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UNDP Project:

Digital skills and opportunities for youth employment towards digital economy in the Kyrgyz Republic

Digital skills and entrepreneurship in Kyrgyzstan

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List of abbreviations

AI	Artificial Intelligence
CMS	Content Management System
CRM	Customer Relationship Management
DCASA	Digital Central Asia – South Asia
ERP	Enterprise Resources Planning
loT	Internet of Things
ISOC	Internet Society
SDG	Sustainable Development Goals
ACS	Automated Control System
SCICT	State committee on information and communication technologies
EU	European Union
AI	Artificial intelligence
ICT	Information-communication technologies
IT	Information technologies
KR	Kyrgyz Republic
MES	Ministry of Education and Science
ILO	International Labor Organization
ITU	International Telecommunication Union
ME	Ministry of Economy of the Kyrgyz Republic
CNS	Committee on National Statistics
OECD	Organization for Economic Cooperation and Development
UNDP	United Nations Development Programme
CAE system	Computer-aided engineering system
SDG	Sustainable Development Goals

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Introduction

The Kyrgyz Republic has identified a digital development vector and laid it as one of the sections of the National Sustainable Development Strategy for 2018-2040. Taza Koom National long-term strategy has been developed in the country. The government has developed and approved a five-year strategy for Sanarip Kyrgyzstan to achieve the long-term sustainable development goals in the digital space. President Jeenbekov has consistently declared the third year as the "Year of Development of Regions and Digitalization of the Country." The goals and objectives of digitalization are consistent with the UN Sustainable Development Goals 2030.

Digital skills development is an important component in achieving the Millennium Goals. For these purposes, the Government has identified the State Communications Committee as the operator of digital transformation, and the Ministry of Education of the Kyrgyz Republic as the responsible executive for the development of digital skills. The development of digital skills is enshrined in the roadmap by a decree of the Government of the Kyrgyz Republic¹. Kyrgyzstan attracted additional funds within DCASA projects directed at digital infrastructure, as well as the development of digital skills that stimulate the establishment of a digital economy in the country.

Digitalization of education, health, and agriculture; e-commerce development; development of the High-Tech Park; digital skills development; and creating a favorable legislative framework are among the key priorities of the year 2020.

However, as of December 2019, there is a shortage of documentation in the information space that legally defines conceptual notes and terminology around digital skills, and shows the current level and market needs for digital skills, as well as practical materials for drawing up a detailed roadmap for the development of digital skills in the Kyrgyz Republic.

Report purpose

The goal of the UNDP project is to assist the Government of the Kyrgyz Republic in creating an environment and ecosystems to increase the state's potential in providing digital skills for various population groups of the Kyrgyz Republic to increase employment opportunities or entrepreneurship, and thus, to reduce inequality, ensure inclusive, innovative and sustainable economic growth, and job creation. The project aims to support relevant national policies, institutions, and mechanisms, to modernize educational institutions to ensure inclusive and

¹ <u>http://cbd.minjust.gov.kg/act/view/ru-ru/216896</u>

effective education in the field of ICT, professional development, dissemination of best practices and use of innovative tools, as well as equal access to education and vocational training for vulnerable population, especially young women, girls and people with disabilities.

The purpose of this study is to provide an expert review of the level of digital skills and digital entrepreneurship in Kyrgyzstan. The product of this work is designed to help the Government of the Kyrgyz Republic, development partners and all stakeholders involved to understand the role of technology, the stages of access to digital technology, digital skills and to develop the necessary initiatives and programs to achieve the target indicators within the framework of Sanarip Kyrgyzstan and the SDGs.

Audience

This report is aimed mainly at practitioners involved in the elaboration of employment programs and the development of digital skills among young people. The data from this report will be useful for representatives of state organizations, the private sector, and international organizations interested in understanding the current situation, developing new approaches to the development of digital skills, technologies, entrepreneurship among youth and women.

Scope of work

The consultant has the following tasks:

- 1. Conduct in-depth market analysis and consultations with the private sector and experts on global and local markets in digital markets, market demand for digital professions and skills and provide recommendations on the necessary set of skills that will make a feasible contribution to the country's digital development with an additional focus on digital technologies and innovations in priority sectors of the economy (agriculture, tourism, light industry, information technology);
- 2. Conduct in all regions, including the city of Bishkek, an in-depth field study of the innovation ecosystem and digital entrepreneurship to identify opportunities for development;
- Conduct market demand research for digital skills and competencies of citizens and all public services for G2C (Government to Citizens), G2B (Government to Business), G2I (Government to Investors);
- 4. Prepare recommendations on how to develop digital entrepreneurship, startups to increase the demand for IT / ICT products, services and solutions, drawing on the best lessons from other countries;

Research approach

The author's approach is in an in-depth study of the current situation, a study of demand and real needs, the reasons why current stakeholders are not satisfied by these needs, what were the previous programs in this direction, and in development of actions schemes that can give maximum effect and coverage with minimal investment. The author focuses on world practices and research, studies how these practices were applied or are applicable in the Kyrgyz Republic, and looks for ways that have improved the effect of known programs on target audiences.

The author has accumulated experience related to the five-year work at the Public Foundation "KG Labs" and the NGO "Kyrgyz Branch of the Internet Society" on the digitalization, the development of information and communication technologies in Kyrgyzstan. Soltobaev Aziz is one of the contributors to the Taza Koom digital transformation strategy, a member of the NSUR-2040 working group, a curator of the research report "Analysis of the IT sector of the Kyrgyz Republic 2019" and the "Roadmap for ICT Development in the city of Osh and Osh Region 2019".

Important factors in choosing measures are experience, the availability of evidence-based examples, the sustainability and scalability of practices throughout the country that have a cascading effect (theory of changes), but which do not have a negative effect on the structure of the current market due to interventions.

Report structure

The report consists of several parts aimed at a better understanding of the document.

The first part explains the conceptual part and the theoretical framework that determines what digital skills and digital literacy mean, what digital competencies exist and are required, types of employment in the digital economy, as well as the components of the digital entrepreneurship ecosystem.

The second part of the report presents the latest data on the current state of the digital economy and entrepreneurship in Kyrgyzstan. This section describes the level of the digital economy, the main challenges in terms of supply and demand for digital skills from the viewpoint of various stakeholders and describes the future needs for digital skills.

The third section of the report presents a program for the development of digital skills and digital entrepreneurship, taking into account the current market situation, the needs of stakeholders, the

national strategy of Sanarip Kyrgyzstan, as well as time constraints in the framework of this UNDP project.

At the end of the document, a bibliography of useful materials is presented for further study, as well as descriptions of previous programs in the development of similar skills and their effectiveness.

The author hopes that this report will be useful to a wide range of readers and will serve as a practical material for drawing up a national strategy for the development of digital skills and the successful establishment of the digital economy of the Kyrgyz Republic.

Digital skills

The national regulatory framework does not validate the conceptual vocabulary related to digitalization and digital skills. In this way, a legal vacuum formed, and expanse developed for multiple interpretations. Thus, it is necessary to give definitions to key notions and concepts for drawing up a research framework.

Literacy

According to regular international studies, 99.6% of adults aged 15 years and over in Kyrgyzstan are literate. This indicator shows the proportion of people aged 15 and over who can read and understand, write short simple sentences regarding their daily lives. As a rule, 'literacy' covers the ability to count, the ability to perform simple arithmetic calculations².

This is a positive factor for mastering digital skills and improving overall digital literacy. However, in recent years, Kyrgyzstan has not participated in international studies on digital literacy. The most famous report is the International adult literacy survey conducted by the OECD³. Digital literacy is determined by the set of knowledge and skills that are necessary for the safe and effective use of digital technologies and Internet resources. In this regard, the level of digital literacy in Kyrgyzstan requires attention and close study.

Competence

Digital literacy is based on digital competencies - the ability to solve various problems in the field of using information and communication technologies (ICT): to use and create content using

2

https://knoema.ru/atlas/%d0%9a%d0%b8%d1%80%d0%b3%d0%b8%d0%b7%d0%b8%d1%8f/topics/%d0%9e%d0% b1%d1%80%d0%b0%d0%b7%d0%be%d0%b2%d0%b0%d0%bd%d0%b8%d0%b5/%d0%93%d1%80%d0%b0%d0%bc %d0%be%d1%82%d0%bd%d0%be%d1%81%d1%82%d1%8c/%d0%98%d0%bd%d0%b4%d0%b5%d0%ba%d1%81-%d0%b3%d1%80%d0%b0%d0%be%d1%81%d0%bb%d0%be%d0%b8%d0%b2%d0%be-%d0%b2%d0%b0%d1%81%d0%b5%d0%bb%d0%b5%d0%bd%d0%b8%d1%8f

³ <u>http://www.oecd.org/skills/piaac/</u>

digital technologies, including searching and exchanging information, answering questions, interacting with other people, and computer programming.

In recent years, the Ministry of Education of the Kyrgyz Republic has been actively introducing competency-based education in the framework of the "Education Development Strategy 2012-2020". At the state level, the skills development is based on a competency-based approach in the course of the formation of a new generation subject standard. In the competency-based approach, the emphasis is not on memorizing information, but on the use of acquired knowledge in different life situations.

As part of this, in June 2019 the Kyrgyz Academy of Education introduced the "Concept for development of an Educational System of the Kyrgyz Republic with elements of Media and Information Literacy (MIL)"⁴.

On digital competencies, the most common general framework is a document issued by the European Commission on Science and the Economics of Knowledge in 2016 ⁵ as part of the European Union strategy for the development of digital education. The Danish government has developed an online system of self-diagnosis of digital competency as an input measure for the current determination of the level of user skills and the development of evidence-based national policies⁶.

Based on this framework product, UNESCO has developed the Digital Literacy Global Framework, designed to help countries develop national literacy structures, curricula, and an assessment framework to achieve SDG 4.4⁷. In Kyrgyzstan, pilot tests of the digital literacy level based on the ICDL assessment system began to be applied in 2019⁸.

