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IRAN'S DIGITAL ECONOMY OUTLOOK

بسم الله الرحمن الرحیم

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Introduction

The world is continually changing, and one of the fundamental drivers is the digital transformation which leads to the emergence of a new concept called the digital economy. The digital economy can be defined as the economic activity resulting from billions of online connections among people, businesses, devices, data, and processes. As we enter the digital era, disruptive innovations in the digital economy have significantly changed production methods and ways of life in a way that brings more welfare, productivity, quality of life, and living standards and less cost and time spent for having the same services and products. Moreover, the digital economy provides facilities for unexpected users who were not possessing these conveniences in traditional structures. That's why we say the digital economy has created unprecedented values.

Although the digital economy is backed by the ongoing spread of information and communications technologies (ICTs), the development of the digital economy is something beyond ICT or IT. Without a doubt, it's a new, complex, large-scale phenomenon that requires a paradigm shift in almost every field, including policy-making and regulation, co-creation, etc., since the conventional approaches seem inefficient or incompatible with the nature of this new trend. Along with many scholars and experts, the emerging arrangements of the digital economy will serve mainly as a window of opportunity for governments. It allows ample room for national policy development and extensive reliance on more inclusive knowledge-based innovations. The government plays a key role in promoting digital economy development, in particular in creating a favorable environment for ICT infrastructure development and digital innovation. The coordination among national regulators, private sector, SMEs and academia is also vital to producing workable governance arrangements.

Our purpose in this report is to show what could be done relying upon a realistic grasp of the multifaceted status of the digital economy in Iran. The main structure of the report was initiated by China Academy of Information and Communications Technology (CIACT). As an independent local think tank, the Data and Governance Lab (D4G) has accompanied the report as a contributor to content development and policy recommendation. We aim to reach these objectives throughout the report:

- **Building an evidence-based depiction of Iran's digital economy:** A central goal of preparing this report is to provide a clear picture of Iran's current situation regarding ICT infrastructures and the digital economy to provide accurate information for stakeholders to accelerate digital economy development in Iran.

- **Consensus formation:** Since there are discords about some statistics and there is no consensus on, such as the share of the digital economy in Iran's GDP and other similar cases, this report tries to provide reliable integrated information by removing the ambiguities. Information validation is the report's target to provide reliable data for decision-making and stakeholder consensus. As a result, a more remarkable agreement is needed on incorporating and strengthening policy initiatives, thereby establishing an integrated national vision proactively toward digital economy development.

- **Providing a practical roadmap:** Considering the undoubted importance of the digital economy's development, one of this report's main goals is to provide a road map for the development of the digital economy in Iran. With the current situation analysis and international case studies, policy recommendations for Iran's digital economy development will be proposed.

- The prices provided in this report have been calculated using a conversion rate of 43,000 Iranian Rials per US Dollar.

Chapter 1

IRAN'S DIGITAL ECONOMY JOURNEY

1.1 ICT is a Key Driver of Economic and Social progress

ICT infrastructure and services are the foundation for countries to develop digital economy and to increase their overall economic well-being and competitiveness. Broadband infrastructure is now a vital infrastructure, as essential as water and electricity networks. ITU's analysis of more than 200 studies on broadband impact notes that a 10% increase in broadband penetration yields an increase in GDP ranging between 0.25% and 1.5%. OECD estimates that a 10% increase in broadband penetration can raise labor productivity by 1.5%. An EIB[1] study asserts that a doubling of broadband speeds can result in 0.3% GDP growth.

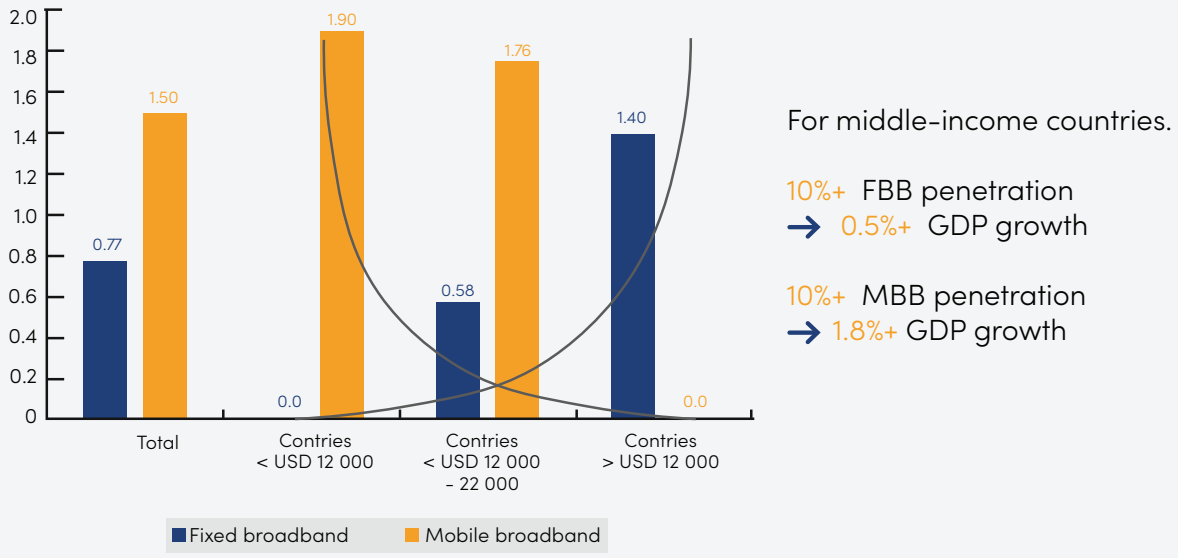


Figure 1-1 GDP growth impact of an increase in 10% of broadband penetration (%)

(Source: ITU)

In recent years, all major economies have released their digital strategies. For example, European Gigabit Society of EU, Industry 4.0 Strategy of Germany, Digital Economy Development Strategy of China, New Deal of Korea, Smart Japan ICT Strategy of Japan. Many of Iran's neighboring countries are committed to enhancing national competitiveness through digital transformation. For example, Saudi Arabia's Vision 2030 aims at becoming one of the world's top 20 digitally innovative nations; Egypt's Vision 2030 aims at building a competitive, balanced, diversified and knowledge-based economy; UAE's Digital UAE covers the efforts of the federal and local governments to make the UAE a smart country. The COVID-19 pandemic further highlighted the importance of the digital economy. More countries are accelerating their timelines of digitalization to fight economic downturn and secure sustainable development. To lead in the next round of international competition in the digital era, Iran needs to further commit itself to nurturing the ICT industry and promoting digital transformation.

1. European Investment Bank

1.2 ICT is at the Core of Iran's National Development Plan

1.2.1 Iran's National Development Plans Hold ICT as a Main Topic

1.2.1.1 The Sixth Development Plan

On 19 March 2017, the "Law on the Sixth Five-Year Economic, Cultural, and Social Development Plan for 1396-1400 (2016–2021)" (the "Sixth Development Plan") was approved by the Iranian Parliament. The general policies of the Sixth Development Plan (2016-2021) are based on the three pillars of development of a resilient economy, progress in science and technology, and promotion of cultural excellence and cover eight topics ranging from economy to ICT.

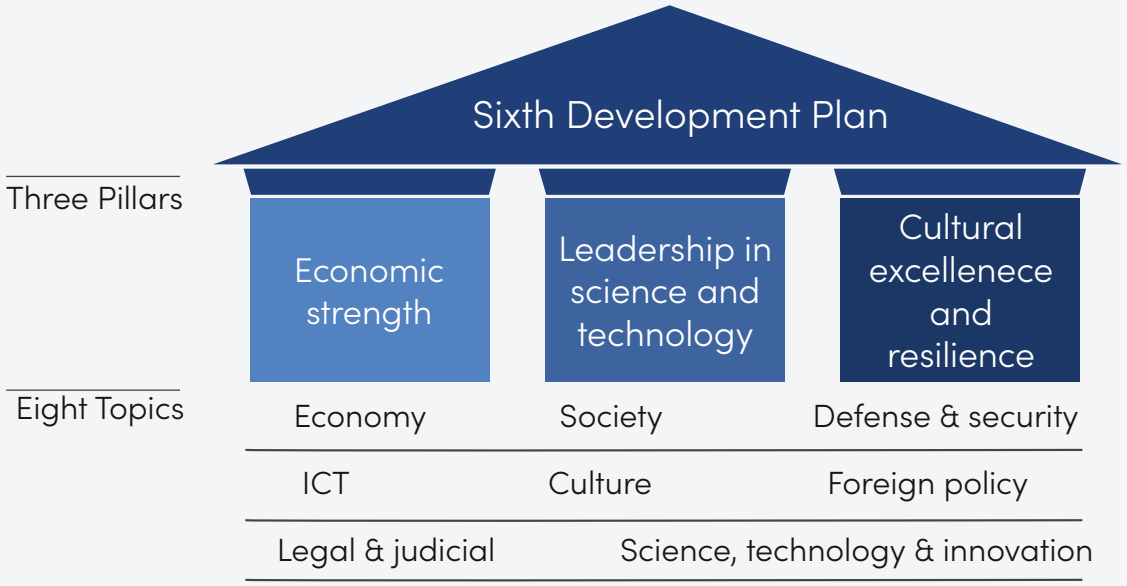


Figure 1-2 "3+8" Framework for Iran's Sixth Development Plan

The Sixth Development Plan recognizes the strategic value of ICT development. ICT is not only one of the priorities of Iran's national development and an integral part of its leadership in science and technology but also a key enabler of all the other pillars and topics.

1.2.1.2 The Seventh Development Plan

The general policies of the 7th development program have been also compiled and publicly declared on September 2022 by the Iranian supreme leader. One of its fundamental clauses is directed to the digital economy, cyberspace and its goals including digital sovereignty. Clause 19: "Establishing national sovereignty and protection of Iranian Islamic values in cyberspace by completing and developing the national information network and providing appropriate content and services and promoting cyber power at the level of global powers with an emphasis on the strengthening and security of the country's vital infrastructure and big data."

Emerging initiatives and the Special Working Group on the Digital Economy

The working group of the digital economy was established in December 2021 by the First Vice President with the aim of developing the digital economy and achieving a 10% share of the digital economy in the country's economy.

The main goals of the working group include developing digital economy infrastructure, removing obstacles and accelerating the formation of the digital economy ecosystem in the country, supporting digital platforms and businesses and basic technology in the country, creating a platform for developing the basic technology in the country, removing barriers for the operation of Iranian platforms at the international level and the development of digital economy skills.

This working group consists of Iranian ministries and personas including;

1. Communications and Information Technology
2. Economic Affairs and Finance
3. Industry, Mine and Trade
4. Cooperatives, Labor and Social Welfare
5. Defense and Armed Forces Logistics
6. The scientific and technology vice president
7. Head of the Central Bank of the Islamic Republic of Iran.

So far, this working group has held three meetings. These meetings' main focus has been emphasizing achieving a 10% share of the digital economy. In doing so, the combination of the working group and the limits of delegated powers were determined, the critical priorities of the working group, specialized committees, and approving the members were done, and committees are responsible for presenting reports and preliminary actions.

To be more specific, one of the most prominent achievements of the working group so far has been the withdrawal of the case of the Amitis system proposed by Iran's Central Insurance Organization; "an integrated system/gateway which led to the creation of a monopoly in providing licenses and services, as well as complicated regulation in the field of insurance businesses (InsurTechs)". The working group has become responsible for such interventions and making decisions in this field and so adopted a policy preventing the bottleneck and artificial forms of monopoly from being legitimated by the government.

1.2.2 Iran's ICT/Digital Development Vision

The government of Iran has recognized ICT as a key driver to enhance economic competitiveness and promote social inclusion. In January 2017, the government of Iran laid down a series of reform targets for the telecoms sector under its Sixth Development Plan. For example, it wanted internet bandwidth increased to 30TB by March 2021, with school networks and e-government services to be digitized. The Ministry of Information and Communication Technology (MICT) is also being urged to attract further private sector collaboration and foreign investment to the telecoms industry.

The MICT sets a few goals in line with the Sixth Development Plan, including:

- First position in the region in terms of e-government development in national information network
- Local content enhancement according to cultural map of country
- Establishment and enhancement of national information network of country and enhancing the security
- Transform Iran to the center of postal and traffic communication and information of region
- Influential presence in international transactions in cyberspace
- Increase investment in infrastructure
- Spatial technology development

The ICT Minister Mr. Zarepour proposed the Intelligent Iran program, which covers 8 areas ranging from infrastructure to digital economy and governance:

- Digital governance and international interactions
- Smart government and digital transformation
- National information network and sustainable development of communication infrastructures
- Regulation of communication and information technology
- Digital economy
- Privacy and security of information exchange space
- Acceleration of space industry growth
- Post services

1.2.3 Digital Transformation Framework

The digital transformation framework integrates various applications, services, resources, and physical infrastructure. It provides a map for all stakeholders to embrace and develop the digital economy.

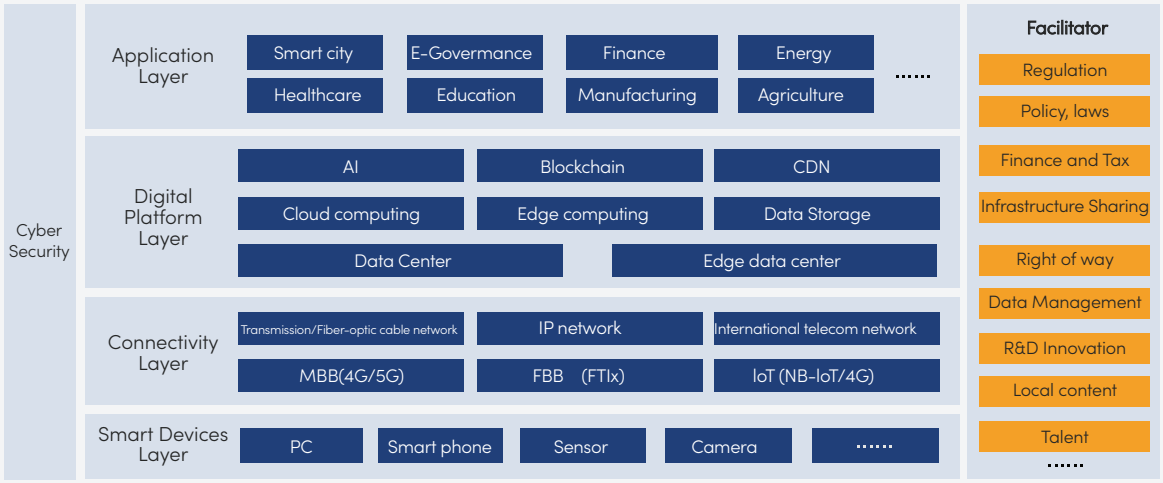


Figure 1-3 Iran's digital transformation framework

- **Smart devices layer :** A better connected country has the potential to be a smarter nation and it is at the smart devices layer that many of the key connections take place. This layer is intertwined with smart terminals and the Internet of Things (IoT).
- **Connectivity layer :** The connectivity layer represents various networks provided by telecommunication operators, as well as other networks provided by city stakeholders or enterprise private communication networks. This layer is responsible for carrying all the data produced by the sensors as well the communications between each of the elements of the ICT infrastructure such as – the data centers, platforms, end user devices and applications. It has fixed and wireless components.
- **Digital platform layer :** The digital platform includes computing and storage infrastructure based on the data center and edge data center. The layer, integrates cloud computing, edge computing and intelligent computing, to provide high-efficiency computing power. New technologies, such as AI and block-chain, are evolving to form infrastructure in the form of platforms.
- **Application layer :** Leverage the capacity of ICTs to enable the vertical social and economic sectors.

