan is education, and the amount of ODA from 2006 to 2020 reached about 14 million dollars (35.42%).

Figure Ⅶ-5. South Korea's ODA to Kazakhstan by sector (2006-2020 total, top 10 categories)

(Unit: USD millions, constant value in 2020)



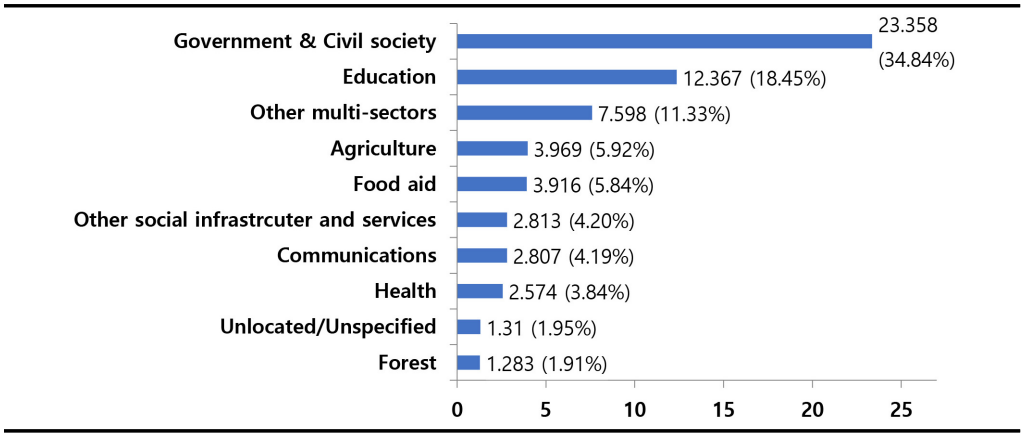
Source: OECD DAC CRS database extract composition

It is followed by the health sector (approximately $5.5 million, 13.65%) and communi-cations (approximately 5.1 million dollars, 12.54%), behind which are the sectors of trade policy and regulation, forestry, and government & civil society with 2 million dollars each (5%).

In the case of Kyrgyzstan, the largest portion of South Korea's ODA is the sector of government and civil society, with contributions from 2006 to 2020 amounting to approximately 23 million dollars (34.84%). It is followed by education sector (approximately 12 million dollars, 18.45%) and other multi-sectors (approximately 7.6 million dollars, 11.33%).

Figure Ⅶ-6. South Korea's ODA to Kyrgyzstan by sector(2006-2020 total, top 10 categories)

(Unit: USD millions, constant value in 2020)



Source: OECD DAC CRS database extract composition

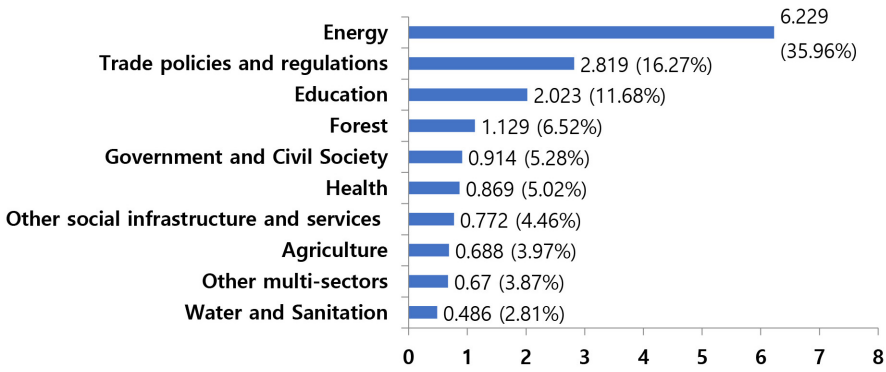
And then the rest of portion of South Korea's ODA to Kyrgyzstan are for the sectors of agriculture, food aid, other social infrastructure & services, communications, and health care.

The energy sector accounts for the largest portion of South Korea's ODA to Tajikistan, with the amount of aid from 2006 to 2020 reaching approximately 6.23 million dollars (35.96%). It is followed by the sectors of trade policy and regulation (about 2.81 million dollars, 16.27%) and education (about 2.02 million dollars, 11.68%). And other

sectors included in the top 10 portions of South Korea's ODA to Tajikistan are forestry, government and civil society, health, other social infrastructure and services, agriculture, other multi-sector, and water supply and sanitation.