⁴ <u>http://kao.kg/wp-</u> <u>content/uploads/2019/06/%D0%9A%D0%BE%D0%BD%D1%86%D0%B5%D0%BF%D1%86%D0%B8%D</u> 1%8F_06.2019-.pdf

⁵ <u>https://ec.europa.eu/jrc/en/digcomp/digital-competence-framework</u>

⁶ digital-competence.eu

⁷ <u>http://uis.unesco.org/sites/default/files/documents/ip51-global-framework-reference-digital-literacy-skills-2018-en.pdf</u>

⁸ https://icdlasia.org/icdl-development-in-kyrgyzstan-in-2019/

Skills

Digital skills are the skills to perform a certain level of tasks related to ICT. Depending on the intensity of using digital technologies, all skills are divided into three main levels, visually presented in the form of a pyramid. Initially, this model was developed and presented by ITU⁹. In this report, the pyramid of digital skills is adapted taking into account examples that are relevant to the realities of the Kyrgyz Republic.



Figure 1 Adapted Pyramid of Digital Skills based on ITU data

This graph depicts skill levels and their importance depending on complexity, daily needs and necessity, audience coverage, as well as the sequence of skills for mastering the most advanced skills and launching startups.

⁹ <u>https://www.itu.int/en/ITU-D/Digital-Inclusion/Documents/ITU%20Digital%20Skills%20Toolkit.pdf</u>

Basic skills include the very minimum skills required for the safe use of digital systems. These skills include the use of e-mail and instant messengers, the use of a computer and a smartphone, the creation of digital doubles on the Internet (Instagram and Facebook accounts), as well as security settings.

Intermediate skills are a set of skills that allow you to use ICTs to digitalize current business processes or perform processes using digital platforms, electronic systems, software, and mobile applications. Such skills include the ability to use social networks to promote goods and services, the use of graphic editors to create digital designs, office applications for making presentations, text, and spreadsheets, as well as mobile applications. Advanced skills include skills aimed at creating innovative ICT-based solutions, including programming and the use of new technologies. It is at this level of digital skills that most information campaigns and educational programs in Kyrgyzstan are oriented.

Types of digital jobs and population employment

The atlas of digital professions and employment classified by the use intensity of various information and communication technologies. The degree of use is determined by three main categories.





This figure is an adapted version of the figure of the WB 2013, OECD 2005. A similar figure provided in the World Bank's Digital Jobs for Youth report, 2018

In line with the digital skills diagram, types of digital jobs and employment are emerging that may be available to the population. ICT-enhanced is activities where ICT is used as a tool, but which could or were performed without an ICT tool. For example, accounting. ICT-dependent is a digital technology that equips work to such an extent that work cannot be performed without technology. For example, call center, freelance work, software testing. ICT intensive - works that are directly created for the production of ICT and through the intensive use of ICT. For example, the development of mobile applications.

Thus, for the most part, basic skills need to be trained to be competent users of digital systems. Intermediate skills are required to obtain jobs and specialties related to ICT - information systems, digital platforms, and technological innovation achievements. Advanced skills related to technical skills related to creating new or modifying information systems, technological solutions. It is at this level, programmers, innovative start-ups and entrepreneurs are trained.

Digital technologies access steps

The implementation of digital skills development programs is largely determined by two mandatory prerequisites in the digital technologies access steps. The fundamental requirement is the availability of electricity for the use of these technologies. This factor is assumed by default as an uninterrupted supply of electricity throughout the republic. The entire ICT environment is based on electricity, in some parts of the republic, supply interruptions are observed.

Another two important factors in the digital technologies access steps are the motivation of citizens to use technologies and material access to these technologies. Figure 3 below illustrates the steps for accessing digital technology.

Most of the current programs are aimed at groups that are motivated to use technology for everyday needs and learn. However, it is important to consider the reasons why people stay offline and do not actively use the Internet for example. One of the factors may be that users do not associate activated applications (WhatsApp) or technologies (Wi-Fi) with Internet access and digital skills.

The citizens, as a whole, lack in understanding the difference between different concepts and their relation - the Internet, social networks, instant messengers, and mobile applications and so on. In the regions of Kyrgyzstan, for example, the older generation asks to connect Wi-Fi but does not

understand Internet tariff plans¹⁰. Another example is the fact that a certain part of citizens does not associate "digital television" with access to the Internet, without which there would be no broadcasting.



Figure 3 Digital technologies access steps

The population have access to smartphones, Internet, but have limited access to desktop devices

The second important factor is material and technical accessibility or prosperity. These conditions include the availability of computers, laptops, the use of smartphones, as well as the availability of Internet access.

Mainly access to computers at home. There are 1.145 million households in Kyrgyzstan and less than 18% of them have personal computers. At the same time, there is a significant difference between the indicators of Bishkek and other regions of the republic. The best situation with computation is observed only in Bishkek and Osh cities, where the penetration rate was 47% and 27%, respectively. The worst indicators are in Osh and Chui oblasts.

¹⁰ More detailed on the digital motivation research results in the world: <u>https://www.goodthingsfoundation.org/digital-motivation</u>

Table 1. The number of personal computers in the KR

					Proportion
Total, units \Year	2016	2017	2018	Number of	Qcomputers / Q
				households	House
Talas oblast	5296	5455	5855	44271	13%
Naryn oblast	6715	7295	7824	51184	15%
Batken oblast	6555	6964	7958	79922	10%
lssyk-Kul oblast	10023	10353	10748	103075	10%
Osh oblast	10450	11464	12773	187882	7%
Osh city	14084	15168	15767	57355	27%
Chuy oblast	14530	16313	17276	206578	8%
Jalal-Abad oblast	15613	17081	18384	186418	10%
Bishkek city	94901	100207	106730	229022	47%
The Kyrgyz Republic	178167	190300	203315	1145707	18%

Resource: National Statistical Committee

It is also important to consider that these indicators do not consider the level of obsolescence of technical equipment, but still can be taken into account in statistical indicators. Some computers may not support modern applications, software and perform operations at the proper level.

According to studies conducted by ISOC in the city of Osh and the Osh region, most people who want to learn programming skills do not have laptops, but they have smartphones with Internet access. The situation in other areas of the republic may be similar.

Figure 4. The number of computers per household in the Kyrgyz Republic and neighboring republics, and the average world median



According to comparative data of the average median for Europe and Central Asia, Kyrgyzstan, with a significant increase in the number of computers in recent years, is significantly behind the neighboring republics in the number of households using computers. This is the main cornerstone of obtaining intermediate and advanced skills. This factor of material access is the main limitation in the dissemination of digital skills development programs in the republic.

However, the situation began to change with the fast growth rate of the

telecommunications industry, mobile communications, cheaper Internet, as well as the cost of devices with Internet access and computing power (smartphones).

At the end of 2018, there were 1209 mobile communication devices per 1000 people. In Kyrgyzstan, 1.5 million more cellular subscribers than residents. The country has 2.49 million active Internet users, representing 40% of the total population. The total number of active mobile Internet users is 1.33 million users, which is 22% of the total population¹¹. By 2019, about 80% of Kyrgyz citizens have smartphones and only 20% use push-button devices¹².

As a result, citizens have experience interacting more with mobile computing technologies than desktop devices. The vast majority of Kyrgyz citizens are mobile native, that is, those who had their first experience of interaction with digital skills through mobile devices. This determines the order of perception of technologies, their role, and interaction.

12 https://mics-surveys-

¹¹ <u>https://www.slideshare.net/DataReportal/digital-2019-kyrgyzstan-january-2019-v01</u>

prod.s3.amazonaws.com/MICS6/Europe%20and%20Central%20Asia/Kyrgyzstan/2018/Survey%20findings/Kyrgyzstan %20MICS%202018 English.pdf

Mainly smartphones are a way to consume digital content and generators of multimedia digital content. However, the share in the creation of more highly intelligent content is minimal. All applied digital skills for training are based on desktop versions. Our citizens do not perceive and cannot master them because they do not have computer literacy.

Citizens learn basic digital skills themselves, and advanced skills are only available in large cities

Most people independently learn basic digital skills informally, directly interacting with technological devices that have access to the Internet (smartphones, tablets, smart TVs). Media literacy is one component of the digital literacy landscape and is relevant to the study of digital skills.

According to the media literacy report, many parents (80%) have no idea about the functions of "parental control", which make it possible to ensure the safety of the child's stay in the Internet environment. According to the report, about 53% of respondents say that they can protect information on the Internet, delete the history of their actions, 43% can change the access settings for their information on social networks. However, only 37% of respondents know how to clean a computer of unnecessary files (recycle bin).

Most citizens in the Internet environment receive news through instant messengers (Whatsapp, Facebook, Telegram), Youtube and social networks (Odnoklassniki, Instagram, Facebook)¹³.

The computer science lessons at school begin from the 6th grade in specialized computer classes. However, children long before beginning independently to learn about technology and the Internet through smartphones, thereby mastering basic digital skills.

Mainly citizens learn intermediate and advanced digital skills by self-education via accessible online courses and Youtube channels¹⁴. At the same time, higher educational institutions are experiencing a shortage of attracting specialists in the direction of "information technology". It is worth noting that the cost of training at universities in IT specialties is quite low and affordable compared with the countries of Central Asia.

¹³ https://soros.kg/wp-content/uploads/2018/03/Otchet-po-itogam-issledovaniya-mediagramotnosti-v-KR.pdf

¹⁴ https://kssda.kg/public/docs/IT%20Research%20St4.pdf

The second most popular way to obtain intermediate digital skills after self-education is through private educational courses available in the country. Mostly, these courses are presented in the cities of Bishkek and Osh. In regional centers and regional cities, such courses are little known or inaccessible to the population.

Advanced digital skills (such as programming) can be obtained only through self-education or only in regional centers: the cities of Osh and Bishkek. In other regional cities and centers, these skills are not available at all or are represented only by a limited number of courses (3-5).

Internet users use their skills for entertainment content

According to my data, about 80% of users access the Internet via mobile devices and less than 20% via computers and tablets. There is a correlation between the time of use and the type of device. During working hours, the number of Internet access via desktop computers is higher than the average statistics; however, in the evening, mobile devices prevail.



Figure 5. Market share of desktop operating systems in the Kyrgyz Republic, 2012 to 2019

If we talk about computers, then access through the Microsoft Windows operating system prevails, which is used by over 95% of all users. The second is Apple OSX applications, but the number does not exceed 3% in total.





Resource: <u>https://gs.statcounter.com/browser-market-share/mobile/kyrgyzstan/#yearly-2012-2019</u>

The Internet is mainly accessed through browsers. The most popular browsers are operating systems Google - Chrome and Apple iOS - Safari installed by default.