1.3 Iran's Digital Economy Development

1.3.1 Measuring Digital Economy

According to UN's definition for digital economy[1] , different technologies and economic aspects of the digital economy can be broken down into three broad components:

- Core aspects of the digital economy, which comprise fundamental innovations (semiconductors, processors), core technologies (computers, telecommunication devices) and enabling infrastructures (Internet and telecoms networks).
- Digital and information technology (IT) sectors, which produce key products or services that rely on core digital technologies, including digital platforms, mobile applications, and payment services.
- A wider set of digitalizing sectors, which includes those where digital products and services are being increasingly used (e.g., for e-commerce). Even if change is incremental, many sectors of the economy are being digitalized in this way. Examples include finance, media, tourism, and transportation.

1. DIGITAL ECONOMY REPORT 2019 by UNCTAD

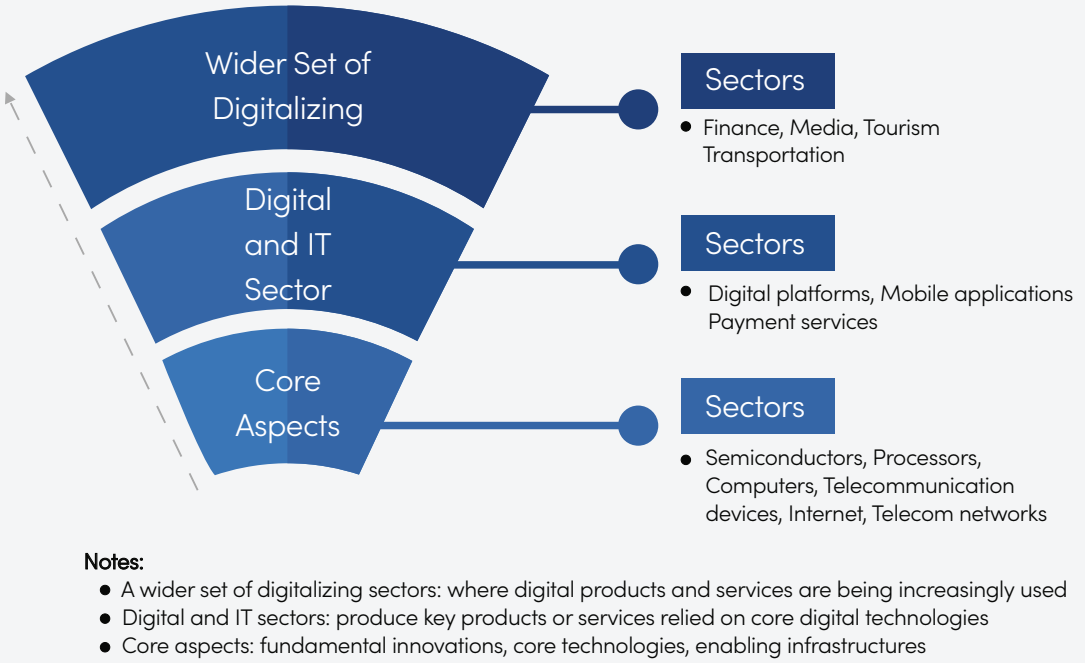


Figure 1-4 UN's definition of digital economy
(Source: UNCTAD)

Currently, many organizations and countries have developed various methodologies to measure digital economy.[1] However, there is still not a globally-accepted methodology that can be used for measuring or benchmarking the digital economy of all countries. According to UNCTAD, the share of the ICT sector (core of the digital economy) and the total share of the digital economy in the global economy in 2019 was estimated at 4.5% and 15.5%, respectively.[2] CAICT also **measured** the value of digital economy of 47 countries in 2021.[3] The study shows that digital economy in broad sense accounts for 8%~68% of a country's GDP, with an average of around 26.5%.

1. For example, see Toolkit for Measuring the Digital Economy compiled by the G20 Digital Economy Task Force.
2. See DIGITAL ECONOMY REPORT 2019 by UNCTAD. Methodological details are available in the UNCTAD Technical Note 3 International Trade in ICT Services and ICT-enabled Services: Proposed Indicators from the Partnership on Measuring ICT for Development, online at Https://unctad.org/system/files/official-document/tn_unctad_ict4d03_en.pdf
3. CAICT's methodology can also be found in G20 Toolkit for Measuring the Digital Economy.

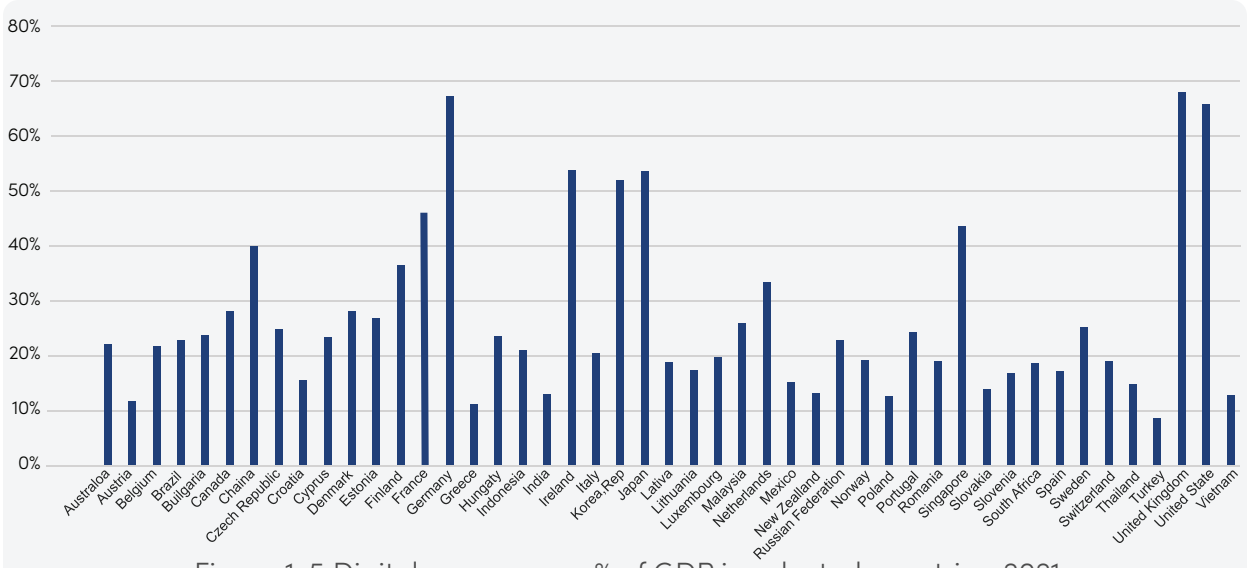


Figure 1-5 Digital economy as % of GDP in selected countries, 2021

(Source: CAICT)

1.3.2 Current Status of Iran's Digital Economy Development

ICT is one of the fastest growing industries in Iran. Currently, ICT comprises a remarkable 10.3% share in the total number of employed throughout the country. This is while the figure stood at 0.8% at the beginning of the Fifth Five-Year Development Plan (March 2011-16)[1]. In 2019, it is estimated that the share of Iran's ICT sector in its total GDP was 4.2% and that of digital economy in broad sense was 6.5%. The share of the ICT sector is almost approaching maturity, but that of the total digital economy is still far below the world average. By comparison, in 2020, ICT sector accounted for 7.3% of China's total GDP and digital economy's share in GDP reached 38.6%.

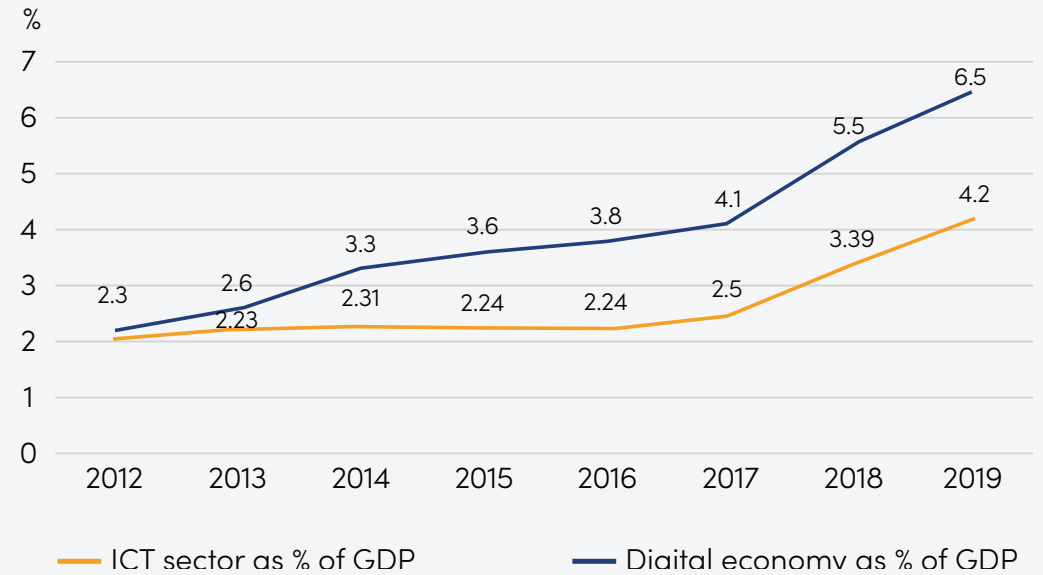


Figure 1-6 ICT sector and digital economy as % of GDP in Iran, 2012-2019

(Source: MICT)

1. Https://financialtribune.com/articles/domestic-economy/68936/ict-role-in-iran-economy-expanding

To recap, the potential of ICT in promoting digital economy development is yet to be unleashed. Iran needs to further promote digital transformation in various social-economic sectors.

1.3.3 Potentials of Iran's Digital Economy Development

Although Iran has not yet emerged as an ICT giant in the new digital era, it has great potential and capacity to become a major digital economy in the Middle East region and an ICT center in Persian-speaking countries. It has a dynamic and growing economy and ICT market, offering significant opportunities for telecoms growth. Its population is one of the largest in the Middle East, it has a youthful, tech-savvy demographic and there is an unmet demand for both fixed and mobile telecoms services. It is now dedicated to building the NIN with customized infrastructures to ensure the security and stability of global Internet traffic and has made great achievements in developing local/ regional ecosystems.

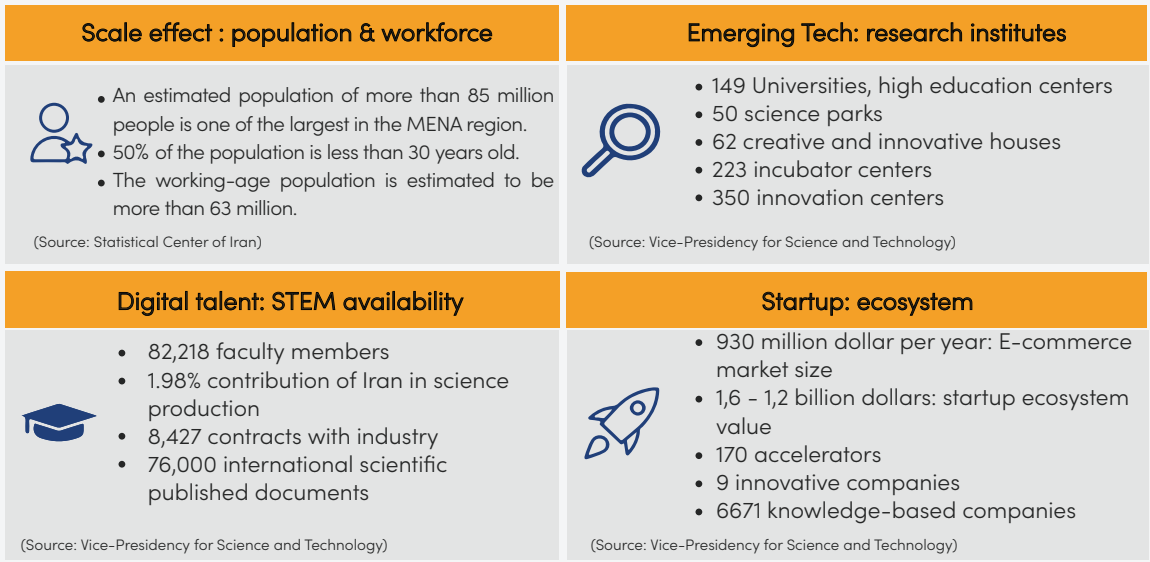


Figure 1-7 Iran's strengths in developing into a major digital economy

Chapter 2

DIGITAL ECONOMY; "THE NARROW CORRIDOR" OF DEVELOPMENT

2.1 Overview

Iran is trying to keep pace with the world in the field of ICT. Today, 98.5% of villagers and 100% of Iranians [in cities] have access to the Internet [1]. By June 2022, Iran's MBB and FBB penetration rates have reached 116% and 13% respectively. By November 2022, Iran has deployed 71315km of fiber network through Telecommunication Infrastructure Company of Iran; its international bandwidth has reached 5489Gbps.[2] In terms of quality and price indices, Iran has one of the cheapest broadbands in the world. Currently, 76,000 schools are connected to NIN, and more than 95% of them are receiving service free of charge.[3] With the development of infrastructure, the innovation and entrepreneurship movement has started in Iran. Over the years, the number of applications has grown to 345,000 [4]

Iran ranks 82th out of the 134 economies included in the Network Readiness Index (NRI) 2022. The NRI released by the Portulans Institute is grounded in four fundamental dimensions of Technology, People, Governance, and Impact, each comprised of three sub-pillars. The NRI covers issues ranging from future technologies such as AI and IoT to the role of the digital economy in reaching Sustainable Development Goals (SDGs). Iran's main strength relates to Governance. When it comes to sub-pillars, the strongest showings of Iran relate to Trust, Governments, and content, among others. More could be done, though, to improve the economy's performance in the Quality of Life, Regulation, and Future Technologies sub-pillars.