Figure Ⅶ-7 South Korea's ODA to Tajikistan by sector(2006-2020 total, top 10 categories)

(Unit: USD millions, constant value in 2020)



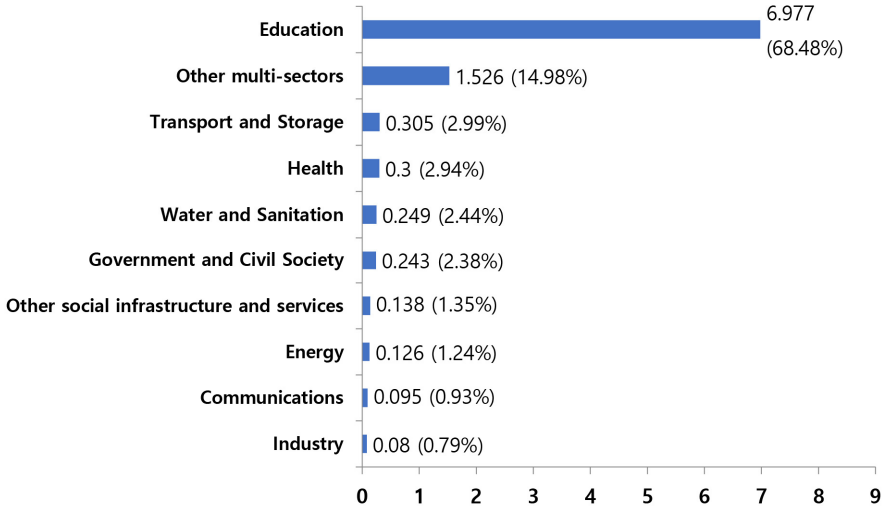
Source: OECD DAC CRS database extract composition

The sector that accounts for the largest portion of South Korea's ODA to Turkmenistan is the education sector. The scale of aid from 2006 to 2020 was approximately 6.98 million dollars (68.48%), far greater than aid to other sectors. It is followed by other multi-sectors with about 1.57 million dollars (14.98%). South Korea's ODA to Turkmenistan for the rest of the sectors are all fall short of 1 million dollars, which include transportation and storage, health, water and sanitation, government and civil society, other social infrastructure and services, energy, communications, and industry.

The sector that accounts for the largest portion of Korea's ODA to Uzbekistan is education, with the amount of aid from 2006 to 2020 reaching approximately 136.53 million dollars (32.85%). It is followed by health (approximately 122.85 million dollars, 29.56%), government and civil society (approximately 41.21 million dollars, 9.91%), followed by industry (approximately 28.8 million dollars, 5.94%) and communications (approximately 41.21 million dollars). $24.7 million, 5.94%).

Figure Ⅶ-8. South Korea's ODA to Turkmenistan by sector(2006-2020 total, top 10 categories)

(Unit: USD millions, constant value in 2020)

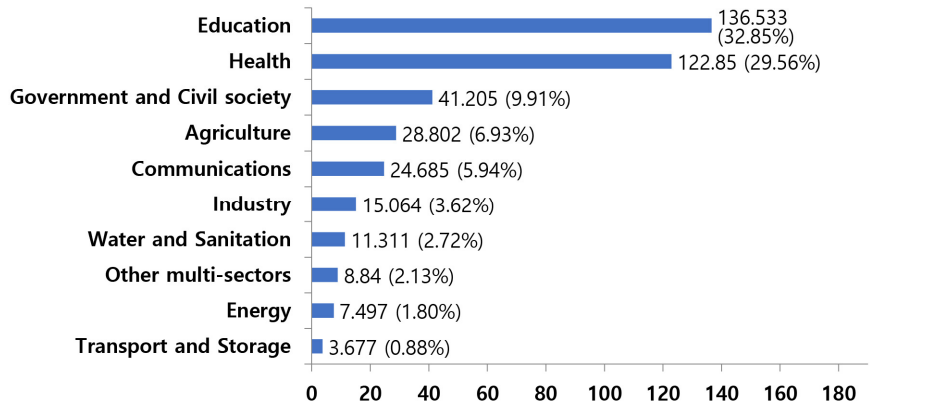


Source: OECD DAC CRS database extract composition

In addition, the rest of sectors within the top 10 sectors of South Korea's ODA to Uzbekistan are agriculture, water and sanitation, other multi-sectors, energy, transport and storage sectors with a share of less than 5%.

Figure Ⅶ-9. South Korea's ODA to Uzbekistan by sector(2006-2020 total, top 10 categories)

(Unit: USD millions, constant value in 2020)



Source: OECD DAC CRS database extract composition

2. Current Status and Evaluation of South Korea's Digital ODA to Central Asia

1) Current Status of South Korea's Digital ODA to Central Asia[110]

There are limitations in accurately examining South Korea's digital ODA status to Central Asia. The reason is that the definition of digital ODA has not been clearly established as mentioned in previous studies or earlier in this report, and there is no DAC CRS code to distinguish it. Therefore, as in the previous report, the pure type of digital ODA corresponding to 'communication (CRS code 22000), and the converged type of digital ODA refers to those cases including ICT-related matters. The converged type of digital ODA cases in this chapter was extracted using DAC CRS data, and refers to those cases in which IT, ICT, computers, or related technologies (e.g., Radar) are included in the title or description of an individual project.[111]

Based on this classification, South Korea's current digital ODA to Central Asia is divided into pure and converged, and based on this, we will examine the whole of Central Asia and each country in detail.