According to Alexa, the top 10 most popular and visited websites include Google, Youtube, Akipress, Vk.com, mail.ru, Wikipedia. Odnoklassniki.ru. ¹⁵.

Another form of accessing the Internet or interacting with digital resources is mobile applications. Google Android is the most popular and covers about 85% of Internet users of the Kyrgyz Republic, and 15% use Apple iOS. Each operating system is a platform that enables third-party developers to develop mobile applications in approved programming languages and provide access to them through special platform stores - Google Play market, Apple AppStore.

According to Appfigures, the most popular Android apps are entertainment (games), social networks, instant messaging systems (instant messengers), image and video processing and editing systems (Likee, inshot)¹⁶. The navigation systems (2Gis, Google Maps) are popular also.

¹⁵ <u>https://www.alexa.com/topsites/countries;0/KG</u>

¹⁶ <u>https://appfigures.com/top-apps/google-play/kyrgyzstan/top-overall</u>

Digital government

In 2018, Kyrgyzstan adopted the National Strategy for Sustainable Development - Vision 2040, which defines the construction of a digital government as a cornerstone of the country's future. In this regard, since 2019, the five-year program "Sanarip Kyrgyzstan" has been implemented. One of the main components is the digital transformation of the state, digitization of internal business processes, the provision of all governmental and municipal services electronically. It is planned that by 2023, 80% of all public services will be provided electronically via Internet sites, mobile applications, information kiosks, specialized information systems, and software.

The Government actively introduces the digitalization strategy

At the heart of all the transformations, the state designated the introduction of the Tunduk system of interagency information exchange, where all government institutions and agencies will exchange information with each other, minimizing the number of inquiries and documents requested from the private sector and the population. 95 government agencies and commercial structures are connected to the Tunduk system, 389 software services are created on the platform, an average of 3 million transactions are performed per month.

As part of the automation of electronic systems, e-kyzmat services were launched, which included 627 government agencies and local government bodies. Electronic document management systems have been introduced in 75 government agencies in an industrial mode. Everywhere, all bodies are switching to electronic information systems that allow the generation of digital data. This gives positive results in terms of the speed interagency cooperation, reducing the burden on citizens and businesses in the number of inquiries and documents requested from them for access to obtaining public services.

The government is actively disclosing data under the Open Data project, striving for transparency and accountability, as well as creating digital assets for enterprises in the digital economy. The data.gov.kg portal presents 585 data packages from 15 organizations. A third of the data was provided by the National Statistical Committee, a leading organization in the field of data disclosure. However, data from many government departments as well as local municipalities are still not available in the database. The total amount of data presented is insufficient for the application of technologies in the field of data science, Big data.

To achieve the goals of digitalization, the state conducts an active information campaign in all regional centers, in the mass media and social networks. For a wide coverage of the population

with public services, within the framework of "State as a platform" concept, communication service operators were involved, together with them the services were launched in the field of digital payments (fines for violation of traffic rules, payment of utility bills, 85 services in total). Thanks to this approach, in 2019, over 1.1 million requests for checking fines for traffic rules violations were made only under the "Fine Check" service within the Safe City project.

To create new products aimed at making government services more accessible, workshops and hackathons were held in Bishkek, where representatives of various sectors created solution prototypes for the state in 48 hours (Sanaripton). 32 teams took part in these events, and 10 projects sailed through to the second round to finalize the product and apply for investments up to USD 20 000.

The roadmap for the implementation of "Sanarip Kyrgyzstan" shows tight deadlines for the introduction of information systems but does not indicate the need for training of both civil servants and the population in these systems to achieve success indicators in public services introduction on time.

Not all online public services are popular among citizens

Over the two-year digitalization period, Internet resources of government departments have begun to gain in popularity. According to state plans, by the end of 2019, 189 public services should be launched in electronic format. To date, the picture of the popularity of state web sites is as follows¹⁷.

Website	Purpose of use	Visits per month
Minjust.gov.kg	Ministry of Justice: regulatory	200 000
	and reference information	
Zakupki.gov.kg	Public Procurement Portal:	225 000
	Publication of	
	announcements, participation	
	in competitive tenders	
Sti.gov.kg	State Tax Service: patents,	163 000
	electronic invoices, reference	
	information	

Table 2. The most visited Internet resources of state bodies

¹⁷ The indicators analysis was carried out on January 10, 2020

Grs.gov.kg	Information services for the	65 800
	population: passport, birth	
	certificate, marriage	
	registration, fines for	
	violation of traffic rules	
e.gov.kg	State portal of electronic	3 830
	services of the Kyrgyz	
	Republic	
Kattar.kg	Portal of electronic appeals of	3 000
	citizens to state bodies of the	
	Kyrgyz Republic	
Data.gov.kg	Open data portal of the KR	1 800
	данных КР	

The data is taken from the popular rating web resource alexa.com, and website traffic using was counted using pr-cy.ru tools

This table reflects the most popular resources to date, at the same time, the problems encountered in the implementation of the project. The most popular are the sites of government agencies, interacting predominantly with the private sector. Users, mainly with intermediate and advanced skills, turn to these sites for information and reference, for participation in electronic bidding, as well as for submitting various reports electronically.

According to data analysis, there is a proportionally low share of the use of government websites that provide services to the population to the total number of Internet users in the country. This is due to several factors.

The first factor is the low level of recognition of government departments among Internet users, despite the high ranking in the search results. Mobile applications of government agencies have a low number of downloads. For example, the application of the Ministry of Economy on the Play Market has been downloaded over 100 times only. The mere fact of the availability of these applications does not make them popular and useful among the target audience. Perhaps the most popular application is the Statkg application of the National Statistical Committee, which has been downloaded over 5,000 times.

The second factor, the overall low level of convenience of navigation (usability) of resources for users of mobile devices, which account for 80% of all Internet access today. Most government websites in the Kyrgyz Republic have low usability and download speed indicators according to the GTMetrix and Google PageSpeed Insights tools. In the Mozilla Firefox browser, many government sites are indicated as "not safe" because they do not have a security certificate installed, the certificate has expired, or the certificate does not have all the fields filled in to verify the site owner. This factor discourages inexperienced Internet users from using these sites. Certain services of state agencies are made for convenience through the Internet Explorer browser, which is used by less than 5% of the population of Kyrgyzstan.

On the website of the Ministry of Justice, it is very difficult to use the section "Searching the database of legal entities" from a mobile device. The site of the centralized bank of legal information of the Kyrgyz Republic does not have a mobile adaptation. This factor makes many public services unavailable for 80% of citizens.

Infocom's "KGZ eID NFC Reader¹⁸" mobile application on Google Play, designed to identify citizens with biometric passports for remote use of public services, has a rating of 2.6 out of 5. There are a lot of comments that this application stops working when scanning biometric passports.

Some information resources of the state are not maintained at the proper level but are not canceled in case of loss of relevance. The portal of state and municipal services and the licensing system of the Kyrgyz Republic, available at http://gosuslugi.mineconom.kg/ has technical errors. Samples of applications on some sites are only in Microsoft Word or Adobe PDF formats for downloading, without providing online forms for filling out applications, thereby making it accessible only to users of desktop devices.

The third factor is that some resources do not fully provide materials in the Kyrgyz version of the site, making information unavailable to the Kyrgyz-speaking population. On the STI website, all the names of internal documents are only in Russian. Navigation and instructions for using public services on websites for the population are also not presented in the Kyrgyz language or presented in a mixed format (Kyrgyz / Russian), which makes general navigation inconvenient for users and restricts access to information of the main population of the republic.

Another fact is that when interacting with government agencies, responses are often received from free mailboxes (mail.ru, gmail.com, ya.ru) with hard-to-identify addresses that are not closely connected with the government agency. Government officials often use personal e-mail addresses to communicate on business matters with the private sector and the public. This shows the level of digital literacy of civil servants, as well as compliance with internal regulations on information security.

¹⁸ <u>https://play.google.com/store/apps/details?id=kg.infocom.eid&pcampaignid=MKT-Other-global-all-co-prtnr-py-</u> <u>PartBadge-Mar2515-1</u>

Accelerated digitalization of public services faces challenges when government employees do not command all new information systems and their functionality. This topic requires additional research and determination of the level of digital literacy of civil servants.

Thus, significant work is required to increase the recognition of electronic public services, increase the level of digital literacy of civil servants, as well as train advanced digital skills (usability, design thinking, mobile development) to provide public services at a qualitative level for the population and business.

Digital economy

Digital entrepreneurship means doing business in a digital space, where the revenue sources of business models are the application of new technologies.

The digital economy is an economic activity based on digital technologies related to electronic business and electronic commerce, and electronic goods and services produced and sold by them. The basis of the digital economy, as well as the information society, is an information technology (IT).

The digital economy has created a huge shortage of people with the necessary digital skills. According to an ITU study, in the coming years, the number of jobs for people with digital skills will make tens of millions. In Europe, for example, it is estimated that by 2020 the number of vacancies for ICT professionals will be 500,000. Each region faces similar challenges. According to experts, the existing digital gap will be supplemented by a deficit in such areas as artificial intelligence, nanotechnology, 3D printing and other technologies, the appearance of which is associated with a new era, which will radically change the pattern of consumption, production, and employment. Many countries view digital skills as the foundation of digital transformation.

Digital economy falls behind advanced countries

Thanks to the rapid development of technology in the world, new innovative forms of business have appeared. Results achieved: there are all opportunities for capitalization in the world.

Phenomenal startups have appeared on the world market that have changed the surrounding communication landscape of a person. Uber and similar companies have increased the mobility of citizens and the use of personal vehicles for commercial transportation. Airbnb has opened up the opportunity for millions to rent their apartments to strangers without fear, and tens of millions have the opportunity to save money when traveling. In Kyrgyzstan, about 300 private and legal entities rent premises on Airbnb. These types of startups began to be attributed to companies with "disruptive technology." Startups such as Wordpress provided the opportunity to open the Internet resource quickly and cheap, SurveyMonkey allows conducting social surveys of the general population and distributing newsletters without physical restrictions on the number and complexity of tasks.

The list of disruptive technologies includes artificial intelligence, the Internet of things, 3D printing (additive manufacturing), cloud computing, blockchain. Thanks to research in machine learning

and the development of startups based on artificial intelligence, the digital systems have learned to detect signs of cancer by X-ray much earlier than specialists.