Sub-pillar	Rank	Sub-pillar	Rank
Trust	44	Individuals	64
Governments	47	Economy	65
Content	62	Businesses	70
Future Technologies	64	Quality of Life	101
Inclusion	74	Regulation	121
Access	92	SDG Contribution	124

Continue

1. Https://en.mehrnews.com/news/175934/Almost-all-Iranian-citizens-have-access-to-internet-ICT-min
2. Data source of MBB and FBB penetration rates, fiber network, and international bandwidth: CRA
3. Https://www.tic.ir/en/news/19078/Iran-among-three-countries-with-highest-ICT-growth
4. Https://cybershafarat.com/2020/06/01/iran-digital-economy/

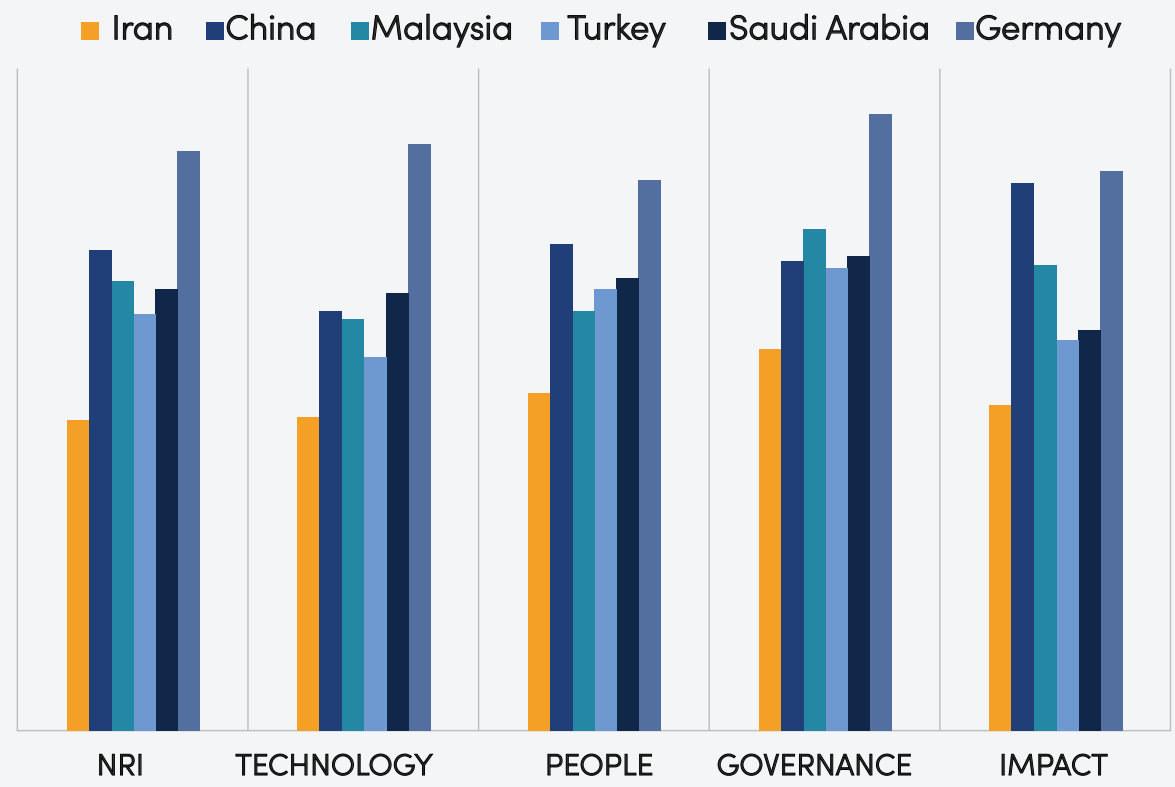


Figure 2-1 Iran's performance in Network Readiness Index 2021 and benchmarking
(Source: Portulans Institute)

The measurement results show that Iran still has a big room to enhance its ICT development, especially when it has fallen behind peer countries which are all dedicated to developing the ICT sector and realizing digital transformation.

2.2 ICT Infrastructure Development

2.2.1 Mobile Broadband

By 2022Q2, Iran's MBB subscription has reached over 84 million, with penetration of 116.4%. Among the MBB subscribers, 3G and 4G account for 48% and 29% respectively. As for MBB speed, Iran ranked 69 among 137 countries with a download speed of 28.4Mbps. Iran's National Information Network (NIN) Master Plan and Architecture targeted coverage of 100% of the country's population for mobile broadband access with an average speed of 10 megabits per second. From benchmarking, the targeted access speed of 10Mbps of MBB is not enough compared to other countries experience. Iran needs to set higher goals and targets.

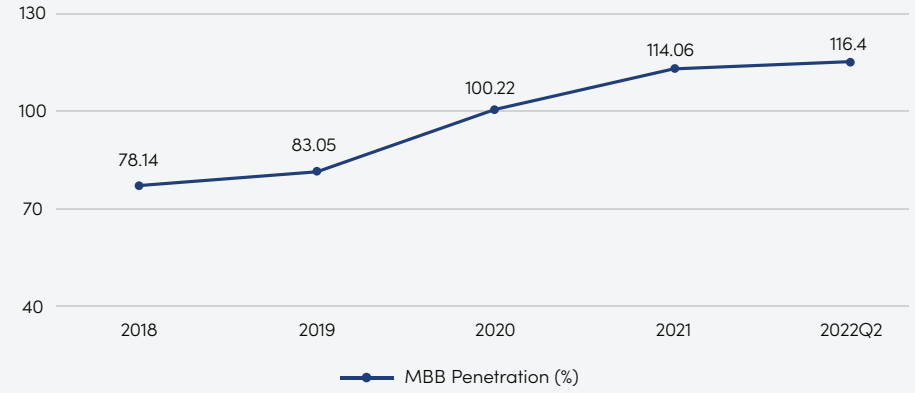


Figure 2-2 MBB penetration, by 2022Q2

(Source: CRA)

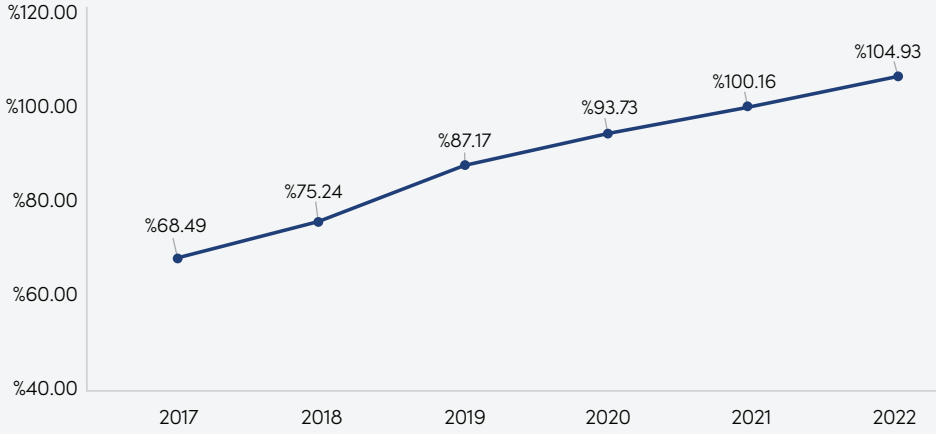


Figure 2-3 Market penetration; smartphone connections (%)

(Source: GSMA)

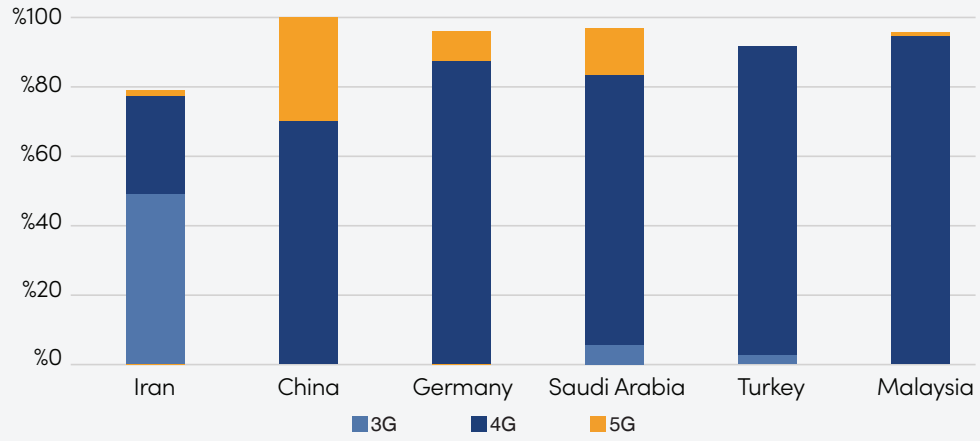


Figure 2-4 Benchmarking of MBB subscriber share by technology, 2022Q2

(Source: GSMA)

Note: No data is available for the 3G share of Germany and Malaysia. No data is available for the 5G share of Turkey

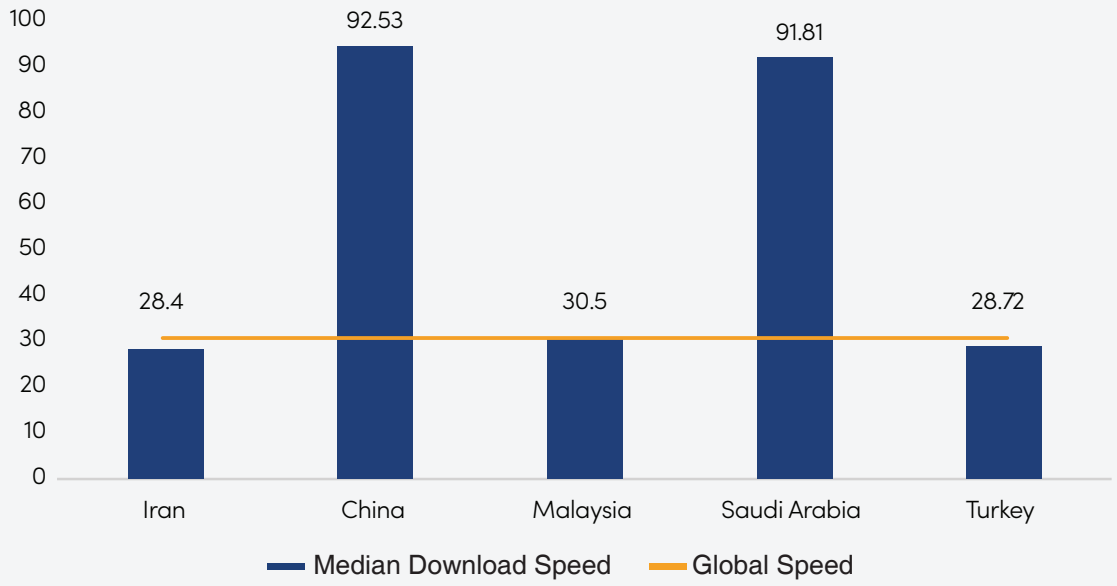


Figure 2-5 Benchmarking of MBB speed, 2022[1]
(Source: Speed test)

According to GSMA, 5G will contribute an economic value of approximately $960 bln to various industries in 2030. Besides, 5G scale commercialization can improve operators' finance. Compared to 4G, 5G drives DOU[1] growth by 29% and increases ARPU[2] by 10%. 5G can also help to grow in FTTX growth rate by solving the last mile issue through FWA. Therefore, Iran needs to accelerate 5G deployment, and it is highly recommended to start the auction of 3.5GHz, the most selected band for 5G.

Despite the trade sanctions imposed by the US and spectrum availability in lower bands, the Iranian government is proactively preparing regulations for 5G deployment and considering suitable bandwidth allocation. In February 2021, the MICT announced that it plans to auction a 3.5GHz spectrum to support the commercial launch of 5G mobile services in the country. MTN Irancell launched a limited commercial 5G network in Tehran in the same month using the existing spectrum. However, Iran's 5G program has remained shrouded until now, with no detailed action plan being made public.