Looking at the digital ODA status of South Korea to the five Central Asian countries from 2016 to 2020, digital ODA (about 88.18 million dollars) accounted for about 26.9% of the total ODA (about 327.27 million dollars). Based on the number of projects, the share has declined to account for about 13.3% (156 cases / 1,174 cases). In the case of pure digital ODA, it is about 5.51% (about $ 18.03 million) of the total

110) South Korea's digital ODA to Central Asia can be traced back to the early 1990s, and since then it has been carried out as a support project for developing countries at the level of relevant ministries. Lee, Heejin et al., 2007. "Will Information and Communication Technology Bring Development to Developing Countries?" *International Area Studies* 16(4) Winter. 113-141.

111) For reference, DAC QWID data and the annual comprehensive action plan of the International Development Cooperation Committee were used to identify the current status of digital ODA in this report. Since the list of detailed projects has been disclosed in the annual comprehensive action plan of the International Development Cooperation Committee since 2016, statistical information after 2015 is included here.

ODA.

Meanwhile, the size of digital ODA differs by year, rising the most in 2019 (approximately 26.5 million dollars) and then falling in 2020. The size of pure digital ODA fluctuated from 2016 to 2018, then greatly decreased in 2019 and 2020, while the size of converged digital ODA increased relatively rapidly.

Table Ⅶ-6. South Korea's digital ODA scale and number of projects in Central Asia(2016-2020)

(Unit: US million dollars, constant value in 2020, number of cases)

		ODA	Digital ODA		
			Total	Pure	Converged
2016	Size	43.831 (199)	12.845 (32)	4.161 (7)	8.684 (25)
	Share	100	29.31	9.49	19.81
2017	Size	71.790 (187)	21.359 (29)	5.961 (7)	15.398 (22)
	Share	100	29.75	8.30	21.45
2018	Size	43.281 (193)	14.603 (32)	5.877 (10)	8.726 (22)
	Share	100	33.74	13.58	20.16
2019	Size	88.165 (337)	26.492 (42)	1.545 (19)	24.947 (23)
	Share	100	30.05	1.75	28.30
2020	Size	80.401 (258)	12.881 (21)	0.482 (6)	12.399 (15)
	Share	100	16.02	0.60	6.82
Total	Size	327.468 (1,174)	88.180 (156)	18.027 (49)	70.153 (107)
	share	100	26.93	5.51	21.42

Source: OECD DAC CRS database extract composition

The status of South Korea's digital ODA to five Central Asian countries by country is as follows. First of all, the total amount of ODA provided by Korea to Uzbekistan is approximately 250.95 million dollars, of which digital ODA amounted to 71.85 million dollars (28.6%) and pure digital ODA amounted to 16.77 million dollars (6.9%). It is much larger than other countries in Central Asia. However, in terms of digital ODA volume compared to total ODA volume, Kyrgyzstan's share is 30.1% (digital ODA volume: 14.59 million dollars / total ODA volume 48.38 million dollars), slightly higher than Uzbekistan's 28.6%. After Kyrgyzstan, Kazakhstan is the country that received more amount of digital ODA from South Korea, with about 1 million dollars

(9.82%), compared to that to Tajikistan (about 90,000 US dollar, 6.49%). Meanwhile, South Korea's digital ODA to Turkmenistan is extremely small, and there is no pure digital ODA.

Table Ⅶ-7. South Korea's digital ODA to Central Asia by country (2016-2020)

(Unit: US million dollars, constant value in 2020, number of cases)

	ODA	Digital ODA		
		Total	Pure	Converged
Kazakhstan	10.285	1.01 (9.82%)	0.039 (0.38%)	0.97 (9.42%)
Kyrgyzstan	48.483	14.592 (30.10%)	1.217 (2.51%)	13.375 (28.30%)
Tajikistan	10.557	0.685 (6.49%)	0.006 (0.06%)	0.679 (6.49%)
Turkmenistan	7.198	0.044 (0.61%)	0 (0%)	0.044 (0.61%)
Uzbekistan	250.95	71.85 (28.63%)	16.765 (6.68%)	55.084 (21.95%)

Source: OECD DAC CRS database extract composition

The current status of South Korea's digital ODA to Central Asia that is divided into pure and converged types by country and sector is as follows.

First of all, there was no ODA corresponding to the subsector (CRS code 22030) of pure digital ODA and the rest of the subsectors differ depending on the partner country. South Korea's digital ODA to Uzbekistan and Kyrgyzstan covers communication policy and management (CRS code 22010), radio/TV/print media (CRS code 22030), and information and communication technology (CRS code 22040). Regarding the last subsector, the amount of South Korea's digital ODA to Uzbekistan and Kyrgyzstan are respectively about 16 million dollars and 9 million dollars each. However, Kazakhstan and Tajikistan only received South Korea's ODA in communication and management (approximately 40,000 dollars and 6,000 dollars), and no aid was given to Turkmenistan. In other words, most of South Korea's pure digital ODA to Central Asia was provided only to Uzbekistan and Kyrgyzstan.