ICT-intensive platform economies have appeared in the digital world, when the most successful and largest companies create an environment around their products, thanks to which third-party developers, companies or individuals can earn money. For example, the most visited video hosting resource of Kyrgyzstan Youtube allows publishers, artists to publish their intellectual property products and earn money from advertisers. Google, based on the Android mobile platform, creates opportunities for mobile application developers to develop their applications and products, post on this resource and monetize in various ways. In Kyrgyzstan, the Instagram photo hosting platform has created an opportunity for users with basic digital skills to post images of their goods and services online and sell through this platform.

All these technologies have allowed creating new enterprises, jobs, and needs for new professions and advanced digital skills while creating value and capitalization of the company for a short period. If before the advent of technology, achieving a company valuation of one billion dollars (unicorn) took decades and significant capital investments, now thanks to the development of digital technologies, startups can gain customer bases, achieve comparable financial metrics and results in several years, shortening the path to unicorn status.

In the Kyrgyz Republic, the National Statistical Committee assessed the digital economy for the first time in 2019. The report of the National Statistical Committee contains mainly statistical data collected from formal sources but does not cover the dynamics of the development of the innovation environment in Kyrgyzstan. According to available data, from 2012 to 2018, the share of the Information and Communication sector, which is at the center of creating a digital economy, in GDP averaged a significant percentage for the economy - 3-3.9%. Nevertheless, from the point of view of employment, 1.2% of the total employed population or 27.6 thousand people are employed in the Information and Communications sector. Where the number of representatives of the active/visible IT community is from 5000 to 7500 people.

Entrepreneurship in the technological environment has evolved, along with the development of ICT infrastructure, the level of digital skills of the population. Fifteen years ago, computer clubs were very popular, which provided material access to engineering and technology. Computers had preinstalled software and Internet access needed for users to master basic computer literacy or to complete tasks. For those citizens who did not have the necessary computer skills, various centers provided services for typing, editing and printing texts. In the 2000s, IP telephony centers were common, which provided cheap international communication services. For 2019, in the markets across the country, entrepreneurs provide for citizens who do not have basic digital skills

the services for installing mobile applications on smartphones, opening e-mails, registering in instant messengers and social networks for a one-time payment of KGS 50-100.

One of the main digital entrepreneurship development drivers in the past decade was an active government policy, reduced regulation, establishing a traffic exchange point in Bishkek, and active penetrating broadband Internet into the households. At the same time, the intra-republican data exchange rate was 100 Mbit / s, while the external one did not exceed 1 Mbit / s or was extremely expensive. Thus, in the period from 2004 to 2010, local leaders such as the Diesel discussion forum, Akipress information media holding, Super.kg online publication, and Job.kg employment platform appeared in the republic. The Namba Internet holding and the Svetofor online store, the Akforta ERP solution development company were able to successfully enter the regional markets of Kazakhstan and the Caucasus and occupy significant niches. Mainly, local startups are the transfers of foreign business models adapted for local realities (copycats)¹⁹.

Another factor of explosive growth was the state policy in the field of frequency liberalization for telecom operators and the opening of opportunities for new players. During this period, the emergence of three mobile operators, such as Megacom, Nurtelecom, Beeline, made it possible to ensure a cellular coverage level close to 100% and make technology accessible for every citizen, thereby stimulating the demand for digital skills.

In terms of digital skills, the market was at the stage of computerization and construction of local computer networks. Therefore, the demand for advanced skills was mainly associated with the support and development of the network infrastructure of organizations. This demand was met and continues to be provided by the national center of information technologies, which trains such ICT-intensive professions as network administrator, database administrator, network security specialist, project manager using technologies from Cisco, Unix, Windows, Oracle, MS-SQL, Java²⁰. In addition, educational institutions also began to provide similar competencies for citizens.

The development of the mobile economy was limited by the high cost of the Internet. In the period from 2011 to 2017 with the annual cheapening of the international Internet, the competitive advantages equalized, and the global Internet sites began to play a significant role in the market. Today, Kyrgyzstan is in the top 10 countries with the most affordable cost of mobile Internet.

¹⁹ <u>https://vc.ru/story/43765-copycat?fbclid=IwAR3sidYPTR5du-w-fMQKusPHhF8zvytjy0DtfwjSCJLI1A-BI4zBot7TAr0</u>

²⁰ Detailed information about the course and the center you can find on it.kg

Thus, today the digital economy is represented by the following business models, digital platforms and companies according to Alexa²¹ and Similarweb²² ratings.

Search engines are the most popular sites for searching and finding the right information on the Internet. A business model is to place relevant paid advertisements on top of search results. The most popular networks are Google, Yandex. Fifteen years ago, there was the domestic search system Kyrgyzstan.kg but failed in competition with international players. According to recent studies, the volume of the Internet advertising market by 2019 amounted to over half a million USD.²³

The development of search engines has created a demand for such new professions as "SEO Search Engine Optimizer", "Targeted Advertising Specialist", "Linkbuilder", "Digital Advertising Specialist", "Google Analytics Specialist" and so on.

Social networks are the most popular platforms among Internet users, where the users themselves generate the content, which combined by certain social features. The business model is to place advertising information on the news feed of users. Russian companies are Odnoklassniki, Vkontakte, American Facebook, Instagram are the leaders in Kyrgyzstan. Chinese Tiktok has actively begun to gain momentum among youth.

Around these platform players in Kyrgyzstan, a whole galaxy of entrepreneurs has emerged that offer social media promotion services (SMM agencies), promote their products (Instagram stores) or are engaged in the promotion of third-party goods and services through their pages with a large number of subscribers (bloggers, viners, influencers, instagram stars). For example, the cost of one post on Instagram stars' page with over one million subscribers, costs from 300 to 1000 USD.

E-commerce is a way of selling goods and services through Internet sites by accepting payment by electronic means. E-commerce refers to both the private and public sectors. The government in many countries is the main driver of e-commerce by introducing the possibility of automatic payment under contracts and for services on state procurement and public services portals. In the private sector, there are many different business models built on e-commerce. The most common

²¹ <u>https://www.alexa.com/topsites/countries/KG</u>

²² <u>https://www.similarweb.com/top-websites/kyrgyzstan</u>

²³ Data displayed as 2.7% of the amount of 19 million USD, resource: <u>https://www.akchabar.kg/ru/news/media-ads-</u> 2019/

is the sale of finished products, the placement of information on an agency contract for a fee, and the placement of advertising information on sites.

The most popular e-commerce sites in the Kyrgyz Republic are companies such as Chinese Aliexpress, American Amazon, Russian Wildberries, as well as the local Lalafo advertisement board, Svetofor marketplace. In addition, many companies open their online representative offices and stores on Facebook, Instagram and Google social networks. Until recently, there were no companies in Kyrgyzstan that provided services for airline tickets online booking, which is one of the main growth factors in the field of electronic commerce and often make up a significant share in the overall picture. This is due primarily to the high cost of Internet acquiring, as well as the lack of gateways from local airlines to accept payment online.

The online taxi platform is a new phenomenon and business model related to the Internet. Thanks to such platforms, any driver can provide services for the transportation of people and goods by connecting to a taxi platform. This has created tremendous employment opportunities for all segments of the population, especially youth and women. The business model is to receive rewards from drivers for each trip provided. Many local players represent the domestic market, but the most significant positions are now assigned to Yandex Taxi and Namba Taxi. Regional cities have their own popular local taxi services, also operating through mobile applications on the Google Android platform. In Kyrgyzstan, about 60 thousand taxi boards use taxi platforms, and in Bishkek about 25-30 thousand²⁴. According to the market participant, about 5 thousand taxis work daily in Bishkek. Most commonly, young people aged 21 to 35 years (70%) work in taxis.

The main driver of growth in Internet consumption today are messengers (instant information exchange systems) - mobile applications that allow communicating via the Internet instead of the usual mobile and telephone communications. Internet messengers have become the main competitor of mobile telecom operators, taking away customer bases and revenues, while developing through their Internet connection networks. In this connection, this type of company is called OTP - over-the-top-players. In Kyrgyzstan, Whatsapp and Telegram are the most popular systems. There are different system monetization models, but the most striking is the Chinese Tencent, Wechat, which built around their messengers an ecosystem of additional services that allow mobile payments, buying additional services, and receiving special benefits in return for viewing ads. In Kyrgyzstan, specialized Whatsapp groups are used to trade cars, cattle in the regions, and as the main data exchange channel between market participants and consumers.

²⁴ The data is based on the number of downloads of applications for drivers in the Play Market and Apple Store. These estimates are indirectly confirmed by a survey of taxi services in Kyrgyzstan.

Online labor platforms were one of the first to supplant classic paper publications from the market by proposing more effective ways of interaction between labor market participants. One of the market leaders in the domestic startup job.kg, which was later sold to Russian investors. Also, there are such companies as Job.kg, employment.kg, headhunter on the market. The business model consists of subscribing to the services of both employers and employees, as well as other additional tools for better personnel selection and company promotion. Such digital platforms make it possible to conduct a qualitative and quantitative analysis of the needs for digital skills and to identify the most demanded competencies in the digital space. About 20 thousand users use such systems in Kyrgyzstan every day²⁵.

The payment means market is developing dynamically and according to preliminary results of 2019, the market volume amounts to about 20 million USD, having doubled over the past three years ²⁶. Kyrgyzstan was one of the first CIS countries in the early 2000s, which actively began to promote payment means, but a change in political course slowed down the development of the market until 2010. Solutions from Kyrgyzstan are effectively exported to foreign countries (IKEEN Group case study²⁷, Mobilnik export to Turkey²⁸). Over the past two years, mobile wallets of telecom operators "Money", "Balanskg", "Megapay", as well as commercial banks' Mbank, Optima24, and Elsom have been rapidly developing. In the regions of Kyrgyzstan, many citizens do not have the skills to use electronic payment systems. This gap is filled by agents who make electronic transactions for users for a certain fee, known as "web cashier".