1. Speed test data is as of August 2022, updated statistics will be applied once the entire report is completed
2. DOU: Average handset data traffic per user per month
3. ARPU: Average revenue per user

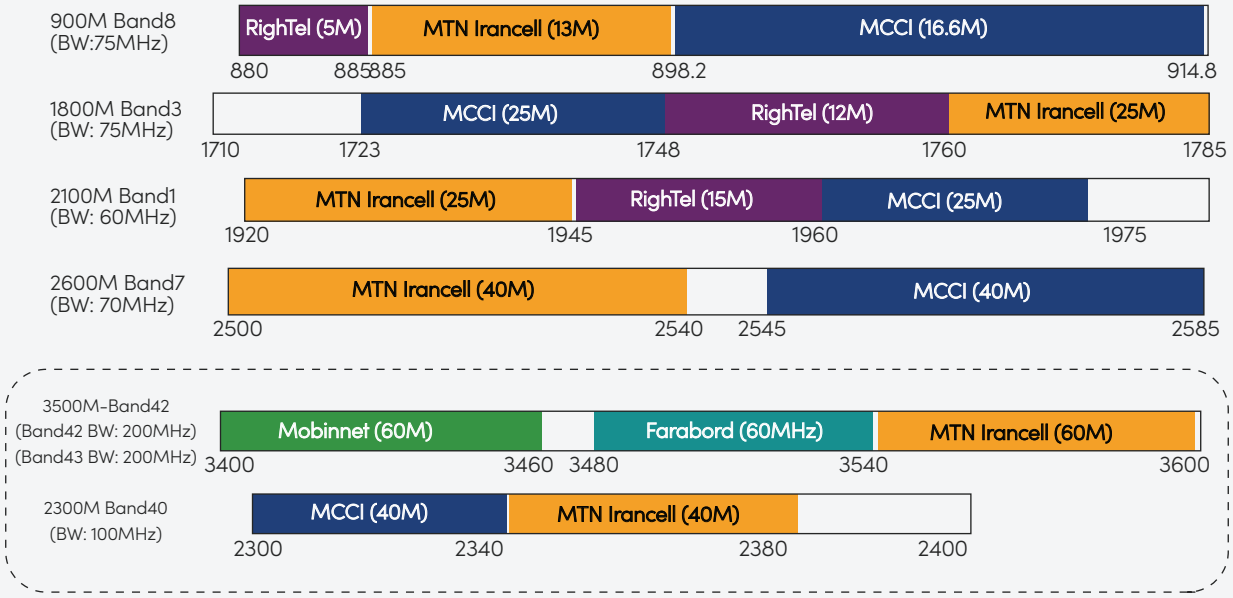


Figure 2-6 Spectrum Map of Iran

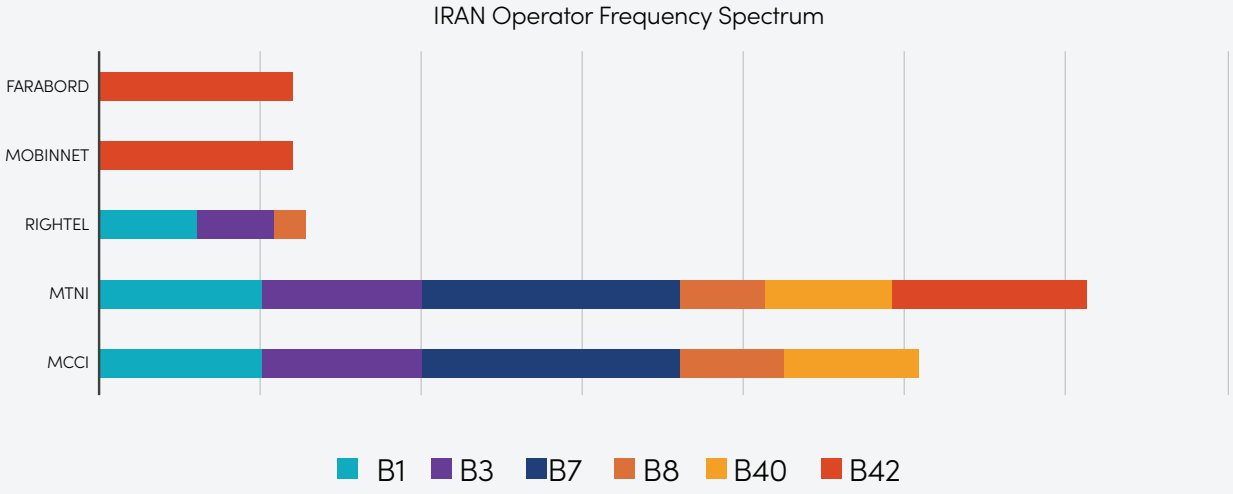


Figure 2-7 Frequency plan of Iran

Saudi Arabia: Concentrated effort made by both government and industry

Public sector

2018, government established the "National 5G Task Force" to speed up the availability of 5G;

2019, the MCIT launched Saudi Arabia's ICT strategy2019-23 ; released an additional 400 MHz in mid-band (3.5 GHz) spectrum, taking the combined spectrum available for mobile services, including 5G, to around 1,000 MHz;

Continue

2020, CITC launched National Transformation Program (NTP) 2020 as part of Saudi Arabia's Vision 2030 to make available more spectrum for the provision of mobile broadband or IMT services;

2021, CITC launched Spectrum Outlook for Commercial and Innovative Use 2021- 2023 to allocate or improve 23 GHz of spectrum to boost 5G speeds and coverage.

Private sector

Operators have been deploying 5G after successfully completing trials.

Zain has so far launched commercial 5G services in 38 cities, and recently launched 5G roaming service between KSA and Kuwait;

STC is deploying 5G home broadband services in a number of cities;

Mobily has signed a memorandum of understanding with Huawei for the development 5G in the Kingdom;

Huawei, Nokia, Cisco and Ericsson are all important players in providing the required radio access and core infrastructure for KSA's 5G rollouts.

2.2.2 Fixed Broadband

2.2.2.1 FBB service development

In Iran, FBB development has been quite slow in recent years. In Q2 2022, FBB subscription and penetration stood at 10.979 million and 12.96% respectively.

Regulator's latest quarterly report, which has been published in September 2022, shows infrastructure development situation related to bandwidth and Internet quality and the indicators in this field have dropped compared to the previous quarterly report.

For example, according to this report, fixed broadband subscribers decreased from 11.33 million subscriptions in the first quarter of the year to 10.979 million subscriptions in the second quarter of the year, which shows a decrease of 0.49%.

On the other hand, the fixed broadband penetration rate also decreased from 13.03% in the first quarter of the year to 12.96% in the second quarter; That is, a 0.54% decrease in the field of fixed broadband penetration.

The share of home users from FBB subscribers in Q2 2022, is 89.87 and the enterprise segment share is 10.13%. The comparison of fixed internet usage also shows that in the second quarter of the year, the amount of data consumption in fixed internet has decreased compared to the first quarter.

While the fixed internet data consumption was 1,099,580,799 gigabits in the first quarter of the year, it reached 1,084,701,628 gigabits in the second quarter of the year; That is, a 1.35% reduction in consumption.

Based on the resolution of the Supreme Council of Cyberspace in 2021, by 2025, 80% of households and 100% of businesses should have access to fixed broadband with an average speed of 25 Mbps, and 20 million households and 5 million businesses should have access to fixed broadband Internet based on optical fiber. In May 2022, the Regulatory and Communications Commission reviewed and approved the "Governing Principles for Supporting the Development of Optical Fiber-Based Access Networks" as one of the priority projects of the Ministry of Communications and Information Technology.

The fiber optic development program is explained by the following motivations:
Increasing employment rate,

- Improving access quality,
- Establishing an infrastructure for the future,
- Reducing the digital divide,
- Increasing the share of the digital economy,
- Increasing access speed,
- Improving environmental conditions, and
- Traffic reduction in mobile communication network.

The main objective of the Iran's Network Development Plan is to ensure access for all Iranian residences and businesses to a high-speed broadband service. The following requirements have been announced of Iran's Network Development Program in terms of Key Performance Indicators (KPIs):

- 80% of households in each province must be covered
- At least 50% of users can use fiber optic access service (FTTP) and up to 50% of users can use high-speed access service through wired access with a minimum speed of 50 Mbps and authorized radio access with a minimum speed of 30 Mbps.
- For at least 10% of users, it is possible to use fiber optic access service with a minimum speed of one gigabit per second.
- A point of presence (PoP) is required in every city.

In terms of technology, DSL continues to account for the bulk of high-speed fixed accesses, while fixed wireless links are also widely used. However, the share of fiber subscribers is very low compared with benchmark countries. Fiber has the advantages of ultra-high bandwidth and ultimate experience. Besides, mobile infrastructure relying on fiber can be upgraded to higher-speed 5G applications at a faster pace if fiber infrastructure is in place. Therefore, it is important for Iran to further promote the construction of fiber.

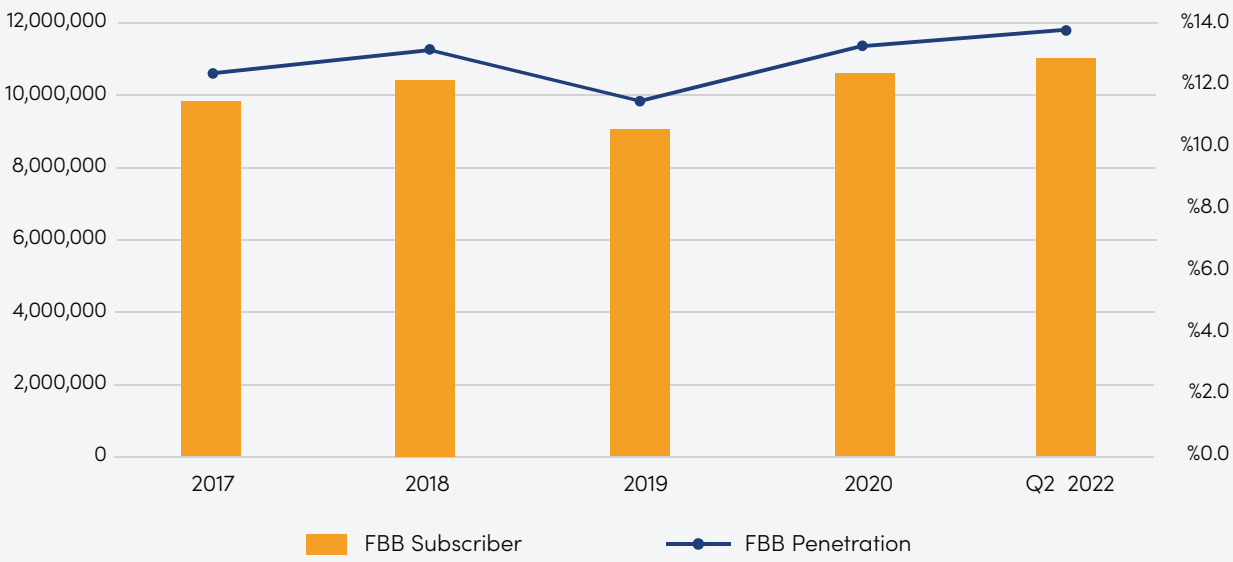


Figure 2-8 FBB subscription and penetration, 2022

(Source: CRA)

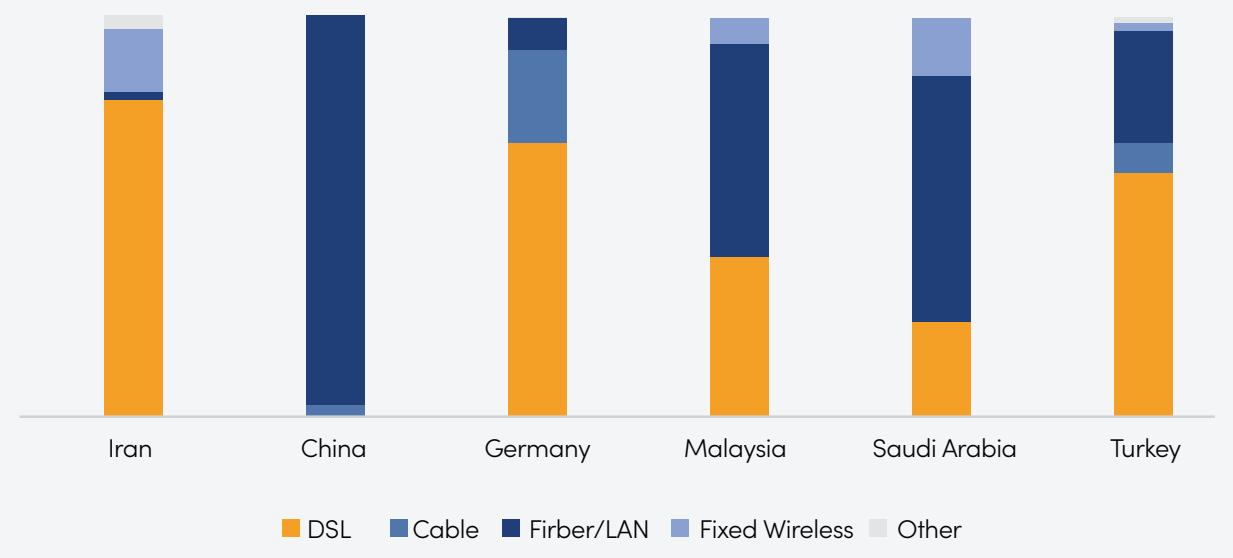


Figure 2-9 Benchmarking of FBB subscriber share by technology, Q2 2022

(Source: TeleGeography)

In terms of FBB speed, according to Speed test's data in August 2022, the median download speed of Iran is about 10Mbps, which is far below the global average of 69Mbps.

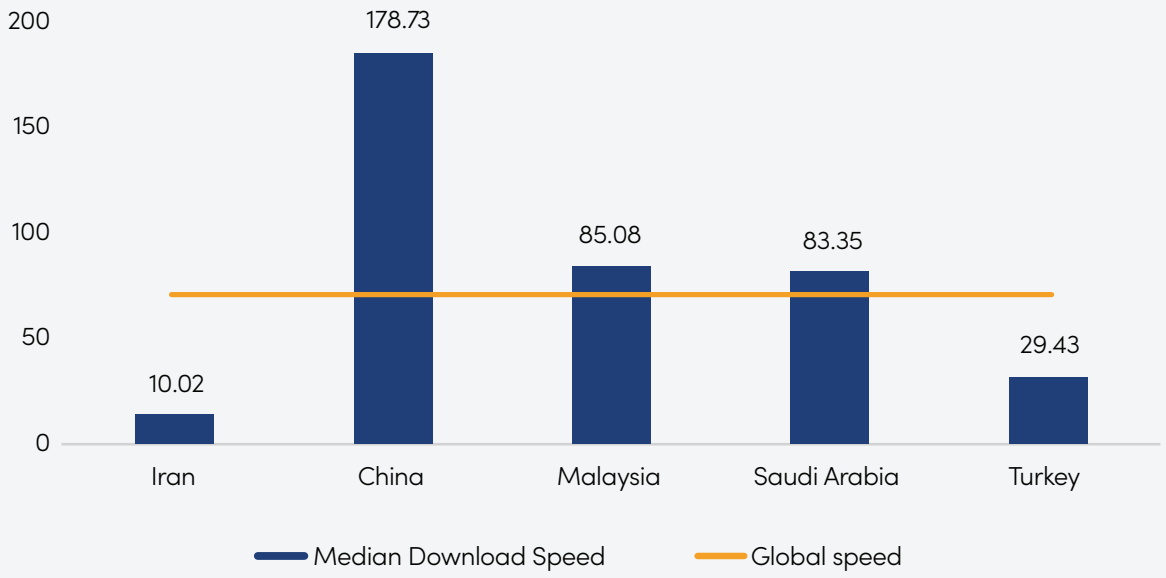


Figure 2-10 Benchmarking of FBB speed, 2022 [1]

(Source: Speed test)

Currently, more than 60% of FBB users have access to less than 10Mbps, and only 45% of businesses in Iran enjoy internet speeds of 30Mbps and more. By comparison, by March 2022, 93.3% of FBB subscribers have a speed of 100Mbps and above in China.