Table Ⅶ-8. South Korea's Digital ODA to Central Asia by country and sector (2016-2020)

(Unit: US$ million, constant value in 2020)

		Kazakhstan		Kyrgyzstan		Tajikistan		Turkmenistan		Uzbekistan	
Pure	Communication policy and management	0.039		0.289		0.006				0.664	
	Radio/T.V./ print media			0.026						0.112	
	Information communication technology			0.902						15.99	
Converged	Sector	Total	Digital	Total	Digital	Total	Digital	Total	Digital	Total	Digital
	Education	2.835	0.339 (11.94)	8.879	2.135 (24.04)	1.376		6.51		52.465	23.599 (44.98)
	Health	1.983		1.864		0.689		0.3			
	Water and Sanitation	0.307		0.32		0.485				8.454	4.814 (56.95)
	Government and Civil Society	0.197	0.017 (8.73)	16.034	7.208 (44.95)	0.313		0.071		27.5	22.897 (83.26)
	Other social infrastructure and services	0.398		0.918		0.3		0.102			
	Energy			0.155		3.143		0.018			
	Industry, mineral, construction	0.091		0.611				0.081	0.044 (53.81)	24.482	2.575 (10.52)
	Trade policy and regulations	0.631	0.614 (97.37)	1.951	0.628 (32.18)	2.8	0.614 (21.94)	0.043			
	Environment protection	0.099		0.052							
	Multi-sectors	0.046		6.917	3.393 (49.06)	0.199	0.065 (32.61)	0.034		3.518	0.733 (20.83)
	Food			3.915							
	Others	3.658		5.65	0.011 (0.20)	1.246		0.039		16.38	0.465 (2.84)

Source: OECD DAC CRS database extract composition

2) Evaluation of South Korea's Digital ODA to Central Asia

Due to the limitations of securing data to conduct a systematic and scientific evaluation of South Korea's digital ODA to Central Asia, the evaluation in this report is to discriptive review South Korea's digital ODA policy to Central Asia from the perspective of the K-BDI. To this end, government literature and statistical data related to digital ODA in South Korea, and case studies from Chapters 3 to 6 are utilized.

The review of South Korea's digital ODA to Central Asia based on the K-BDI's perspective in this report is divided into three areas. The first is a review of South Korea's digital ODA promotion strategy. To this end, *the Strategy for promoting science and technology ICT ODA to support digital transformation in developing countries* (hereinafter 'ICT ODA promotion strategy') presented in 2022, the 2nd Uzbekistan Country Partnership Strategy and Kyrgyzstan Country Partnership Strategy are reviewed. The Tajikistan Country Partnership Strategy was excluded here because, as discussed above, South Korea's digital ODA to Tajikistan is very small, less than 1 million dollars. The second is a review of the progress of South Korea's digital ODA policy toward Central Asia. To this end, the case analysis of major countries in Central Asia and South Korea's ODA to Central Asia from 2016 to 2020 are reviewed. And the last is a review of the implementation system of South Korea's digital ODA policy to Central Asia. The implementation system discussed here is limited to South Korea's digital ODA project to Central Asia, which was carried out from 2016 to 2020.

(1) K-BDI and South Korea's Digital ODA Strategy

South Korea's digital technology has been recognized as one of the important models in the international community. Reflecting this, discussions on digital ODA have continuously appeared in various mid- to long-term plans since the International Development Cooperation Committee was established in 2006, and in January 2022, the 'ICT ODA promotion strategy', which comprehensively systematized South Korea's digital ODA policy, was announced. However, from the perspective of K-BDI,

the 'ICT ODA promotion strategy' is judged to need to be supplemented with a systematic approach to 'digital inclusiveness' and the negative effects of digital transformation as follows.

Firstly, from the perspective of K-BDI, 'digital inclusiveness' is being narrowly applied to the 'ICT ODA promotion strategy.' In the 'ICT ODA promotion strategy', a direct awareness of the problem of digital inclusion is included in the item of 'creation of an inclusive science and technology/ICT ecosystem for a virtuous cycle', which is a detailed strategy of 'Strategy 1: Support for science and technology ICT innovation tailored to the level of each recipient country' and its contents are as follows: "Intensive support for basic infrastructure such as expansion of communication network (broadband, wireless network, etc.) and expansion of information access centers in countries and regions with low ICT access" in terms of "support for mitigating the digital divide for inclusion of the underprivileged." It is described as "providing customized education and expanding access opportunities through IT volunteer groups and ICT education centers to reduce the digital divide for the underprivileged, such as women and children."[112)]

Secondly, the consideration of the digital ODA regional promotion strategy should be supplemented. A direct critical awareness of the digital ODA regional promotion strategy is shown in 'Expansion of achievements through connection with the New Southern and New Northern countries' of 'Strategy 3. Among the contents of the expansion of win-win negotiations between two countries.[113)] This approach is meaningful in that it secures connectivity with South Korea's diplomatic strategy and includes awareness of issues at the regional level. However, it is difficult to find any cases in which policy documents related to South Korea's ODA or digital ODA policies contain awareness of issues at the regional level. In this regard, according to the case analysis based on the K-BDI conducted in the prior chapters, the five Central Asian

112) Joint with related ministries. 2022. *Science and ICT ODA Promotion Strategy to Support Digital Transformation in Developing Countries*. 6.
113) Ibid. 7.

countries have common problems at the historical and geographical level, which can be solved through regional ODA.