One of the international indicators of technology use by the business is the level of penetration of CRM and ERP solutions. Overall penetration is low and correlated with international reporting data. There are solutions on the market from Russian companies 1C-Bitrix, the Ukrainian company Terrasoft, several companies have introduced SAP. However, the market has a small number of offers for business, taking into account the economic realities of the republic. SaaS solutions are underdeveloped in the market, a business model in which customers are offered a monthly subscription for using the software at their workplace instead of purchasing turnkey solutions. According to the ICT market research in the Osh region and the city of Osh, this situation is to some extent explained by the lack of understanding of the role of information technology of

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²⁵ These estimates are based on the analysis of site traffic through the pr-cy.ru tool

https://24.kg/ekonomika/132018 tsifra dnya obyem operatsiy cherez elektronnyie koshelki dostig 14 milliarda som ov/

²⁷ <u>http://www.ikeen.com/index_ru.html</u>

²⁸ <u>https://hepsicebinde.com/</u>

business in increasing the competitiveness of enterprises²⁹. This is indirectly confirmed by the fact that for the entire region with a population of over two million people there are two companies offering business process automation and accounting services.

The market of financial and technical solutions have begun to develop rapidly only for the last two years in connection with the modernization of regulation and easing certain type of operations. Banks mainly purchased ready-made solutions of foreign vendors and refined the software "at home". However, in 2019, the demand in the banks' labor market has significantly increased for programmers to develop their solutions. The most famous domestic solutions are the credit bureau ishenim.kg, banking solutions financesoft.kg, the accounting system openCBS for microfinance organizations.

Data on the development and use by the industry of domestic Process Control Instrumentation and business automation solutions are little known, except as indicated above and require additional research to display fully and reliably the overall picture. However, it should be noted that there are unique technological developments on the vegetables, fruits, and other food products freeze-drying based on the control and measuring instruments of the Russian company Oven³⁰. Advanced courses "Programming in Codesys, Siemens Simatic" are conducted, which allow creating unique products³¹.

Unfortunately, a few numbers of domestic enterprises were able to create unique disruptive startups, scale to global markets, and occupy their niche, while maintaining their head office in Kyrgyzstan. Nevertheless, we observe how Kyrgyz people open successful startups in other countries, which shows that the country has a certain human potential and a talent pool for which favorable conditions for development and scaling should be created³². Potentially in 2020 a startup unicorn with a billion-dollar valuation with the founder from Kyrgyzstan – Behavox³³ may appear.

²⁹ <u>https://kglabs.org/ru/index.php/2019/11/06/osh-city-ict-development-roadmap-2019-2024/</u>

³⁰ <u>https://automation.kg/resheniya/%D1%81%D1%82%D0%B0%D1%82%D1%8C%D1%8F/403-sublimatsionnaya-sushka-ovoshchej-fruktov-i-drugikh-pishchevykh-produktov</u>

³¹ Course "Programming in CoDeSys V2.3" (basic course), <u>https://ddef.kg/?page id=15123</u>

³² Entrepreneur Erkin Adylov creates financial solutions for Wall Street, <u>https://www.fnlondon.com/articles/meet-the-soviet-sheep-farmer-now-policing-financial-markets-20170518</u>

³³ <u>https://www.telegraph.co.uk/technology/2019/07/22/ai-startup-behavox-targets-unicorn-status-100m-funding-round/</u>

Digital entrepreneurship is developing but limited by a list of factors

Along with the development of technology, new approaches to launching and piloting projects, working in teams, and evaluating data that allow enterprises to be more flexible and able to quickly scale to international heights have appeared. Any digital enterprise now starts with designing thinking, creating a map of the consumer's path, creating minimally viable products, conducting A/B testing, and using flexible teamwork methodologies to develop new features for end-users.

Together, all these factors determine the emergence of digital entrepreneurship and the ingredients necessary to succeed. Digital technologies provide especially tangible opportunities for young people who have better mastered digital skills, have higher digital competencies, and more digitally native than the older generation.

In Kyrgyzstan, digital entrepreneurship is supported by the regulatory establishment of the High Technology Park, which creates favorable conditions for IT companies that provide their services for export. Over the past three years, HTP residents have shown an annual revenue growth of 50%. The main growth factor is representatives from the animation industry, who produce video content for the Youtube platform and earn from advertising.

IT entrepreneurship is being actively promoted in the community, especially among women. Over the past three years, TechWomen, Technovation, TechGirls, and other organizations have been actively involved in technology entrepreneurship and technical education incentives.

Space co-working is actively developing in Kyrgyzstan, uniting in their spaces intellectual workers and the creative community. The most sustainable and developed is the coworking space of Ololo, which has five coworking spaces in the cities of Bishkek and Osh.

Over the past four years, innovative laboratories and technology parks have been opened in collaboration with international organizations at several universities, to enhance the innovative potential of young people. However, these spaces either are represented by exhibition spaces or have low technical and technological equipment. Based on KSTU there is a laboratory that has only printers for 3D printing. In Kyrgyzstan, state universities do not have access to advanced disruptive technologies, software, and technical equipment, which limits the potential for creating advanced innovations in the country. Several private universities financed from foreign sources have good technical computer equipment - AUCA, Manas, Ataturk-Alatoo University. In Kyrgyzstan, industry fab labs, regional training centers, regional equipped technoparks with the transfer of foreign technologies are lacking.

From 2015 to 2016, a business incubator operated in Bishkek, which supported start-up entrepreneurs in the region by providing comprehensive training, mentoring and start-up capital. During the incubator, a shortage of advanced digital skills, programming skills and the general industry competence of participants was identified, which limited the success of entrepreneurs in their endeavors. In 2019, reports appeared in the mass media about plans to open new business incubators.

Acceleration programs are regularly launched in Kyrgyzstan. In 2019, acceleration programs focused mainly on the development of entrepreneurial skills were carried out by organizations such as Accelerate Prosperity, John Galt, KG Labs, and the Association of Young Entrepreneurs. The most significant acceleration program was organized by the private company InkubasiaLab, inviting mentors from leading Silicon Valley companies such as Uber, Linkedin, Facebook, Google, Apple, thereby organizing a platform for leading companies technology and expertise transfer in Kyrgyzstan (2017-2018). As a result of all acceleration programs over the past three years, more than 70 teams, 200 participants, have pumped their business modeling skills, design thinking, forming a value offer, prototyping new products, and also received seed funding for the development of their products.

Hackathon is gaining popularity as a format for holding innovative events. These are 24-54-hour events, during which specialists from various fields, including software developers, industry experts, intensively and collectively work on a technical solution to a problem. The event's outcome is a demonstration of product prototypes. In 2019, hackathons were held on open data, journalism, environmental issues, legal topics together with artificial intelligence, e-commerce, and financial technology, as well as solutions for the state. According to my estimates, in total over 500 participants took part in such events, which shows a healthy increase in demand for such competitions.

In a society rapidly advancing scientific and technical directions of professional specialization (STEM). Professional conferences (GDG DevFest, Pycon, Gamedev, Kyrgyz Internet Forum), master classes on new technologies (AR / VR, Data Science, artificial intelligence), as well as meetings on flexible project management methodologies are regularly held.

Startup and pitch competitions have been held over the past few years, including events such as Startup Nations the Pitch, Future Agro Challenge, Creative Business Cup, Falling Walls Lab, Seedstars Bishkek, and Eurasian Digital Platforms.

It stands to mention the events dedicated to the professional development of girls in ICT-intensive professions: TechWomen Alumni Meetups, Technovation Challenge for girls from 10 to 18, TechGirls, Django Girls, Lean in Circle, Facebook Developer Circle. For example, more than 30 girls from the Kyrgyz IT industry have visited Silicon Valley as part of the TechWomen 5-week

mentoring program. In 2018, the implementation of an analog of this program for young girls, TechGirls, began. In the fall of 2018, an event called Startup Weekends Women Edition was held as part of the month of women's entrepreneurship development worldwide.

However, according to the data based on the hackathons and acceleration programs of PF KG Labs, for the development of innovative entrepreneurship, participants lack advanced digital skills, industry competencies, teamwork skills, project management, work experience, interaction with existing international technological solutions, access to advanced technologies, as well as the availability of angel and venture capital investments.

Offers deficiency for Advanced Digital Skills

According to the data of the National Statistical Committee, the share of employees in the Information and Communications sector is 28.1 thousand people out of 2.38 million people employed in 2018. This is about 1.1% of all employed in Kyrgyzstan³⁴. While in Russia this indicator is at the level of 2.44%, the total employed population is 4.3% in the leading countries worldwide³⁵.

Based on the data of world technological leaders, it can be assumed that the number of people employed in the information and communication sector in Kyrgyzstan should be 102 thousand specialists. Thus, the total number of new specialists in ICT-intensive professions requiring advanced digital skills should be 74.3 thousand people. In fact, about 7400 specialists graduate annually from educational institutions of the country, including private short-term training courses in technical specialties³⁶. Representatives of the export-oriented part of the IT sector of Kyrgyzstan constantly complain about the lack of qualified ICT specialists for intensive professions.

According to the survey, only private universities in Kyrgyzstan provide courses on advance digital skills and disruptive technologies for students and professionals. So, courses on machine learning, artificial intelligence, and data science are offered by "Manas" Kyrgyz-Turkish University, AUCA, UCA. However, such courses are absent in the regional state educational institutions of the republic, where the majority of young people study. Artificial Intelligence Laboratory was established at the International University of Kyrgyzstan. However, a review shows the limited application of these technologies in various sectors of the economy³⁷.

³⁴ <u>http://www.stat.kg/ru/statistics/zanyatost/</u>

³⁵ <u>https://hightech.fm/2018/02/01/free_2mln</u>

³⁶ https://kssda.kg/public/docs/IT%20Research%20St4.pdf

³⁷ <u>http://kis.iuk.kg/laboratoriya-iskusstvennogo-intellekta/</u>

Professions in the Information and Communications sector are considered the highest paid in the world and Kyrgyzstan. For 2018, a significant increase in the average monthly salary growth rate was observed in the republics in the Construction (11%) and Information and Communication (9.8%) sectors. According to published vacancies, the salary range is from twenty thousand to two hundred thousand KGS. According to the NSC of the Kyrgyz Republic, from January to November 2018, the average salary in the Information and Communications sector amounted to 31,636 KGS, while the average monthly nominal wage in Kyrgyzstan is 16,218 KGS.

Regarding the size of the salary of a programmer (developer), there is a dependence on the experience of an IT specialist, the demand for a programming language, and the skills that he/she possesses. For example, in the Kyrgyz market, a junior specialist earns between 300 and 600 USD per month. Middle-level specialists from 600 to 1000 USD per month. A high-level specialist (senior) can earn from \$ 1,000 per month.