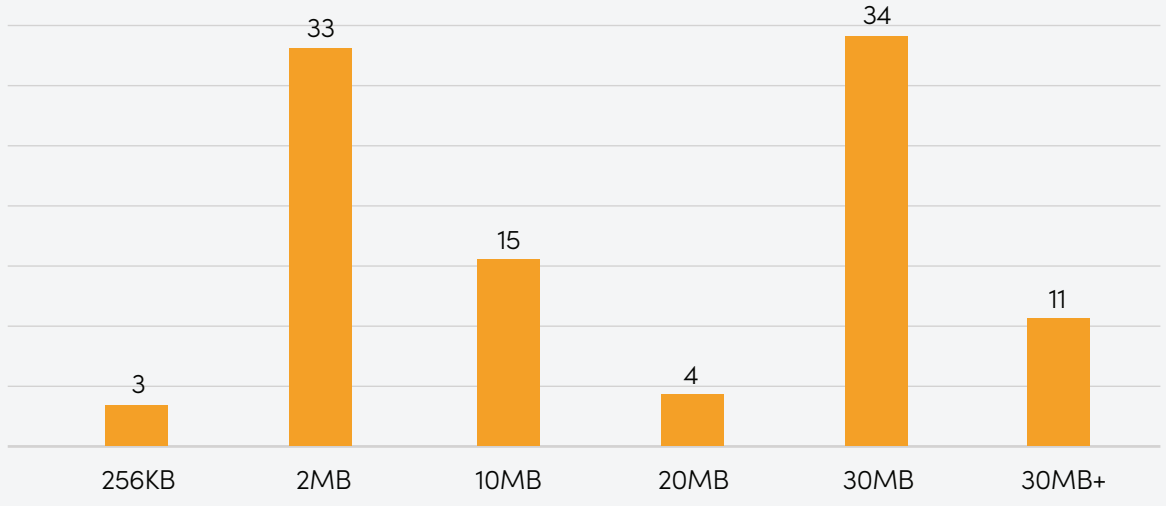


Figure 2-11 Internet speeds of businesses in Iran (%)

(Source: CRA)

To recap, Iran still needs to invest more in developing FBB, in particular fiber-based FBB, in order to provide better broadband service speed and quality and meet the needs of both business and household costumers.

1. Speed test data is as of August 2022, updated statistics will be applied once the entire report is completed

2.2.2.2 Fiber optic network development

With the rapid development of the fiber-optic access technology, the construction of fiber-optic network has been accelerated globally. For example, China has been vigorously promoting the transformation to "all fiber-optic network" since 2013. From March 2021 to March 2022, China built 1.11 million km of new fiber-optic cable, bringing the total length to 55.6 million km. In Philippines, PLDT is still expanding its fiber infrastructure during the COVID pandemic, with 61,000 km fiber-optic network built in the first 10 months of 2020.[1]

Iran has built quite good fiber backbone network. In recent years, it has accelerated the pace of constructing fiber network. The fiber optic capacity of the national information network increased to more than 240,000 km across the country.

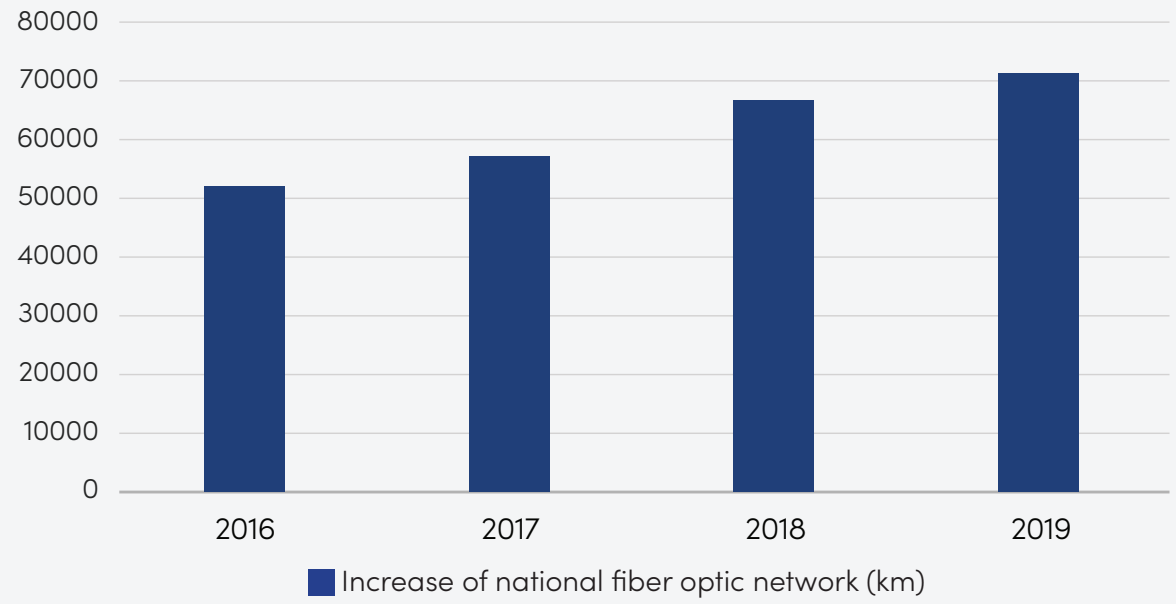


Figure 2-12 Development of Iran's national fiber optic network (km), 2016-2019
(Source: Smart Iran report)

After the finalization of enactment 329 dated January 2022 by the regulator, the expansion of FTTX in Iran has been accelerated. In May 2022, by signing a memorandum of understanding, the regulator entrusted the development of high-speed internet based on optical fiber to 9 operators. The statistics of the Iran FTTX site, which shows the progress of the project of covering and connecting households to the Internet based on optical fiber, indicate that since the beginning of this project; That is, from February 2022 to the end of August 2022, there are more than 1,500,000 planned ports in this field, and more than 363,000 users use VDSL and fiber optic services in the country.

1. https://www.pna.gov.ph/articles/1119302

The statistic called "ports assignment" means the number of available ports. Based on a request from the end user, the service from the serving operator will be ready within a maximum period of one month.

The statistic is named "number of covered households" where the figure means the number of covered households in a distance of 300 meters.

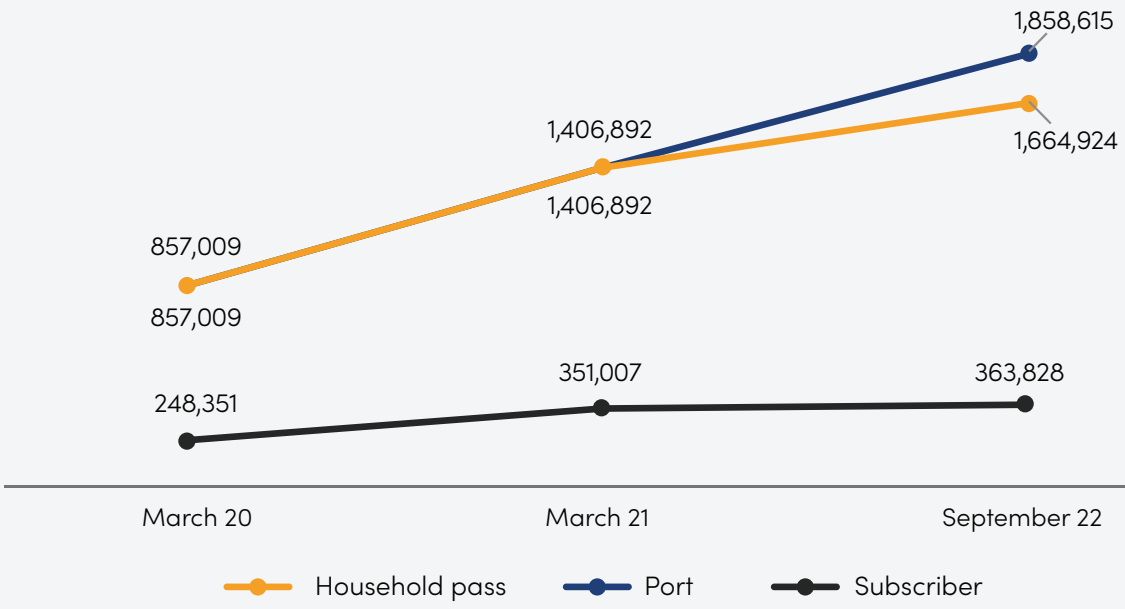


Figure 2-13 FTTX Deployment progress

2.2.3 International Connectivity

In terms of international connectivity, Iran is linked to the Trans Asia Europe (TAE) terrestrial network, which connects China with Germany. Iran is connected to its neighbors in the Persian Gulf via the Kuwait-Iran, UAE-Iran, FALCON and Gulf Bridge International submarine cable systems.

Figure 2-14 Iran's submarine and terrestrial connections
(Source: ITU)

According to the CRA[1], Iran's capacity of international bandwidth has reached 5489 Gbps by June 2021. Also, as TeleGeography reported, in 2022, Iran's international internet bandwidth accounted for 7% of that of Middle East. The CAGR between 2018-2022 is 33%. Traffic between Iran and Europe and between Iran and other Middle-Eastern countries account for the majority.

1. Communications Regulatory Authority

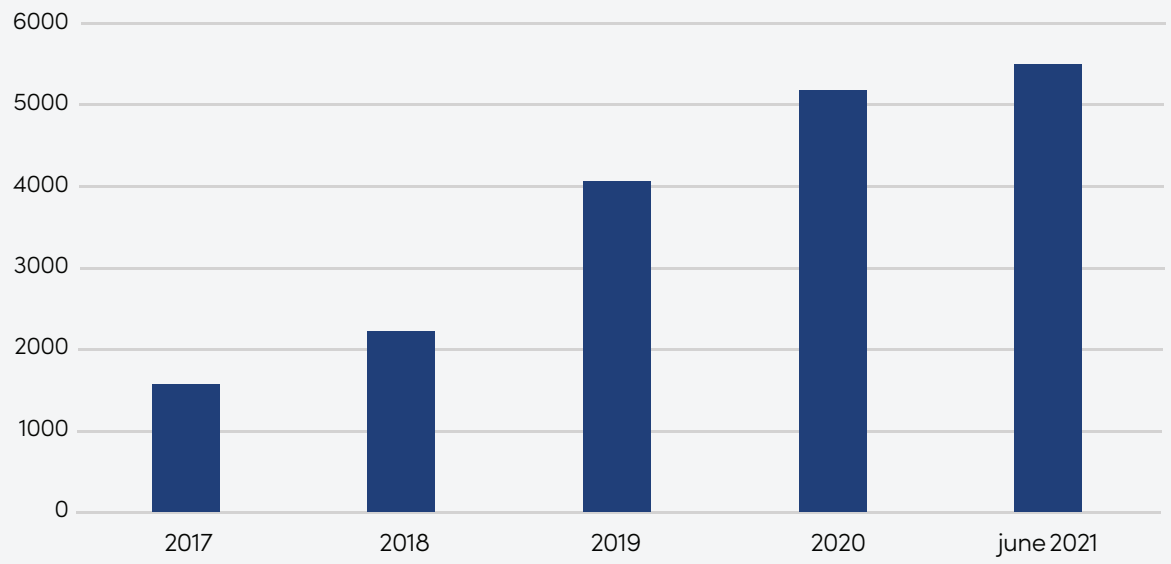


Figure 2-15 Iran's capacity of international bandwidth (Gbps)
(Source: CRA)

2.2.4 Data Center & Cloud

New-generation information technologies, such as 5G, cloud computing, and artificial intelligence, are developing rapidly, the integration of information technology and traditional industries is accelerating, and the digital economy is booming. As the foundation of the digital economy and emerging technologies, the data center has become an essential infrastructure for economic and social development .

2.2.4.1 Trends of data center development

The scale continues to grow. Companies in various industries, including financial, internet, and media have adopted cloud services. As an important carrier of cloud and other emerging technologies, the scale of data centers continues to expand. The overall scale of global data centers has grown steadily. In 2019, the number of racks in data centers worldwide reached 7.5 million racks, with 63 million servers installed. It is expected that the number of rack and its average power will continue to grow steadily in the next few years.

Location and regional distribution. Data centers are mainly located in North America, Asia-Pacific and Western Europe. Specifically, North America as the source of Internet traffic and content provider, has the largest rack size, accounting for more than 40%. In the Asia-Pacific region, the broadband and Internet have developed rapidly in recent years, leading to the growth of new data center which global share exceeded 30%. It is expected that in the next few years, with the rapid improvement of informatization, the scale of data centers in the Middle East, South America, Africa and other places will grow rapidly.

Large-scale and centralized. In order to better control and manage energy consumption, the scale of racks in a single data center is increasing. For example, according to MIIT of China, the number of data centers in China is 74,000, of which the number of large and super large accounts for 12.7% but ratio of new-built large data centers is 36.1%. This trend could be seen from the number of global data centers and the number of racks. According to Gartner statistics and estimate, the number of data center decreased from 450,000 in 2015 to 422,000 in 2020, while the number of racks increased from 4,797,000 in 2015 to 4,985,000 in 2020.

2.2.4.2 Data center development in Iran and Middle East region

As a traditional oil and gas export region, major countries in the Middle East are undergoing diversified economic transformations, trying to eliminate their dependence on energy economies. The UAE, Saudi Arabia, Kuwait and other countries have formulated economic transformation plans. Digital economies as one of the important directions are incorporated into the national development strategy, which leads to the growth of demand for data centers. It is predicted that from 2019 to 2024, the compound annual growth rate of the Middle East data center market may be around 7%. Equinix, Global Data Center, Batelco, Gulf Data Hub, AWS and Khazna are the main market investors and suppliers of the Middle East data center. Turkey, the UAE, Saudi Arabia, and Bahrain are in a leading position in IDC development in the region. Iran has three data centers and plans to build three data centers in ICT free zone next five years, but the overall scale is relatively small. Shahid Haj Qasem Soleimani's data center was built by Telecommunications Infrastructure Company (TCI), with a capacity of 178 racks. MCI launched a data center in East Azerbaijan Province with a capacity of 350 racks to promote the mobile network in the west and northwest of Iran. Irancell built a data center in Tehran, which could provide 407 racks. The number of data center racks in Iran is reaching 6500 by 2022.