Lastly, comprehensive standards for digital ODA country-specific implementation strategies should be supplemented. The 'ICT ODA promotion strategy' includes 'very low level', 'low level' and 'low level' innovation capabilities of partner countries (recipient countries) based on the Global Innovation Index (WIPO) to prepare support programs for each country.[114] Although this approach is being dealt with as an example, it is evaluated as a very important starting point for preparing a customized digital ODA strategy for each country.

Table Ⅶ-9. Level of Innovation Competence of Partner Countries

	Content
Very Low Level	• Overall, the basic infrastructure such as power and communication networks is poor and the level of education is low, so it is difficult to directly apply and support advanced technologies such as ICT. • Mainly Least Developed Countries (LDC) countries, and recipient countries tend to have high demand for short-term technology to increase productivity and resolve pending issues.
Low Level	• There is a large gap between urban and rural areas as basic infrastructure is built mainly in cities, but basic human capabilities for accepting science and ICT such as the population using the Internet are equipped. • High interest and capacity are being invested at the national level for the development of science and ICT and economic growth through it.
Middle	• Basic competencies such as infrastructure (Internet and mobile networks), educational institutions, and human resources are at a considerable level, but self-sustaining technology and ICT competencies for continuous innovation are somewhat insufficient. • The recipient country government's interest in and investment in science and technology and ICT are high, but the advanced innovation ecosystem such as R&D, ventures, and patents is not developed.

However, there is a limitation in that it includes only some indices and indicators suggested by K-BDI. Specifically, not only K-BDI's digital conversion adjustment index, but also human capacity conversion indicators such as 'gender gap in accessing internet', 'gender gap in accessing wireless phone', and 'generation gap in accessing internet' are not included. As a result, there are limitations in preparing systematic

114) Ibid. 8

and specific projects necessary for digital transformation based on digital inclusion.

On the other hand, when examining the Uzbekistan Country Partnership Strategy and Kyrgyzstan Country Partnership Strategy from the perspective of K-BDI, there is no comprehensive strategy for digital inclusion. Specifically, the two strategies include only digital transformation-related content in the basic direction and business contents of projects in specific sectors, without a comprehensive strategy for digital transformation or digital inclusiveness. Specifically, in the case of Uzbekistan, only digital transformation is included in education and government sectors, and in Kyrgyzstan, government and agriculture sectors

Table Ⅶ-10. Uzbek and Kyrgyz Strategies and Sectors for Digital Transformation

		Directions
Uzbekistan	Education	• Cultivate talents in preparation for the future industry through ICT in education, such as IT education and information system establishment
	Government	• Establish e-Government through digitalization of administrative system and establishment of institution
Kyrgyzstan	Government	• Strengthen the basis for promoting digitalization in the public sector - Expansion of digitalization in the public sector
	Agriculture	• Increase agricultural productivity and strengthen marketability - Expansion of agricultural infrastructure: support for the construction of agricultural facilities using our excellent technologies, such as ICT-integrated smart farms

(2) K-BDI and South Korea's Digital ODA Practices

As mentioned above, the review of Korea's progress in digital ODA to Central Asia is based on data from 2016 to 2020. As a result, there may be inconsistency due to the temporal difference between the review of the previous promotion strategy and the review target. However, since the purpose of this report is to contribute to the improvement of digital ODA strategies through the development of K-BDI, a review of the progress from 2016 to 2020 based on K-BDI will be meaningful. Based on this recognition, we will review the key problems of Central Asian countries presented in the case study from the perspective of K-BDI and Korea's digital ODA project to

Central Asia.

Firstly, one of the indicators pointed out as a common problem in the digital technology capability transformation index in Central Asian countries is broadband Internet coverage and wireless Internet penetration rate. This problem is due to the geographical conditions that Central Asian countries face. Uzbekistan is a doubly landlocked country, and other Central Asian countries are also landlocked, so there are limitations in securing a wide area network using submarine cables. In addition, Kyrgyzstan and Tajikistan are mountainous countries, and Kazakhstan has a large territory and requires a lot of cost to build a broadband network. In addition, Kyrgyzstan has an extreme continental climate, so the season for installing optical cables or building wireless communication towers is only a few months out of the year. In order to solve this problem, a project corresponding to the subsector of communications (CRS code 22020) among pure digital ODA was required. Examples of the project that fall under this category include the 'Communications Ocean Meteorological Satellite Analysis System Establishment Project' implemented by KOICA in the Philippines in 2016, and the 'Broadband Wireless Communications Network Establishment Project' implemented by the Export-Import Bank of Korea in Bangladesh. However, there was no project in this field among South Korean pure digital ODAs to Central Asia.