According to some reports, the programmer attracts \$ 20,000 of export money, while the seamstress is \$ 1,700 a year. Universities now produce 400 programmers a year, while market needs are 10 times higher³⁸.

Figure 7 IT trends according to respondents



At the same time, issues of advanced training on future technologies essential. are According to "Analysis of the IT sector of the Kyrgyz Republic" report, produced in early 2019 for "Competitive Enterprise" the program, the most relevant trends are mobile development on Google Android and Apple iOS, front-end, backend, as well as topics related to

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http://lmndeit.kg/%D0%BF%D1%80%D0%BE%D0%B3%D1%80%D0%B0%D0%BC%D0%BC%D0%B8%D1%81%D1%82 -%D0%BF%D1%80%D0%B8%D0%B2%D0%B5%D0%B5%D0%B0%D0%B5%D1%82-%D0%B2-%D0%B4%D0%B5%D1%81%D1%8F%D1%82%D1%8C-%D1%80%D0%B0%D0%B7-%D0%B1/

data science (machine learning, artificial intelligence).

All this shows a shortage of personnel with relevant competencies and growing demand for new digital skills.

The government relies on the digitalization of different sectors, but low cross-sectoral cooperation observed in the economy

According to the national program "Sanarip Kyrgyzstan" adopted by the government, deep digitalization should affect traditional sectors of the economy such as industrial production, tourism, agriculture, and construction. The rapid effects of digital transformation can be achieved through the development of digital commerce and access to digital financial services through improved policies and regulatory mechanisms³⁹.

The state prioritizes increasing population incomes and employment by "increasing agricultural productivity by optimizing irrigation, monitoring land quality for minerals, monitoring weather conditions and moisture, monitoring the status of crops and pest threats through the use of technologies such as integrated sensors, automated machines for sowing and harvesting, the systematic collection and transmission of data, and images of agricultural land through the use of remotely piloted vehicles. Using digital technologies, important data arrays will be collected, aggregated and analyzed for modeling, forecasting, and making strategic decisions for the development of the agricultural industry. These technologies can be used not only for agriculture but also in farming. Electronic identification and monitoring, the use of Internet of things technologies will allow us to monitor the condition of animals, collect and analyze data from pastures, changes in weather conditions".

In the field of light industry, "Digitalization may include the introduction and application of such new digital technologies as 3D modeling and digital design, digital prototyping based on computer graphics, additive printing of fittings and accessories, automated production, and much more. Systematic inventory tracking, analysis of data arrays, the emergence of new materials and fabrics, and manufacturing innovations will help Kyrgyz companies reduce costs and enter highyield markets. Also, manufacturers need to be given the opportunity to effectively use ecommerce tools to market products both domestically and abroad. For this, it is necessary to develop digital technologies in the financial sector, to effectively implement mechanisms that facilitate the process of obtaining electronic certificates and other permits to stimulate export".

³⁹ <u>http://www.ict.gov.kg/index.php?r=site%2Fsanarip&cid=27</u>

Today, some domestic sewing enterprises use CAD of "Grafis", "Lira", "Leko", "Investronica", and "Gerber". Business sees the advantages of implementing such solutions. However, there are problems with a shortage of specialists who can work on such solutions in Kyrgyzstan⁴⁰.

In the tourism industry, "a multilevel digitalization of business processes should be carried out to increase the income of tourism-related enterprises, ensure the convenience and safety of tourists, and improve the image of the country as a tourism destination."

All priority sectors include a component of increasing income through the development of ecommerce and digital channels of trade, and the efforts of the state and development partners will be aimed at improving digital skills in this direction.

Despite the positive dynamics of demand for ICT-intensive professionals, the economy has low inter-industry cooperation to increase innovative human resources. Some sectors of industry are open to cooperation and work in this direction through associations with the academic sector. However, the interaction between the IT sector and priority sectors of the economy is not visible.

The desk analysis did not reveal a significant number of activities aimed at strengthening crosssectoral partnerships, as well as tripartite meetings with the academic community.

In Kyrgyzstan, there is a tendency where industry associations cooperate with educational institutions in the training of specialists with digital competencies. For example, in 2019, a training center for the light industry "Personnel Industry" was established based in KSTU, where digital skills specialists - computer specialists will be trained on the design of garments (CAD) based on the solutions of the German company Grafis. Manas Kyrgyz-Turkish University trains digital skills specialists who can work on automated control systems (ACS) of Fidelio Front Office, Fidelio Material Controls solutions, which increases the digital competencies of youth in the field of tourism and hospitality.

In the private sector, only a few large enterprises and associations have training centers designed to improve the overall qualifications of employees. Training centers were established by such enterprises as Gazprom, Union of Banks, NENK, and SCIESU (State Committee for Industry, Energy and Subsoil Use of the Kyrgyz Republic). Almost all training centers are located in the capital of the republic, but still, they do not offer courses to improve intermediate and advanced digital skills. The most successful example of intersectoral cooperation is the training centers established for the "1C" computer accounting solution for accountants.

⁴⁰ http://arch.kyrlibnet.kg/uploads/KSTUZHOLCHUBEKOVA2017-42-2.pdf

At the same time, there are no systemic meetings and partnerships between the software developers sector and industry associations aimed at increasing the competitiveness level of these information technology sectors. To some extent this is explained by the fact that successful IT companies are residents of the High Technology Park and, for the sake of obtaining preferential taxation, must generate 80% of their income from foreign sources. In fact, for many of these companies, 100% of their income comes from external sources. Thus, the regulation creates prerequisites for low intra-republican intersectoral cooperation.

The second ensuing factor due to the personnel shortage and the high cost of export-oriented rates of IT specialists working in HTP resident companies, are local enterprises, which do not have the finance to strengthen their competitive positions with the help of technology.

In total, it is found that the academic sector does not provide digital skills competence designated by national policy, and cooperation with the private sector is fragmented and occasional. Based on these factors, in the republic, there are no industry-specific innovation platforms where innovative solutions can be created, and IT specialists can deepen their knowledge in certain sectors of the economy.

Digital skills and digital entrepreneurship development program

According to the pyramid of digital skills and analysis of the current situation in the Kyrgyz Republic, it is revealed that different levels of digital skills require the involvement of different stakeholders, methodology and approach, as well as the expected results. It is crucial to increase the overall level of digital literacy, which will open the opportunity window for mastering digital professions.

To determine the level of digital literacy, Kyrgyzstan could adapt ready-made methodologies developed as part of the achievement of SDG-4, which sounds like "Ensure inclusive and equitable quality education and promoting lifelong learning opportunities for all." As part of the achievement of indicator 4.4, methodologies have been developed for assessing literacy rates. Target 4.4 By 2030, substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship.

The participation of the Kyrgyz Republic in studies on the level of digital literacy of the OECD's adult population could make it possible to determine quantitative indicators and more accurately set target indicators for future programs for the digital skills development in the republic.

To achieve the goals of the Sanarip Kyrgyzstan five-year national strategy, the Ministry of Education needs to accelerate the development of a competent approach to education and the preparation of a competency scale for new digital professions to adapt and implement at the vocational and higher educational levels of the republic. Several major digital competency assessment methodologies have been developed in the world and the most common is DigComp 2.1 of the European Union. However, it is necessary to adapt these methodologies considering the level of digital technology accessibility in the Republic because historically in Kyrgyzstan the first device for acquiring digital skills was mobile devices, not computers, as happened in the EU.

The following described measures are aimed at general increasing the level of basic digital skills, building an ecosystem for intermediate skills training, employability, and youth employment, as well as strengthening digital entrepreneurship in the country. To achieve SDG-8 "Decent Work and Economic Growth", it is extremely important to take into account the level of users in the digital skills pyramid in implementing initiatives to increase employment in the digital economy.

Raise the overall digital literacy level through popular platforms

To address the shortage of skills in ICT for intensive professions for the real sector of the economy and to meet the current and future volume of demand for specialists, the general level of digital literacy of the population must grow. In many respects, the choice of digital professions depends on the level of skills of applicants' parents and their fears of using new technologies in everyday life. For students, young professionals, and those who are engaged in continuous training, it is necessary to increase the awareness that, in addition to the profession of a programmer, there are many other possibilities in the atlas of digital professions that do not require a high level of digital skills and technical qualifications. In this regard, it is necessary to raise citizens' awareness of basic digital skills through national campaigns.

The effectiveness of the "Hour of Code" campaign in Kyrgyzstan shows the possibility to conduct large-scale national events to increase the level of digital skills through short-term information campaigns - Internet Week, Privacy Hour, during which all citizens will learn through any information channel about a particular topic regarding digital skills.

Based on the available analytical data, the most effective way to increase the digital skills of citizens can be by using existing popular digital platforms and their key players (influencer) to achieve maximum results.

It is extremely important to focus on the fact that it is necessary to interact with the target audience through familiar platforms and existing popular channels, rather than creating new ones. Based on the experience of previous initiatives conducted in the republic, it is visible that, for example, specially created educational channels on YouTube for financial inclusion did not get the maximum attention of the target audience and did not achieve the desired result. This means that certain educational content distributed through the top 10 Instagram stars and the top 10 Instagram channels in Kyrgyzstan can be more effective than creating a separate channel/page and its further promotion.

Today, the most popular platforms are Youtube, Instagram, Whatsapp, and several information sites. On these platforms, you should create joint content and distribute through Instagram pages with over 250 thousand followers, YouTube channels over 100 thousand subscribers, and create short videos that are distributed through Whatsapp. This will ensure the fastest coverage of the general population and the achievement of the goals of the national campaign.

Additionally, short online tests can be developed to assess the level of digital literacy, where Instagram stars will direct at the beginning and at the end of the digital skills development campaign. Anglia Ruskin University has developed digital literacy assessment tools that may be useful for learning.⁴¹

To reach a younger audience, educational editions of the most downloaded Minecraft game in Kyrgyzstan from Microsoft can be used. This educational game provides opportunities for children to master basic digital skills at their own pace. This solution may be budgetary and effective in collaboration with Microsoft⁴².

On the Internet, there are many ready contents to promote basic digital skills developed by the joint efforts of the international industry organizations, including the International Telecommunication Union, the GSMA, the UN, OECD, Skolkovo, as well as technology companies. In this direction, work is required to localize foreign content into the Kyrgyz and Russian languages with the adaptation of examples.