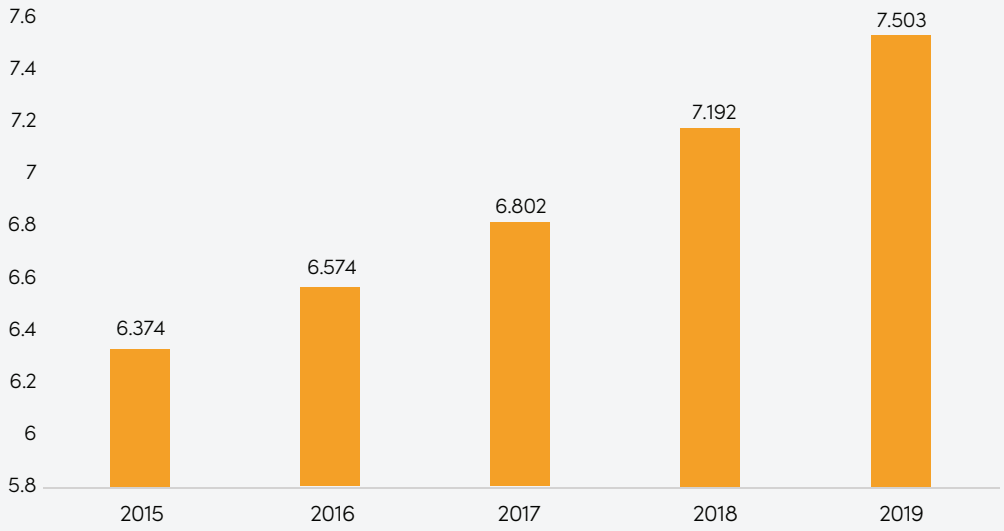


Figure 2-16 The number of data center racks worldwide (Millions)
(Source: CAICT)

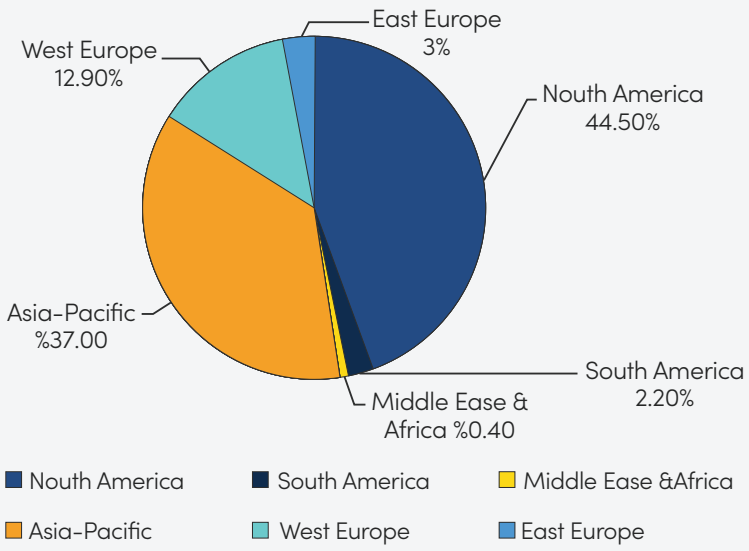


Figure 2-17 The global distribution of data center in 2019

(Source: CAICT)

2.3 Digital Transformation

In the digital economy, products and services are affected by digitalization. Digitalization not only means the emergence of new digital goods and services, but also most of the traditional products and services that were provided non-digitally before, are gradually affected in this economy.

In Iran, moving towards digitalization and the development of the digital economy has been on the agenda of the government since the Third Development Plan. The share of the digital economy in Iran's GDP is currently around 7%, which is far from its average value in the world economy. According to Minister Zarepour, the share of the "digital economy" in GDP is supposed to reach 10% by 2025, which, of course, is far from global estimates.

2.3.1 Digital Government

Iran has made considerable progress by expanding e-government services to enhance efficiency, accessibility, transparency, and accountability in the government sector. The government of Iran offers 201 general services and 734 specific services electronically from judiciary and agriculture to education, health, and culture. More than 450 million transactions have been done in 2018 in the context of e-government, which means a 450 million reduction in face-to-face visits to offices.

The United Nations E-Government Development Index (EGDI) assesses e-government development at the national level. It is a composite index based on the weighted average of three normalized indices of Telecommunications Infrastructure Index (TII), Human Capital Index (HCI) and Online Service Index (OSI). In the 2022 UN E-Government Survey Report [1], Iran ranked 91st out of 193 countries and was among the "high EGDI" group. Among the three sub-indexes, Iran performs worst in terms of OSI [2]. The Government of Iran needs to further improve its use of ICTs in the delivery of public services.

Country	EGDI 2022	OSI	TII	HCI
Iran	**89**	**130**	**71**	**79**
China	43	15	47	101
Malaysia	53	53	53	87
Turkey	48	24	85	43
Saudi Arabia	31	32	27	48

Note:
EGDI 2020: E-Government Development Index 2020
OSI: Online Service Index
TIL: Telecommunication Infrastructure Index
HCI: Human Capital Index
Country in total: 193

Figure 2-18 Iran's performance in E-Government Development Index 2022 and benchmarking

(Source: UN)

The E-Participation Index (EPI) is derived as a supplementary index from the United Nations E-Government Survey. A country's EPI reflects the e-participation mechanisms that are deployed by the government as compared to all other countries. The purpose of this measure is not to prescribe any specific practice, but rather to offer insight into how different countries are using online tools in promoting interaction between the government and its people, as well as among the people, for the benefit of all. As the EPI is a qualitative assessment based on the availability and relevance of participatory services available on government websites, the comparative ranking of countries is for illustrative purposes and only serves as an indicator of the broad trends in promoting citizen engagement. As with the EGDI, the EPI is not intended as an absolute measurement of e-participation, but rather, as an attempt to capture the e-participation performance of counties relative to one another at a point in time.

1. https://publicadministration.un.org/egovkb/en-us/Reports/UN-E-Government-Survey-2020
2. The OSI is calculated based on five weighted subindices. Specifically, Member States are assessed for services provision (45 per cent), technology (5 per cent), the institutional framework supporting e-government development (10 per cent), content provision (5 per cent), and e-participation (35 per cent).

In 2022, Iran ranked 167 among 193 countries, but the corresponding rank in 2020 was 89, which means that Iran's rank has fallen by 49 places in 2 years. The chart below shows the value and score of Iran according to EPI [1].

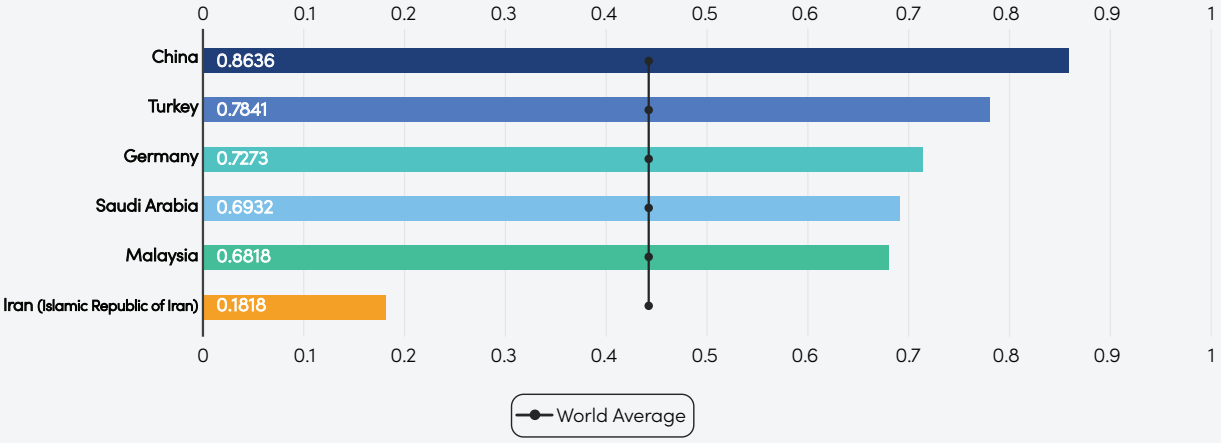
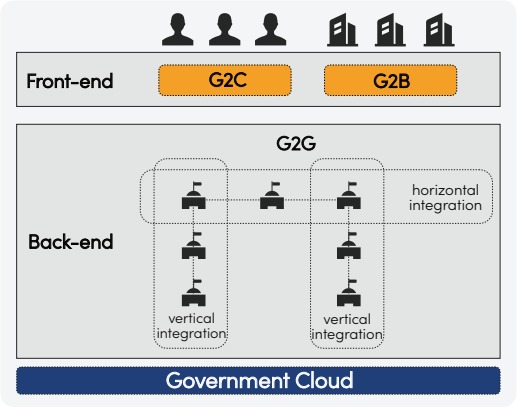


Figure 2-19 Iran's performance in EPI Development Index 2022 and benchmarking

2.3.1.1 Digital government services

Digital governance is the application of ICTs for delivering government services, exchange of information, communication transactions, integration of various stand-alone systems and services between government-to-citizen (G2C), government-to-business (G2B), and government-to-government (G2G).

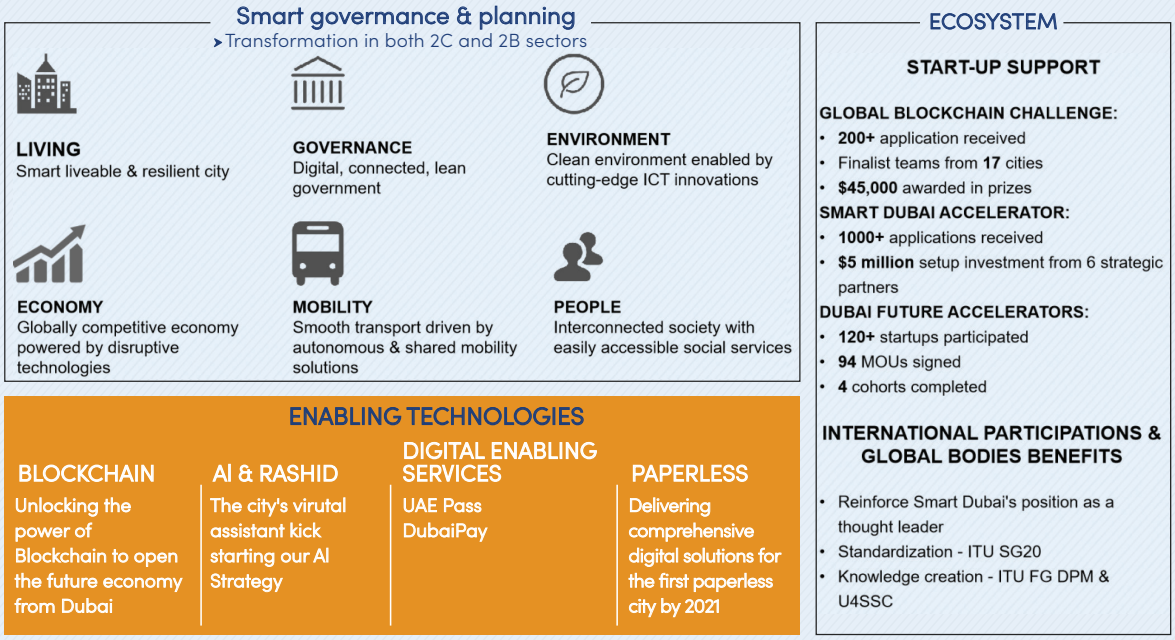


Globally, governments have continued to increase the provision of digital government services in both 2C and 2B sectors. According to the UN survey, more than 84% of countries now offer at least one online transactional service, and the global average is 14. The most commonly offered services include registering a new business, applying for a business license, applying for a birth certificate, and paying for public utilities.

1. https://desapublications.un.org/sites/default/files/publications/2022-09/Web%20version%20E-Government%202022.pdf In the 2022 Survey, the e-participation questions were further reviewed and expanded to reflect current trends and modalities on how governments engage their people in public policy-making, implementation and evaluation. New questions were added to address the complexity along with the different types of interactions that can take place in e-participation services, through its three dimensions further categorized into six sub-dimensions as: e-notification and e-enabling (under e-information), e-discourse and e-dialogue (under e-consultation), and e-collaboration and e-empowerment (under e-decision-making)

Smart Dubai Initiative

Dubai has launched Smart Dubai Initiative since 2014, which is transforming city-wide experiences to inspire new realities, with an aim of achieving a happier life for all. The Initiative consists of a portfolio of digital government services covering 2B and 2C sectors enabled by cutting-edge technologies and a holistic and mature ecosystem.

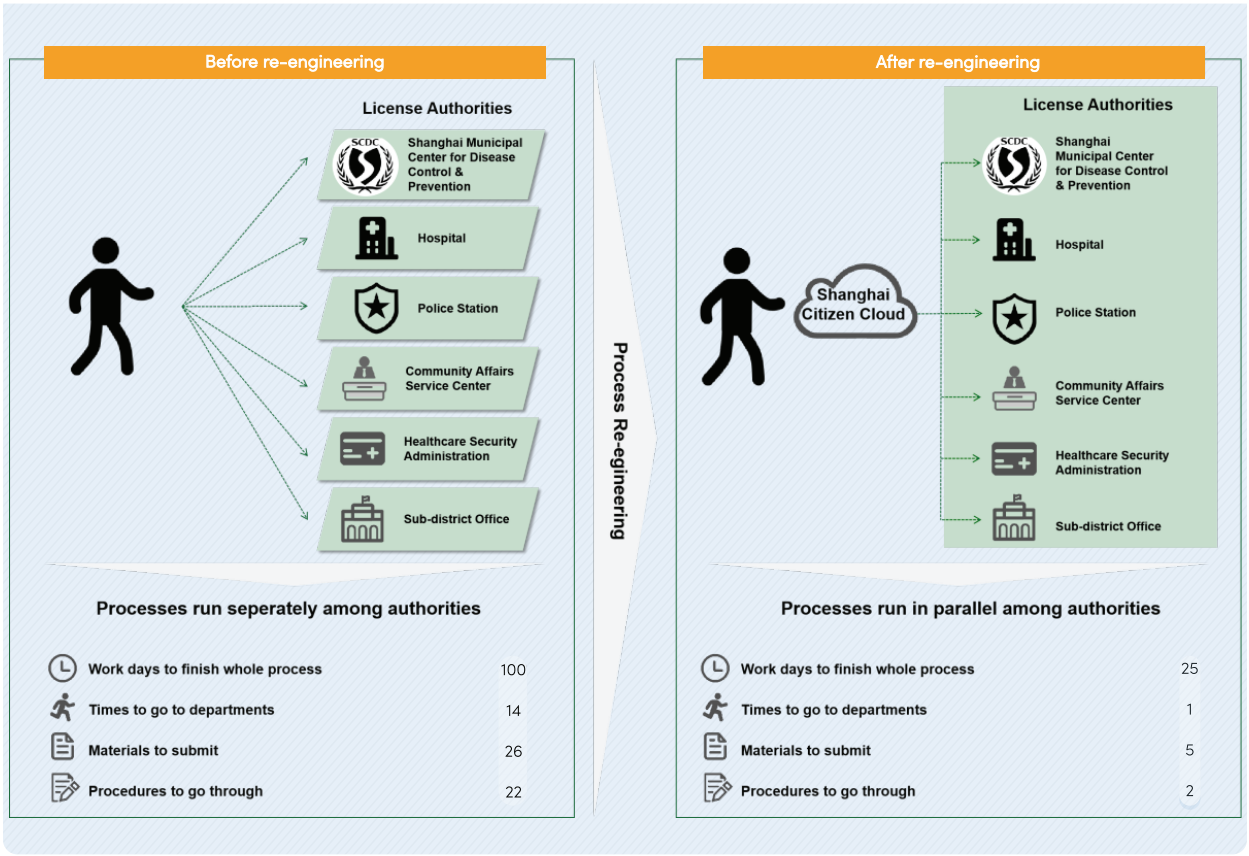


With more and more services and departments incorporated in digital government platforms, governments are under pressure to re-engineer the process for establishing a single point of access to complete services of different departments and at different levels. Business process re-engineering not only achieves cost savings and efficiency gains, but also provides citizens and businesses with better access to digital government services.