Secondly, the indicator that emerged as a problem in the previous case study is the Internet usage gap between cities and provinces. This problem is occurring due to a combination of causes. For example, in the case of Uzbekistan, the difference in purchasing power between city and local residents in Internet use-related devices and parts, related facilities concentrated in large cities such as Toshkent, and the low effectiveness of IT center lectures that the government has installed complementary in the provinces. Representative projects of South Korea ODA that can contribute to solving this problem include the establishment and operation of the Information Access Center (IAC) by the Ministry of Science & ICT and the Korea Institute for Intelligent Information Society (NIA). This project is part of the ODA project for global

digital inclusion, which has been promoted for about 20 years since 2002, and is known to contribute to improving information accessibility for residents of developing countries and creating an advanced ICT education environment. This project was carried out targeting Central Asian countries, and an information access center was opened in Fergana, Uzbekistan (Tashkent University of IT, TUIT) in April 2021, followed by Ashu, Turkmenistan in February 2022. An information access center has been opened in the city of Habart. In addition, it is judged that KOICA's integrated education information system establishment and dissemination support project can contribute to the improvement of the digital technology competency conversion index. However, most of these projects were centered on cities.

Lastly, in the perspective of K-BDI, another common problems the Central Asian countries faced is the language of online contents. According to the case studies of the previous chapters, Central Asian citizens prefer content composed of their own language rather than Russian, and trust in this content is high. However, most online content is often produced in Russian rather than the local language, and even in the case of Uzbekistan, professional and educational content is in Russian. Also, in the case of Kyrgyzstan, there was an analysis that because Russian is not spoken in the provinces, local residents do not fully enjoy the benefits of online resources. Therefore, in order to improve satisfaction with online contents in Central Asia, it is very important to develop online contents produced in the local language. However, South Korea's digital ODA project to Central Asia has a limitation in that there is no program to solve this problem.

(3) South Korea's Digital ODA Implementation System

Looking at the current status of government ministries and institutions that participated in South Korea's digital ODA project to Central Asia from 2016 to 2020, it is judged that a cooperative system needs to be established. For example, the Korea International Cooperation Agency, the Export-Import Bank of Korea, and the Ministry of Science and ICT participated in Korea's pure digital ODA project to Central

Asia. Such participation also has a positive aspect in light of the expertise of each ministry or institution. However, if there is no cooperative system between them, administrative costs may increase, and there may be limitations in efficiently implementing digital ODA strategies.

Table Ⅶ-11. South Korea's Participation in Pure Digital ODA Projects to Central Asia

(Unit: USD million, constant value, number of cases)

		KOICA	Export-Import Bank of Korea	Ministry of Science and ICT	Total
Total	Size	2.778	14.139	1.110	18.027
	Cases	36	3	10	49
Kazakhstan	Size	0.010	0	0.029	0.039
	Cases	1	0	1	2
Kyrgyzstan	Size	0.806	0	0.411	1.217
	Cases	15	0	3	18
Tajikistan	Size	0	0	0.006	0.006
	Cases	0	0	1	1
Uzbekistan	Size	1.961	14.139	0.665	16.765
	Cases	20	3	5	28

In this respect, the implementation system in 'ICT ODA strategy' presented in 2022 is evaluated as positive. In the strategy, the basic principle of strengthening administrative governance is centered on the International Development Cooperation Committee. Based on this, measures such as strengthening linkage between projects, forming a network of experts, and securing local bases are suggested. If these plans are realized, it is expected that the limitations of South Korea's ODA implementation system to Central Asia will be overcome.

3. South Korea's Strategy for Digital ODA to Central Asia

The following section presents matters to be considered in improving South Korea's digital ODA to Central Asia from the perspective of K-BDI.

1) The nature and status of the strategy based on the K-BDI

The first thing to consider is the nature of South Korea's digital ODA strategy based on the K-BDI perspective. The vision of the ICT ODA strategy reviewed above is "realization of global values and mutually beneficial national interests through cooperation and solidarity," and its goal is "promoting overcoming crises and achieving sustainable development goals in developing countries through the spread of Korean-style digital models." By including those concepts such as 'realization of the national interest' and 'spread of the Korean digital model', it is judged that the 'perspective of the donor country' was considered. Compared to this, K-BDI is a perspective in which the 'needs' of the partner country (recipient country) takes precedence, and when a strategy is prepared based on K-BDI, this issue needs to be discussed.

This issue is related to the status of South Korea's digital ODA strategy based on the K-BDI perspective. The status of Korea's digital ODA strategy based on the K-BDI perspective can be established as one of the followings. On the one hand, K-BDI is based on the concept of digital inclusion to offset the negative aspects that may result from digital transformation. Therefore, according to this method, the digital ODA strategy based on the K-BDI perspective can be established as a digital transformation strategy itself. On the other hand, K-BDI can be established as a means to understand the digital transformation status of partner countries, rather than a goal that donor countries will achieve with ODA. In the case of the former, the strategy based on the K-BDI perspective replaces the 'ICT ODA strategy' presented in January 2022, giving priority to needs of partner countries. It will have a status as a basic data for the 'ICT ODA strategy.'