The educational and methodological materials of the GSMA International Association of Telecommunications Operators are especially suitable for the audience of Kyrgyzstan, where the coverage of users of mobile devices and the Internet significantly exceeds the owners of personal computers and users of broadband Internet. The Digital Skills Observatory ⁴³ toolkit developed by the Mozilla Foundation allows reaching the most vulnerable and groups not covered by technology through blended learning techniques that may be applicable in Kyrgyzstan.

Within this program, it is possible to organize joint campaigns with <u>the Decent Jobs for Youth</u> initiative, which will increase the visibility of the program at the international level and create opportunities for new international partnerships to develop digital skills. A more detailed list of sources of finished materials is presented in the Annex in the "Bibliography" section.

Leading technology companies Google, Microsoft and others have developed courses to develop basic digital skills. These courses are aimed at improving the skills of quick search and finding the right information, processing and decision making, and security rules in the digital space. These

⁴¹ <u>https://aru.ac.uk/anglia-learning-and-teaching/good-teaching-practice-and-innovation/technology-enhanced-learning-and-teaching/digital-literacy</u>

⁴² Detailed information on Minecraft Education Edition - <u>https://minecrafteducation.zendesk.com/hc/en-us/articles/360034140692-Join-the-Minecraft-Education-Edition-Library-Beta-Version-1-12-3-?fbclid=IwAR0WoO4GefgSiUp4DQ3Xy95pJo0xj1em9oUco-LFrWMag3MxekLbCyhj08, and on YouTube channel https://www.youtube.com/channel/UC2XjBkW16jGLGSEF9vo4PDA</u>

⁴³ <u>https://mozillafoundation.github.io/digital-skills-observatory/</u>

courses are licensed under a Creative Commons 4.0 license, which allows you to copy, edit, and redistribute freely. Partnership with these platforms to localize these courses can significantly increase the reach of the audience, the visibility of this project and the further sustainability and accessibility of these materials to the general population.

In addition to promoting digital literacy on the Internet, television remains an important educational channel, especially in the Kyrgyz language in the regions. National and regional television channels are effective tools to deliver the role and importance of digital skills to the public.

According to the scheme of digital technologies access stages, television allows to increasing the motivation of citizens to use the Internet, acquiring the necessary devices (laptops, smartphones), and what skills are necessary for safe operation in the digital space, what non-entertainment applications and software exist that could to be useful, and what employment prospects exist in the Internet space. This information is especially necessary for financial trustees and parents of young people, whom career prospects may depend. For example, parents with no understanding the value may not approve the purchase of a desktop computer, high-speed Internet, programming courses or the purchase of the necessary online service, for example, the purchase of a developer certificate on Google Android (3250 KGS) or Apple iOS (7000 KGS) platforms.

Thanks to the development of digital television, educational content on digital skills, designed for broadcasting, can be available constantly for various target audiences and any time anyone can watch the necessary content. Thereby, it is possible to convert popular Internet programs and channels to wide TV screens. Digital television can also act as a tool for distance learning of schoolchildren and students in those subjects where there is a lack of competence or teaching staff in local educational institutions.

In a certain sense, the popularity of television is explained by the lack of content in the Kyrgyz language for the comfortable development of new skills. In this regard, the localization of international educational resources is a necessary additional factor for creating an environment for a teaching person. In this regard, the linguistic translation of the main teaching materials into the Kyrgyz language (subtitles, transcripts) could be a driving factor. An example of this is the Khan Academy, which could eke out the missing knowledge in many fields for schoolchildren, students, and young professionals, where there are not enough teachers and specialists. However, based on the experience of past years, we can conclude that the creation of individual resources with similar educational content does not give the desired effect. Separately created educational channels on Youtube or web sites are little viewed, rarely gaining more than 2,000 views in three years of existence.

Another important channel is community radio services, which are popular in regions. Radios are effective and low-cost tools for adult education. Public radios are considered recognized because they are closer to the local community, do not require electricity to access, and radio programs⁴⁴ are cheap in the production.

Local communities, understanding the quality of the Internet, the availability of computer and mobile technologies, can best tell how people can improve their skills and abilities. An academic example of evidence of the community radio role in public education is the example of the Peshawar region in Pakistan⁴⁵. In Kyrgyzstan, there are more than 24 community rural and regional radio stations.

Another effective way to promote basic and intermediate digital skills can be the opening of computer centers based on libraries in communities where there is no access to computers and educational institutions. Libraries are valuable in the eyes of parents and are not associated with gaming computer clubs. Here they can get the necessary experience of interaction and the skills necessary to increase their ability to find a job. The International Federation of Library Associations presents a range of best practices on how libraries contribute to the achievement of the SDGs and strengthen digital literacy in the world⁴⁶.

Pilot projects have been implemented in Kyrgyzstan, but there are still many communities where there is a need for community-based educational centers, where there are no other ways to gain access to information, education, and quality jobs⁴⁷. In total, there are 289 libraries throughout the republic.

Thus, thanks to all these efforts, the level of digital literacy can be increased, and the ground created for the development of intermediate and advanced digital skills, as well as the development of ICT-enhanced and ICT-intensive digital majors.

Strengthen key digital competences of civil servants

To ensure the holistic and sustainable development of the state and the implementation of the approved strategy, the state needs to take measures to increase the human potential of civil

⁴⁴ <u>https://epale.ec.europa.eu/en/blog/community-radio-broadcasting-and-adult-education-case-study-using-</u> <u>community-radio-non-formal</u>

⁴⁵ <u>https://www.academia.edu/34037756/Role of FM Radio in Education A Case Study of FM Radio in Peshawar</u>

⁴⁶ https://www.ifla.org/files/assets/hq/topics/libraries-development/documents/access-and-opportunity-for-all-ru.pdf

⁴⁷ http://www.bik.org.kg/ru/projects/

servants through enhancing digital competencies. The problems associated with the leakage of data from state databases due to the human factor can undermine the credit of the population and business in the ability of the state to be a data operator and contribution to plans for the implementation of Sanarip Kyrgyzstan.

In this connection, it is necessary to develop a national system of certification of civil servants for digital literacy. Given the limited financial resources, it is necessary to develop distance learning systems with mandatory passing for civil servants on information systems and certification of graduates (Tunduk, open data, departmental services (electronic patient recording), adapted for mobile applications.

Such educational systems are designed to provide basic skills in electronic correspondence, the use of corporate mail systems, electronic interaction with stakeholders, data storage and transfer, etiquette on the Internet, and to ensure a universal high standard of service in state agencies and municipal bodies. Using open-source software such as Moodle and Open EdX for these purposes will strengthen the potential of developers to create software for educational services.

Considering the digital gap between major cities and regional centers, the development of additional educational programs is required that will strengthen the skills in feeding information in the correct format, saving and transmitting data, and cybersecurity. This will improve the potential for the successful implementation of the Open Data project.

In the aspect of the state, in addition to the development of digital skills, an information security audit should also be carried out in all state agencies in the regions, the internal information security system and network infrastructure should be strengthened to prevent leakage of confidential data of the state. It is also necessary to audit and strengthen the systems resiliency for the seamless provision of public services.

In addition to basic digital skills, ministries need to develop additional training programs for specialized information systems and using the potential of the Tunduk interagency platform. Given that most employees use their office applications, additional courses for advanced users of these applications would be an additional plus.

In the context of strengthening the regulatory environment, additional training is required on new technologies, standards, and protocols to develop national technical standards on technologies. To date, the plans include the introduction of "smart cities"; however, there are no standards and certifications in this area, which creates a legal vacuum due to the lack of competencies among employees of the agency.

As part of the "State as a platform" concept, the government needs to produce quality technical documentation for its information systems, to create a complete application programming

interface (API), to conduct webinars on developing services on "Tunduk", to ensure access for interested developers, and to hold regular competitions programming.

Improve skills to provide state services for population and business

To increase the number of citizens using state websites and mobile applications, it is necessary to improve standards for the usability of interfaces, add educational landing pages so that the experience of learning the system is easy and simple. These initiatives would help strengthen users' confidence and increase the percentage of those who use remote information services of the state.

Given that, there are a certain number of users who do not know how to find such websites and use services via the Internet, the organization of physical educational spaces in popular population and business interaction places (SRS) is required in order to increase the percentage of citizens motivated to use digital technology and skills. For example, to teach how to use electronic digital signatures, an eID card.

Developing intermediate specialized skills will strengthen the business position and the digital entrepreneurship potential

To strengthen the competitiveness of enterprises, youth employment, and innovative potential increase, it is necessary to facilitate the technological transfer of foreign solutions to Kyrgyzstan. These transfers can be in the form of acquiring the necessary software and hardware, adapting teaching-methodological and certification materials, opening training centers, technically equipped innovative laboratories, fab labs, and makerspace.

The choice of the main directions for increasing the employment of youth with digital skills is determined by the availability and prevalence of digital platforms, demand from the private sector, priority sectors of the economy, national programs and the structure of the economy.

The universal and demanded globally are the digital specialties built around certain technological platforms. Most of these platforms have training programs in English and certification systems that allow graduates to receive international recognition and easily find jobs. From this point of view, for the realities of Kyrgyzstan, the most popular and affordable platforms are Google, Apple, Microsoft, Amazon AWS, Facebook.

Google has a wide range of products and services, each of which requires specialized digital skills that you can learn by completing online courses in short period of time. The company certifies on the search network advertising, the Google Display Network, video ads, and product listing ads. From the point of view of products, there are certifications by Google Analytics, Google Ads, Google Cloud cloud solutions, development of Google Android Developer mobile applications, Tensorflow / PyTorch technology for machine learning and artificial intelligence. Apple offers certification capabilities for developing mobile applications in the iOS environment.

Amazon AWS and Microsoft primarily promote training and certification on the world's most sought-after cloud technologies. Such specialties as Amazon AWS Cloud Practitioner, Machine Learning, Solutions Architect, Big Data, Security, DevOps Engineer, as well as Microsoft Azure Solutions Expert, 365 Certified Enterprise Administrator Expert, Azure DevOps engineer can be available in this direction.

Facebook, Instagram social networks offer courses to promote advertising in this area. These specialists on social networks are in high demand in the republic. The opening of YouTube Space in Kyrgyzstan would increase the number of self-employed specialists involved in the production of video content and receiving income from advertising displays.

Given the limited access of young people to computers in the regions, it is proposed to use a mixed type of training, when participants get the basic skills in computerized training centers, and at home they view materials accessible via smartphones.