Process Re-engineering of Shanghai Citizen Cloud

With the aim of achieving higher efficiency, Shanghai government has engaged in process re-engineering plan of Citizen Cloud since the end of 2019. Citizens and businesses can receive one-stop-shop government services online through a single window. For instance, birth certificate, which used to take 6 departments 22 procedures and 100 work days for approval, now can be obtained only in 25 work days after the evolutions.

Continue



2.3.1.2 Data management

With the emerging trends in government data and the mounting risks and challenges, a paradigm shift is occurring that compels Governments to leverage data governance frameworks and data-centric e-government strategies to generate public value in innovative ways. According to the UN E-Government 2020 Survey, the number of countries that have set up open government data (OGD) portals has increased markedly rising from 46 in 2014 (24%) to 153 in 2020 (80%).

The collection and use of timely, high-quality data, and a cohesive way of sharing and managing data will prevent siloed planning and decision-making and help governments realize the full benefits of data. The UN[1] summarizes some common approaches to publishing, sharing, linking and exchanging data across government agencies (both horizontally and vertically) and strengthening the interoperability of government data systems.

1. UN E-Government Survey 2020

Approaches	Description	Examples
Open government data	Publishing open government data that are accessible internally within the Government and externally to the general public.	Since 2014, the UN E-government Survey has documented development trends relating to open government data (OGD). The number of countries with OGD portals jumped from 46 in (%24) 2014 to 153 in (%80) 2020. Among the Member States surveyed, 59% have an OGD policy, 62% have metadata or a data dictionary, 57% accept public requests for new data sets, 52% offer guidance on using OGD, and 49% engage in promotional efforts (such as data hackathons).
Linked data	Linked data is a technical standard for structuring complex information and relating and linking independent sets of data from different sources; used for launching linked open government data portals to connect isolated data repositories (data silos).	 The Administrative Data Research Network in the UK has created a number of "safe havens" where administrative data can be anonymized and linked, with strict controls over who has access to the data and for how long.
Data sharing	Sharing government data in accordance with guidelines, policies or other instruments that govern data formats and dictate data management, retention, security and privacy rules.	 Ireland passed the Data Sharing and Governance Act 2019. The Act paves the way for more efficient and cost effective service delivery by public bodies by providing a clear legal basis for the sharing of personal data in certain circumstances
Interoperability	Enabling systems and devices to exchange machine-readable data from multiple sources in a standardized and contextualized way and to interpret shared data. Standards are essential for data interoperability, as they allow different system components to be integrated seamlessly without any loss of meaning or integrity.	 Argentina has an interoperability framework; Mexico, Uruguay, Brazil, Peru, and Argentina have interoperability acts/decrees; the National Digital Interoperability Regulation in Portugal covers the adoption of open standards in State computer systems; and the three-part Philippine eGovernment Interoperability Framework (PeGIF) addresses the technical aspects and standards of interoperability, information interoperability, and exchange and business process interoperability.
Data exchange	Often a combination of two or more of the elements listed above; platforms that provide two-way data exchange through application programming interfaces (APIs), data exchange portals or centralized data services.	 The data exchange platform in Estonia (X-Road) is administrated centrally to interconnect government information systems and databases and allow government authorities and citizens to securely send and receive information over the Internet within the limits of their authority. In the US, the National Information Exchange Model has been used for integrated applications such as the Disaster Assistance Improvement Program, which provides "a single access point for more than 40 federally funded forms of assistance".

Figure 2-20 Different approaches to sharing, linking and exchanging data and strengthening interoperability

(Source: adapted from UN E-government Survey 2020)

Currently, with the exponential growth of data, Governments are increasingly transitioning from traditional relational database server to cloud server. G-Cloud is designed to meet the needs of data sharing among national, provincial, and local governments.

Malaysia – MyGDI Data Services Application

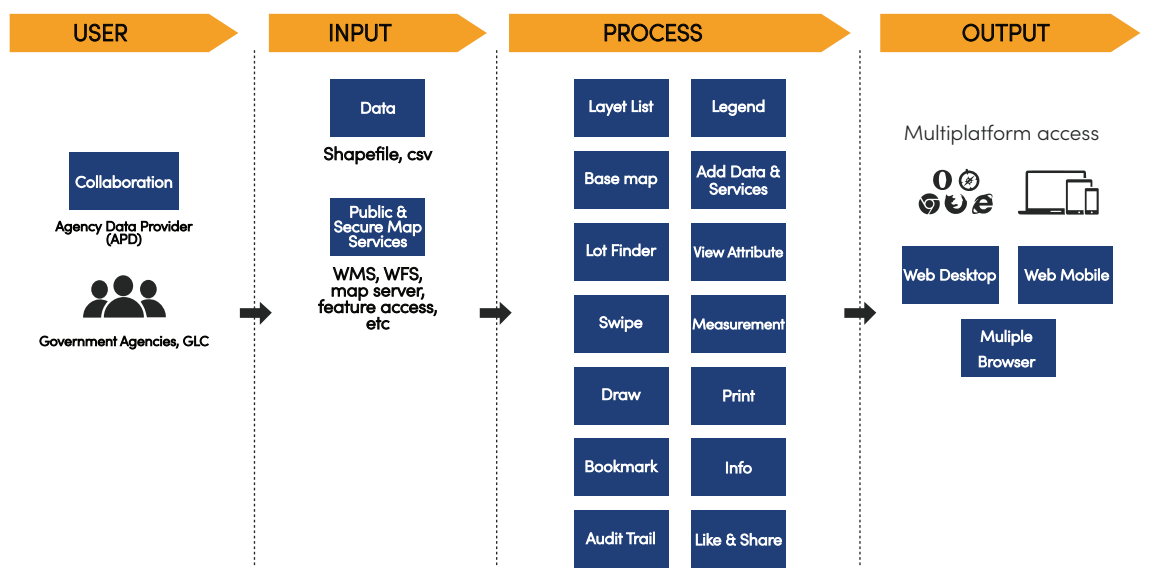
Introduce: MyGDI Data Services Application is a web based application which is developed for geospatial data sharing between government agencies. It is an initiative of MaCGDI under the MyGDI program to provide a platform for data sharing between Government to Government (G2G).

Data sharing in this application involves 12 categories of Geospatial Data Centre (GDC) basic data that is Aeronautical, Built Environment, Demarcation, Geology, Hydrography, Hypsography, Soil, Transportation, Utility, Vegetation, Special and General Use through internal secured map services which is secure (government cloud).

Objective:

I. Provide a geospatial data sharing platform between government agencies (G2G) in a secure environment.
II. Facilitate access to geospatial data by government agency users.
III. Encourage geospatial information sharing by data provider agencies.
IV. Avoid duplication of effort in collecting, processing and preparing geospatial information between related agencies.

MYGDI DATA SERVICES APPLICATION ARCHITECTURE



China's experience of G-cloud

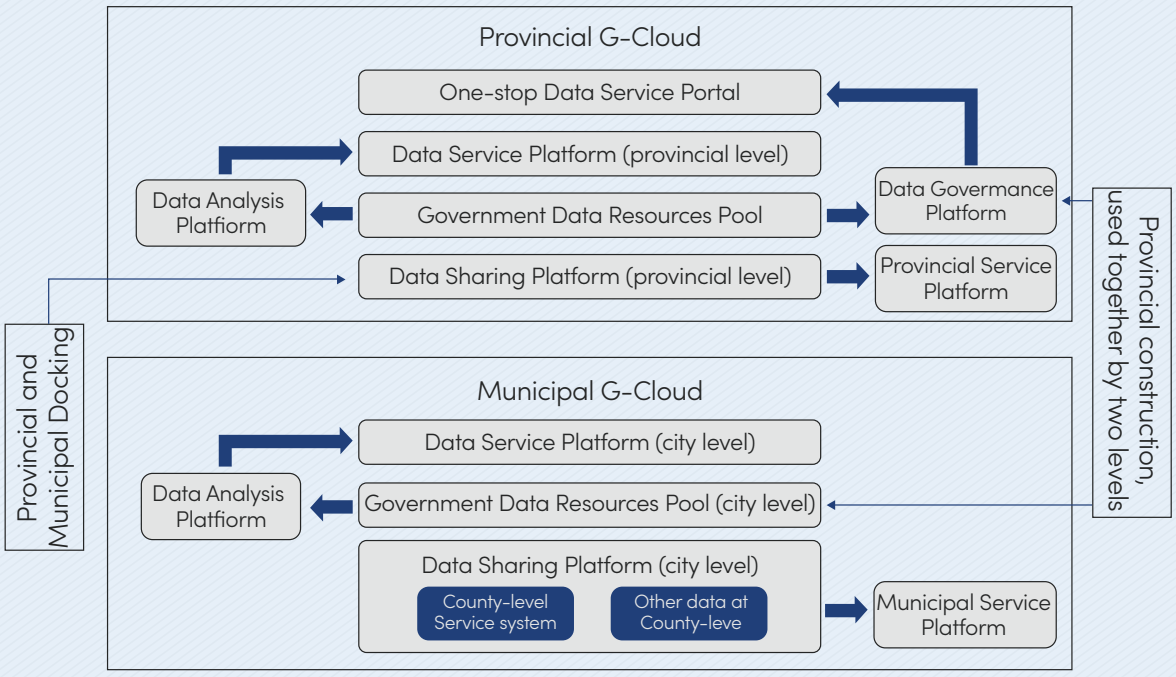
Build physically distributed and logically centralized G-cloud platform–Anhui Province, China

Obstacles: Different government departments built their own cloud platform without unified standard and interoperability. The data, network, system and services of different government agencies did not integrate with each other. It was impossible for government agencies to realize cross-level (provincial-municipal), cross-agency, or cross-region data exchange.

Experience: The Government of China is now building Digital Government. The G-cloud covers national, provincial, municipal, and county level. In the Digital Government Plan of Anhui Province, a physically distributed and logically centralized G-cloud platform with "1+16+N" architecture is planned.

"1" – one logically centralized provincial G-cloud platform: provide data computing, storage, security and other cloud infrastructure, software and service to meet the demand of cross-level and cross-agency service integration, data sharing and exchange.

"16" – 16 physically distributed municipal G-cloud nodes: the G-cloud platform of each city is built and reformed in line with the national G-cloud standards, and integrated with the provincial G-cloud platform. The data center of each city is inter-connected with the provincial data center.



2.3.2 E-commerce

The digital economy is transforming global retail as more consumers and businesses embrace E-commerce and digitalization. According to UNCTAD, E-commerce accounted for nearly 19 percent of retail sales worldwide in 2021, compared to 16 percent in 2020. The status is forecast to reach 24 percent by 2026 as online shopping becomes more prevalent across various industries

and regions. However, the digital economy is not equally accessible or beneficial for all countries and groups, as there are significant gaps in digital readiness, infrastructure, skills, and regulations. For example, Asia is the largest E-commerce market in the world, accounting for 63 percent of global online retail sales in 2020.

On the other hand, the least developed countries only had a 0.5 percent share of global online retail sales in 2020. Mobile devices are becoming increasingly important for E-commerce, as they are expected to generate 72.9 percent of all retail E-commerce sales worldwide in 2021. So, mobile-first countries like Iran enjoy an advantage in capturing more opportunities more agile and adaptively.

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Due to Covid-19, the world witnessed a spike in demand for online goods ordering: when overall retail sales declined by 1% in 2020, online retail grew by 22% Iran ranked 44 out of 152 countries around the world in terms of B2C E-commerce performance 2020, indicating a significant potential for e-commerce development.

A technology policy analyst and also former Deputy Minister of ICT, has notified a bad ICT policy in the field of E-commerce development in Iran; He has recently tweeted that "The total volume of E-commerce [transactions] in 2021 is 28,7 million dollars; which 80 percent of it, that is, about 23,2 million Tomans, will be in crisis due to the limitations of social networks. This policy means reducing economic security." Moreover, the 2021-2022 report from Iran Center for E-Commerce Development confirms such a claim. It states that 80% of e-commerce units with e-namad[1] license, use social networks in addition to website.

2020 Rank	Economy	Share of individuals using the Internet (2019 or latest)	Share of individuals with an account (2017 ,+15)	Secure Internet servers (normalized, 2019)	UPU postal reliability score (2019 or latest)	2020 (Index value)
6	Germany	93	93	93	93	93
30	Malaysia	84	84	84	84	84
44	Iran	70	70	70	70	70
49	Saudi Arabia	96	96	96	96	96
55	China	61	61	61	61	61
57	Turkey	74	74	74	74	74

Table 2-1 B2C E-commerce index, 2020, world

(Source: UNCTAD)

1. E-Namad license: e-trust seal to prove an E-Commerce website has been accredited by a government body

E-commerce, as one of the main components of the digital economy, has a significant role in the economic development of countries. According to global statistics, the financial value of E-commerce in the world in 2021, compared to 2020, reached 4.92 trillion dollars with a growth of about 17%.