2) Necessity of Regional ODA Strategies

Currently, South Korea's ODA policy is being implemented with a five-year basic plan for international development cooperation at the top, and reflecting which an implementation plan for international development cooperation by year. In addition, the 'Green New Deal Promotion Strategy' (2021), 'KSP Advancement Strategy for Expansion of K-Soft Power' (2022), 'Multilateral Cooperation Promotion Strategy' (2022) and 'Private Sector Participation Strategies' (2022) were presented. Examining these strategy documents, there is no individual implementation strategy at the regional level. Therefore, when a regional strategy is prepared in the field of digital ODA, the need to prepare a regional strategy for other sector promotion strategies in terms of uniformity of strategy may emerge. This depends on whether the common historical and geographical problems of Central Asia, which are recognized as K-BDI perspectives, can be resolved without regional measures.

In addition, it is necessary to review whether to divide Central Asia into one unit. Currently, the OECD DAC classifies regions based on continent and location, but the criteria for regional classification in South Korean ODA policy-related documents or statistical data are different. For example, in South Korea, the five Central Asian countries covered here are included in the 'CIS-Middle East' rather than Central Asia, which is a sub-tier of Asia, so it is necessary to review this.

3) Strategic Priority of Challenges

The various indices and indicators presented by K-BDI may have different priorities depending on the situation, so strategic consideration is needed for this. For example, according to the case analysis of the prior chapters, broadband network establishment and local language content development are the most important tasks in enhancing digital inclusiveness in five Central Asian countries. Building a broadband network and developing local language contents are problems caused by the historical and geographical conditions common to the five Central Asian countries, and are analyzed as tasks that can contribute to improving digital literacy

and bridging the digital divide between cities and provinces. Therefore, it is necessary to establish a digital ODA project for building a broadband network and developing local language contents. In this way, since there may be strategic priorities depending on the causal relationship between the indexes and indicators presented by K-BDI, a digital ODA strategy that reflects this should be prepared.

4) Linkage between digital ODA and other ODA projects

It is necessary to review the strategy of linking digital ODA with other ODAs. This is one of the points derived from the previous case study, and it is because each index and indicator presented by K-BDI is linked to complex variables that are distinguished from digital transformation depending on the circumstances of each country. For example, in the case of Kyrgyzstan, it was identified that one of the reasons digital transformation was not a policy priority was the economic situation. In this case, there is an aspect in which ODA to solve economic problems should be given priority rather than digital ODA. However, digital ODA can also be one of the means to solve economic problems. Therefore, it is necessary to closely review this, and based on this, a strategic approach that reflects the linkage with other ODA projects is needed when constructing a digital ODA project.

5) Cooperation mechanisms between government and non-governmental sectors

It is necessary to consider establishing a cooperative system not only with the government but also with local NGOs or private companies. According to the case analyses of the prior chapters, in the case of Kyrgyzstan, local NGOs are found to be contributing greatly to relieving the digital divide between cities and provinces as well as the gender digital divide. In addition, in the case of Kazakhstan, it is identified that private companies have played a decisive role in digital transformation. In addition, it is known that the 'Internet Society', a non-profit organization mentioned in Chapter 2, is putting a lot of effort into digital transformation in developing

countries. These examples suggest that, depending on the circumstances, non-governmental-led digital transformation can be more effective in promoting digital inclusion than government-led digital transformation. Therefore, South Korea's digital ODA strategy to Central Asia should include measures to establish a system of material support and human resources cooperation with non-governmental sectors so that their roles can be strengthened.

6) Digital ODA Strategy Focusing on Cross-Sectors

The K-BDI perspective suggests that a cross sector approach is effective for digital ODA strategies. As mentioned several times before, K-BDI has a strong cross-sectoral nature that presents principles for all digital ODA projects. In this context, the 'digital ODA promotion strategy' proposed by KOICA in 2021 is very meaningful in emphasizing the strengthening of the sector-wide digital ODA promotion strategy through the concept of 'digital mainstreaming', and it is very meaningful to apply it to South Korea's digital ODA strategy in the future.

7) Foundation for Digital ODA Implementation

Accurate statistical data necessary for a systematic and scientific approach to planning, implementation, and evaluation of South Korea's digital ODA promotion strategy must be established and disclosed. KOICA and related organizations are already aware of this point, and I understand that KOICA is carrying out work for this. Things to be consider in the process as follows.

Firstly, it is necessary to establish an accurate concept and type of digital ODA so that it can be included in statistical data. It is a well-known fact that in order to conduct a general or impact assessment of digital ODA projects, it is necessary to be able to approach not only the scale and proportion, but also the types of digital ODA projects.