The most suitable business model for the implementation of training we propose to choose the model of the "Ecole 42" French school - an innovative programming school without teachers, without lectures, without grades, where training takes place on the principle of mutual assistance between program participants. Each participant works on his tasks at his own pace and at a convenient time for him. Such schools are also launched in the USA, Ukraine, and Russia (school 21). As part of the implementation of this program, it is proposed to adapt the business model to other digital specialties.

From the point of view of the existing demand for personnel and digital skills, infrastructure investment projects create significant opportunities for youth employment. Together with external credit and investment funds, and technologies imported into the country, but the corresponding qualified local personnel is not trained to support such systems. In this connection, there is a constant dependence on foreign specialists with the necessary competence. Based on this, it is necessary to train local specialists to support these technologies. Most of all infrastructure projects are in the field of road construction. This sector is one of the main generators of unskilled labor. However, at the same time, this sector can become a generator of jobs requiring higher qualifications by advancing digital skills. For these purposes, it is necessary that the target

audience, based on training centers, masters such technologies as business information modeling (BIM), computer-aided design (CAD) systems and geographic information systems. The most popular and common are technological solutions from Autodesk, Siemens, and Russian companies Ascon and Nanosoft. All these enterprises could transfer their training materials and open training centers and laboratories in Kyrgyzstan.

Given the national priorities for the development of priority sectors of the economy for the next five years, the private and academic sectors need to form key competencies in digital skills in the following areas: tourism, agriculture, light, and processing industries. In this regard, it is necessary to technically strengthen the innovative laboratories of universities and update the curriculum with the addition of digital competencies.

In the field of tourism and hospitality, universities should train using Fidelio, Opera, and Edelweiss hotel management information systems. In light industry, the established innovation center at KSTU can be strengthened by BMSVision production management systems, which will further strengthen the skills of specialists and employability in the labor market.

Agriculture requires serious attention due to the lack of any training programs in the field of digital skills. For the implementation of the program for the precision farming introduction, it is necessary to purchase and provide equipment and solutions for training centers and innovative laboratories of market leaders such as AgLeader, Innoquest, Teejet, Dickey-john, John Deere, Amity. All these complex high-tech agricultural management systems, including global positioning technologies (GPS / Glonass), geographical information systems (crop yield estimation technologies, Variable Rate Technology), remote sensing technologies, and Internet of Things "(IoT) technology solutions should create a galaxy of digital specialists who will be in demand not only in Kyrgyzstan but throughout the Central Asian region.

For the processing industry to enter new markets, it is necessary to comply with HACCP⁴⁸// GMP / GLP / QC standards. In this aspect, the training of specialists who are able to work on laboratory information systems (LIMS) to control product quality is required. Market participants in Kyrgyzstan are in great need of personnel capable of working in such systems. In this regard, cooperation between the academic sector and associations is required to select the most popular LIMS and systematic training. The most famous proprietary systems include Starlims, Specpage,

⁴⁸ 28 enterprises have implemented HACCP and, in principle, are ready for IT solutions <u>https://www.tazabek.kg/news:1585926/?from=kgnews&place=maincats</u>

Thermo Fisher, but there are also open-source systems for further customization and modification⁴⁹.

If we consider the economy structure, then an important aspect is the solutions for small and medium-sized businesses. In services and trade spheres, 1C and R Keeper are the most common systems, which allow keeping track of sales, movement of inventory items, and personnel records. In this direction, the private sector is effectively managing the supply of solutions and personnel. Moreover, thanks to the early development of information technology, local developers have created a series of new software products, thereby having a positive impact on digital entrepreneurship.

A significant part of the population and a large number of individual entrepreneurs are employed in the field of trade. Digital technology is only gaining momentum, and additional skills in this direction would create more opportunities for youth entrepreneurship. Short-term and university programs could enhance students' digital competencies in the field of content management systems (CMS) of technologies such as 1C-Bitrix, Wordpress, Bigcommerce, Cs-cart; customer relationship management (CRM) systems based on Vtiger, Terrasoft, Megaplan, and others. Among other things, private companies could organize sales courses through electronic trading platforms Alibaba, Beru, Instagram, Ozon, Qoovee, Svetofor, Wildberries.

All these measures for the development of specialized intermediate skills will allow in the medium term to increase the competencies of specialists and, together with training in digital entrepreneurship, create a fertile ground for creating unique competitive digital products ready for international scaling. Considering that graduates of programs in these specialties will be relatively expensive for a separate enterprise, there is a need to create new service enterprises that will offer industry-specific services for digitalizing business processes.

However, even the most innovative laboratories can stand idle without proper training of the teaching and administrative staff of educational institutions.

Invest in competence centers on advanced digital skills

In access to digital technologies for building a dynamic technological ecosystem, Kyrgyzstan lacks centers of competence and innovative laboratories. In this regard, there is a need to create

⁴⁹ More detailed information on the list <u>https://www.limswiki.org/index.php/LIMS_vendor</u>

thematic creative workshops (makerspace), fablabs, digital laboratories, as well as technically equipped acceleration programs.

Makerspace is a publicly accessible room where you can do any business: from sewing clothes to welding metal. The main feature is the use of engineering and technology to create new prototypes. In Ukraine, the innovative physical space of the Agritech Unit enables its residents to create prototypes of new products, test together with representatives of the real sector of the economy, and find financing resources for their startups. In Kyrgyzstan, there are no such centers in the regions, which limits the potential of young people to create something innovative.

Fablabs are manufacturing laboratories for physical prototyping. Such centers are equipped with laser cutters, 3D printers, 3D scanners of various values, as well as devices for the manufacture of printed circuit boards. The theme fablab for the Lottozerotextile industry, located in the Italian city of Prato, provides an opportunity for anyone who wants to use the equipment for silk-screen printing, weaving, dyeing, sewing, knitting and much more.

In addition to such innovative solutions for Kyrgyzstan, in the regional centers, there are not enough network academies to study telecommunication technologies, which allow finding the advanced digital professions that are in the capital. Moreover, without such specialists, it is difficult to deploy technological solutions to a higher level and industry significance. It is necessary to open network training academies on technologies such as Cisco, Red Hat, Vmware, Huawei, Oracle, Linux, MySQL Apache, Nginx, MongoDB. Kyrgyz universities could apply for research grants and laboratories funded by Huawei for the development of advanced telecommunication technologies like 5G, as well as innovations in the application of artificial intelligence in the field of smart cities and public order⁵⁰.

Technologically advanced acceleration programs would make it possible to advance not only the soft skills of teams but also provide opportunities for testing bold ideas. Such technologies may include access to the resources of Microsoft Azure, Google Cloud, Digital Globe, Amazon AWS. In terms of advanced skills, the services provided by the Russian Foundation for the Development of Internet Initiatives (IIDF) are outstanding.

Cooperation with IIDF could provide an opportunity to create specialists in the field of tracking, unit economics, product managers, as well as raise the general level of Internet entrepreneurship.

⁵⁰ https://www.huawei.com/minisite/russia/20anniversary/network-academies.html

Promote digital professions for women

Though statistics show equal gender intake in the ICT profession, a small number of women after graduation remain in this area. This is due to gender stereotypes in companies, as well as maternity factors when they drop out of processes. More awareness-building efforts need to be done on presenting the entire atlas of digital professions and how this can strengthen the financial situation and provide a path for self-realization. For example, in Kyrgyzstan, as well as in the world as a whole, the overwhelming majority of programmers are men, however, in digital professions such as SMM and marketing women are predominant. Technologies enable women to work remotely, have extra income, and be more flexible than in ICT non-intensive professions. In this regard, there is a need to support educational initiatives, which open the opportunities in information technology for women. An important part of the initiative is the fight against warnings from parents, spouses and loved ones that affect women's career choices.

In this regard, within the project, national weekly information campaigns, practiced in other countries of the world, could be carried out. The Girls Who Code movement could receive the same informational support from the society that the "Code Hour" movement has received in the country in recent years.

Expected results on digital skills development

This review of the state of digital skills and entrepreneurship in the Kyrgyz Republic shows the conceptual framework needed for further exploration of this topic. The analysis demonstrates the key challenges facing the state, the private and academic sectors in implementing programs to build a digital society and economy. Conclusions and observations in the field of innovative potential are consistent with the recommendations of the overview report "Innovations for Sustainable Development: A Review of Kyrgyzstan" presented by the Economic Commission for Europe (UNECE) in 2019. In addition to international review reports, this work allows building a specific strategy for the development of digital skills and drawing up a detailed action plan involving various state agencies, business associations, and educational institutions.

A focus on teaching the basic digital competencies of the population and business will strengthen the foundation of the digital skills pyramid, open access to a wide range of people in advanced digital professions, popularize the provision of public services remotely, and increase the competitiveness of enterprises using technology. Digital literacy is the basis for building a sustainable digital society that Kyrgyzstan is striving for in the framework of NSDS-2040.

The basic focus is the young growing population, who is entering a working-age, completed with digital technology but without the required skills. The development of intermediate skills, training in new digital professions will increase the employability, overall innovative and entrepreneurial potential of young people in the digital space. The income level of young people will increase compared to those positions that they held before mastering intermediate digital skills. Young people, who make up a significant share of the Kyrgyz population, will be able to gain access to new ways to earn a decent income and get a job, which coincides with the goals of SDG 4.

Strengthening human potential will allow meeting the needs of the new skills and technologies labor market. Mastering digital professions and information systems would allow businesses to increase the competitiveness of enterprises in the international arena, increase productivity and export potential, increasing overall confidence in the need for digitalization and building a digital economy in the Kyrgyz Republic.

Together with the development of digital entrepreneurship skills, innovative entrepreneurship in Kyrgyzstan will rise to a new level. The number of unique startups that can scale regionally or globally will increase. Kyrgyzstan will be able to move from laggard to catching-up countries on technology adaptation and improving living standards through ICTs. Thanks to the development of digital skills, Kyrgyzstan will be able to implement the established action plans and goals of Sanarip Kyrgyzstan and receive adequate appraisal in international reports on measuring the

digital development of the country along with the achievement of high indicators within the UN sustainable development goals.

ANNEX

List of literature

- 1. Coding Bootcamps: A strategy for youth employment, <u>https://www.itu.int/en/ITU-</u> D/Digital-Inclusion/Youth-and-Children/Pages/Coding-Bootcamps.aspx
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