China, the United States and the United Kingdom were the largest e-commerce markets in the world. Iran, has also experienced a growing trend in the field of E-commerce in recent years. According to the UNCTAD report in 2019, Iran's rank in the field of E-commerce among 152 countries was 42, which has improved by 7 places compared to previous year. However, Iran's share of E-commerce income among neighboring countries including Turkey, Saudi Arabia, UAE, etc., is only 7%.

Meanwhile, Iran has significant potential for E-commerce development. By September 2020, the country has a smart phone penetration rate of 65%, an internet penetration rate of 102%, and more than 185,000 electronic signature certificates issued in public key infrastructure. What's more, the nominal ratio of e-commerce transactions to GDP (without oil) has achieved 36%, increased by 205% compared to the previous year, and the number of new licenses issued for online businesses also tripled, which shows that many Iranians have changed their shopping methods to online shopping, and traditional and offline businesses have tried to sell online.

It is notable that the nominal value of E-commerce transactions was 28,7 million dollars, which has grown by 13% compared to the previous year.

- The amount of each electronic purchase is estimated at 8 dollars on average.
- The total number of e-commerce transactions was 3 billion 60 million items, which has grown by 14% compared to the previous year.
- The value of government electronic transactions was 7 dollars, which has grown by 65% compared to the previous year.
- The number of government electronic transactions was 345,000, which has grown by 2% compared to the previous year.

Iran Center for E-Commerce Deployment under the Ministry of Industry, Mine and Trade depicted the E-Commerce landscape in Iran. By September 2020, most E-commerce units prefer to shop through social networks and ship through Post Company of Iran. As for payment methods, value of transactions via internet payment gate has reached almost 70% of total E-commerce turnover, increased by 230% compared to the end of 2019. Among the E-commerce units with e-namad license, most active fields are sales of goods, education, programming and computer, and advertising and marketing.

E-namad is issued exclusively by the Iran center for E-commerce development. This sign is granted to authorize online businesses (Internet and mobile business) for the purpose of organizing, authenticating, and qualifying. The total number of active e-namad at the end of 2021 has grown by 35% compared to the previous year by reaching more than 120 thousand.

2.3.2.1 Online shopping and the eccentrically prominent share of social media platforms

Currently, the largest social commerce in Iran has been formed on Instagram. 415 thousand stores operate on Instagram, and the volume of financial transactions on this platform is estimated at 418 to 744 million dollars in 2021. Approximately, 310 to 470 thousand buying and selling orders are made on Instagram every day, which has provided direct employment opportunities for one million people. The distribution of various businesses on Instagram has shown in figure 2-16 in more detail.

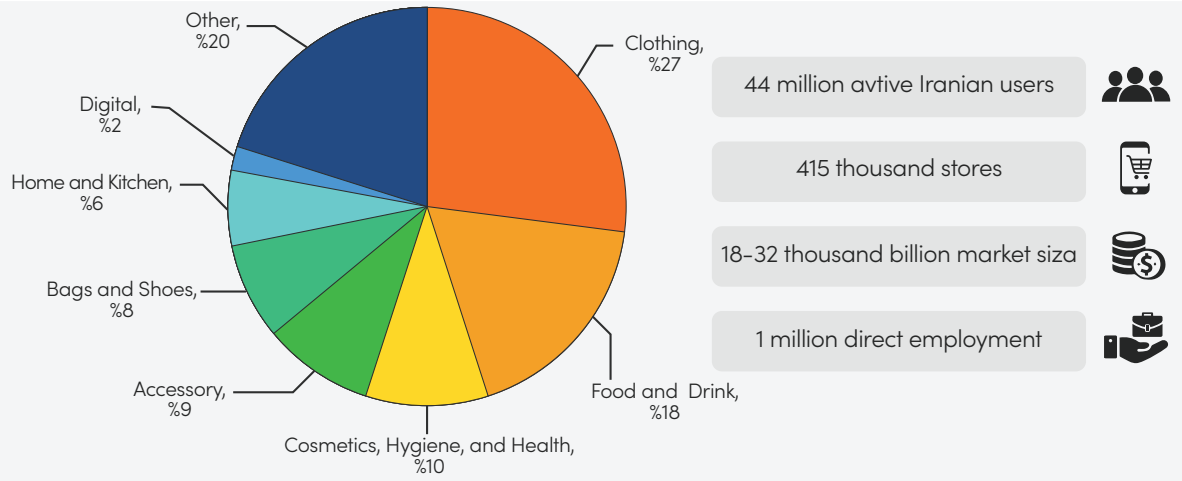

Figure 2-21 The distribution of businesses on Instagram in 2022

(Source: Techrasa Report)

More than 70 Iranian platforms are social business enablers. In addition to the social commerce industry, these platforms also serve the traditional E-commerce industry. For this reason, social media led by Instagram and the activity of 415,000 Instagram stores can be considered the main player in Iran's social commerce industry. The penetration rate of 71% of social media and messengers among the people of Iran and the presence of 44 million active Iranian users on Instagram confirm this.

Since more than 60% of employment and 55% of GDP in the economy of developed countries are formed by small and medium-sized enterprises (SMEs) and home businesses, the promotion and development of social commerce platforms can be a fruitful and innovative strategy for the country's sustainable economic growth, knowledge-based employment, and more inclusive and equitable business development.

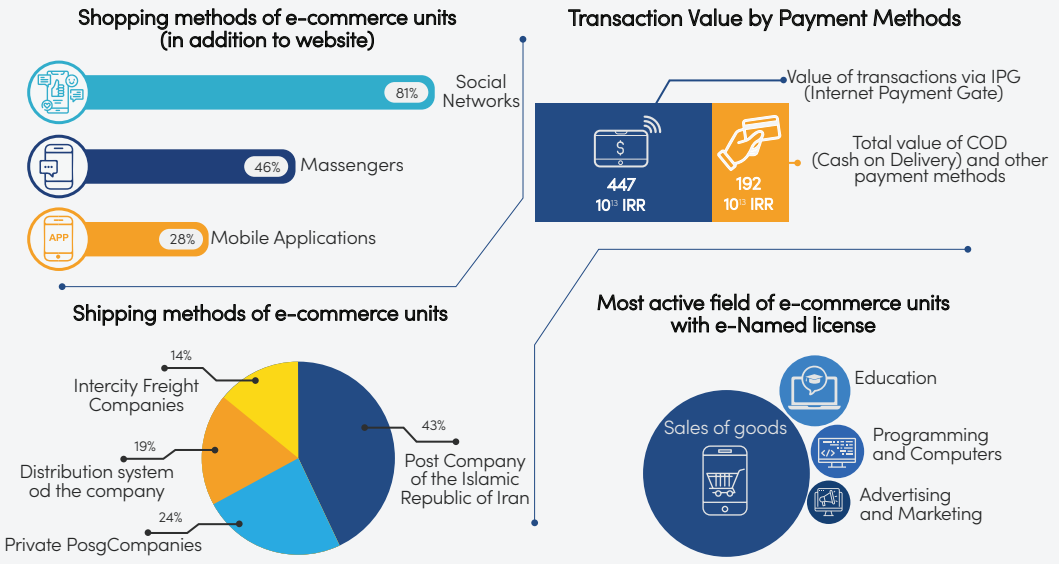

Figure 2-22 Current situation of E-commerce in Iran

(Source: Iran Center for E-Commerce Deployment)

However, because the retail market in Iran is mostly dominated by the informal sector (about 80% of the whole market), the official sectors, including Post Company of the Islamic Republic of Iran have not grown as much as they should have with the E-commerce sector. Besides, the share of e-commerce units with e-namad license only accounts for 23% of the total number, which exacerbates the difficulty of organizing, ranking and validation of E-Commerce websites activities, and protecting consumer rights in cyberspace.

2.3.3 Digital Oil & Gas

Iran has the third largest oil reserves and ranks 2nd for its natural gas reserves in the world . The oil and gas industry accounts for 13.5% of GPD and is of cardinal importance for the petro-currency it brings in. Therefore, digital transformation has always been playing a great role in the industry. Oil and gas exploration generates a large amount of geological data dispersed in various processes and places.Many companies are developing a unified exploration platform to collect and store all data from oil fields and chemical plants. It could realize data sharing, technology exchange, and business collaboration by utilizing big data and AI to improve oil and gas exploration efficiency, reduce exploration and production costs, and increase the ratio between production and storage.

Oil storage and transportation digitalization realizes centralized control and dispatch, real-time monitoring and fault warning by means of Big Data, IoT, HD video monitoring and SCADA. Digitalization of the existing pipelines are done by installing and re-engineering IoT meters, remote controllers and HD cameras while the new generation of pipelines are already manufactured with these built-in technologies in accordance with smart pipeline standards. It is with the aid of these technologies that many companies have been able to reduce the number of their personnel on sites with harsh environment and increase the labour productivity. Also, many have been blessed with the visualization of oil and gas production, storage and sales which supports their business especially in pricing process.

2.3.4 Digital Electricity

With the development of digital technology, the electricity industry has begun to digitalize in generation, transmission, and distribution. The electricity grid companies also introduce digital technology in their management and services .

Digitalization of the power grid. The grid companies deploy fiber-optic cables alongside the electricity lines like OPGW, augment traditional equipments, facilities and instruments with IoT-based/online technologies, and build IoT platforms to realize infrastructure digitalization. This process has been so beneficial in monitoring the status quo of the network on a real-time basis, and therefore operators and people can rest assured that electricity transmission lines are safe

and reliable. The use of digital technology enables the grid to adapt to the large-scale access and consumption of new energy sources, such as wind and solar energy, and reduces carbon emissions in the power industry.

Enterprise digitization. Electricity companies in Iran like those in the gas and oil industry apply technologies like Big Data, AI and IoT to the process of production, operation and management in order to drive business process re-engineering and organizational structure optimization. Added to these benefits, and coupled with the data generated, better decision making, higher collaboration capabilities be it inter/intra organizational and KPI- based management have been injected to these companies.

Service digitization.

- The grid companies use digital technology to enhance their business and service.
- They offer online interaction, automated services, and intelligent experience to their customers.
- They connect and expand their customer resources in a wide range, and bridge the online and offline worlds seamlessly.
- They provide application services that are easy to use, fast to respond, and flexible to customize, to improve service efficiency and customer satisfaction.
- They support business innovation, improve user experience, and stimulate user demand to be constantly generated and fulfilled.

Mexico: NetCity

Mexico's power grid has been facing a high line loss rate, twice as high as the average of OECD member countries. On the one hand, it was due to the obsolete and outdated electrical infrastructure; on the other hand, an inefficient billing system, specifically regarding to fee collection and its slow process, aggravated the situation. But, other problems were also there such as poor management, and low customer satisfaction. So, and in order to tackle these issues, NetCity was established as a subsidiary of GEOS Telecom.

NetCity deployed an Advanced Metering Infrastructure (AMI), including 88 eLtE-IoT- based stations and a smart metering platform to cover Mexico City. AMI could remotely read data on meters and allowed real time transaction charges based on a bi-directional high-speed communication. in the end, the grid was successful in lowering lines loss, reducing fee collection time and improving both its revenue and customer satisfaction.

Concluding points

A digital economy is usually characterized by online transactions and engagement – a virtual, paperless and cashless world. It harnesses a range of technologies, services and business models that improve personalization through human-centered design while disrupts the traditional time-consuming ones and create new opportunities and markets. Considering ICT as a top priority, more than 170 countries have released their national strategies for their digital economies. After COVID-19, significant countries have updated their digital strategy to lead in the next round of economic cycles. In July 2020, South Korea released the New Deal, focusing on the digital and green fields, covering ten key areas and aimed at creating 1.9 million jobs. Korean government has invested 160Tn won ($133Bn) and is focusing on digital plus green, involving 5G, AI, new energy vehicles and other 10 fields. In 2021, the plan upgraded to New Deal 2.0, adding a "humanity" module, new industries such as Metaverse, etc., expanding investment to 220 Tn won ($183Bn), and create 2.5 Mn jobs.

In April 2021, the China Academy of Information and Communications Technology (CAICT) released the White Paper on China's Digital Economy Development, which pointed out that China's digital economy will reach RMB39.2 trillion by 2021, accounting for 38.6% of GDP. In Oct 2021, China adopted the Proposals for formulating the 14th Five-Year Plan and Vision 2035 Targets to initiate the preparation of its economic plan for the next five years. Seven industrial infrastructures include: 5G, AI, big data centers, industrial Internet, intercity fast train, charging station, and UHV transmission are the key directions of this plan.

As with Iran and with respect to the ratio of digital economy to the GDP, it had a long leap from 2.6 % in 2012 to 7% in 2022 yet there will be a long road to the 10% target set by the current administration in office at the en of 2025.

The chapter explored Iran's digital economy's current status and future opportunities, composed of three layers: ICT infrastructure, digital platforms, and digital services. It states that Iran has advanced its ICT infrastructure but still has to improve in some aspects, such as 5G and broadband access. It also highlights the necessity of regulatory and policy reforms to promote the growth of digital platforms and services, which are the main contributors to value creation and innovation in the digital economy. It indicates that the Iranian government has implemented some actions to address these issues but should continue to pay attention to the emerging trends and challenges in this field.[1]

According to a report by Statista, Iran's digital economy revenue is expected to reach $8.6 billion in 2021, with a compound annual growth rate (CAGR) of 9.2 % from 2021 to 2026. The largest segment of the digital economy is e-commerce, with a projected market volume of $6.7 billion in 2021. The revenue share of e-commerce-fashion amounts to 19.7 % in 2021. According to a report by World Bank, Iran's economy is slowly recovering from a decade-long

1. Digital Economy - Iran | Statista Market Forecast. https://www.statista.com/outlook/co/digital-economy/iran.

stagnation caused by economic sanctions, oil price fluctuations, and the COVID-19 pandemic. The report states that Iran's economy remains constrained by widespread inefficiencies, price distortions, and climate change challenges affecting agriculture and industry sectors.[1]

Iran's digital economy development is influenced by various factors, such as its domestic policies and regulations, international relations and sanctions, natural resources and environment, and technological innovations and challenges. The role of the government is crucial in shaping these factors and creating an enabling environment for the digital economy to flourish. However, the government faces many difficulties and uncertainties in pursuing its digital ambitions. Therefore, it needs to adopt a flexible and adaptive approach that can respond to its people's changing needs and demands and the global market.

1. Iran's Economic Update — April 2022 - World Bank Group. https://www.worldbank.org/en/country/iran/publication/economic-update-april-2022.