Secondly, notification data for all ministries and institutions should be included. In the process of conducting this study, the data mainly used to identifying data for all

ministries and institutions were the DAC QWID and the annual comprehensive action plan, but the latter had limitations in that it was not converted to digital.

Lastly, specific and accurate content on digital ODA projects should also be included. Not only the data submitted to DAC QWID, but also the annual comprehensive implementation plan are described in very abstract words depending on the project, so there is a limit to grasping the specific details of the project.

Ⅷ. Conclusion

This study was conducted with the purpose of preparing an effective digital ODA strategy to solve various problems arising from digital transformation. In particular, the study was conducted with the aim of deriving implications for Korea's more inclusive digital ODA promotion targeting the Central Asian region.

To this end, first, we reviewed the discussion on digital transformation and digital ODA. As a result of the analysis, we found that not only the alienation in digital conversion caused by region, gender, age, and other socio-economic factors which are dealt with in the traditional inclusivity discussion, but also the negative side-effects of the benefits of digital conversion rather expanding the poverty of the underprivileged. Accordingly, we recognize the need for a new perspective on digital conversion. We set out to find ways to facilitate more people, more frequently, more satisfied, and more trustworthy digital transformations through our Better Inclusion Index proposal. Based on the results of reviewing various existing indicators, a better inclusiveness index was proposed. The newly proposed index emphasizes attention to socio-cultural capacity and coordination between various actors, sectors, and levels. This can be the comparative advantage of this index in terms of what the existing indexes missed. In addition, in this study, the cause of the side effects caused by the expansion of digital inclusion is recognized as the limit of social and cultural acceptability. Therefore, the newly proposed index was designed to contribute to improving the effectiveness of digital ODA in the future by emphasizing socio-cultural capabilities.

Specifically, an analysis was conducted using a better digital inclusion index targeting Central Asia. As a result, firstly, Central Asia has a problem in that the coordinated description as a community is very poor despite having limitations in expanding digital connectivity that inland areas have in common. Second, Uzbekistan

was examined focusing on the field of education. Lack of manpower in the education sector has been presented as a chronic problem, especially in the process of digital transformation, where various stakeholders such as teachers, education experts, information and communication technology experts, and education-related government ministries can communicate and collaborate together. We confirmed that it is more difficult to use effectively. Third, in the case of Kyrgyzstan, the lack of reliable data on understanding the status of digital transformation was cited as the most urgent problem to be addressed. In addition, in the case of Kyrgyzstan, we confirmed that policies and regulations of cities and provinces need to be differentiated using various coordination mechanisms. Fourth, Kazakhstan is an advanced example of a certain level of digital transformation, and the Kazakh government needs to introduce a mechanism to evaluate users' technological adaptability before upgrading e-government and online public service platforms or introducing new technologies. Such mechanisms are particularly important as governments work with private technology and fintech companies to increase the convenience and efficiency of e-government services.

Using the analysis results, the implications for Korea's digital ODA strategy for Central Asia were derived as follows. In terms of promotion strategy, 'digital inclusion' is being applied in a narrow manner, and there are limitations in not being able to adequately respond to relevant regional issues. In terms of the current status of digital ODA policy promotion to Central Asia, responses to problems such as wide-area network construction, local language digital content development, and digital divide between cities and provinces are lacking, and it is judged that there is room for improvement in terms of the promotion system. Therefore, in order to improve Korea's digital ODA promotion strategy for developing countries, including Central Asia, it is first necessary to systematically identify the needs of partner countries (recipient countries). Based on this, it is necessary to consider the preparation of regional digital ODA strategies, prioritization of tasks required by regions or individual countries, strategic linkages with other ODA projects, and cross-sector-oriented digital ODA strategies. In addition, efforts are needed to

strengthen the coordination mechanism between the government and non-governmental sectors and the basis for systematic support in the process of promoting this.

This study is meaningful as it is a preliminary study related to the development of an index for preparing a digital ODA strategy. Nevertheless, we discovered the following limitations. First, in relation to the index proposal, due to limitations in the size of the research team and the research period, only a limited level of index measurement was conducted for Central Asian countries and a macroscopic index proposal. Therefore, despite the proposal of a new index, it was not possible to properly measure each country based on the index. The measured index values are presented through the attachment. Therefore, additional research on preparing a specific measurement method should be conducted, and measurement of the missing indicator value is proposed as a future study. After the work is done, country-level evaluation using a better inclusiveness index can be meaningfully progressed. Second, reflecting the expertise of local researchers in Central Asia, it contains only the contents of research on specific fields by country, so the uniformity of the research report is found to be damaged. Through future research, a detailed and consistent analysis of the relevant countries should be added.

Lastly, this study is the result of the process of building partnerships with researchers in the field of international development cooperation in Korea, local researchers in the Central Asian region, and Central Asian researchers in the UK. During the year of the research, the newly established digital network among researchers was of great help in strengthening mutual digital capabilities, and I would like to thank KOICA for their financial and physical support throughout the research process.

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