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Information Technology in Iran: History, Scenario and Recent Developments

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Abstract

This thesis provides a comprehensive historical and analytical overview of the evolution of information technology (IT) in Iran, tracing its journey from the early introduction of computing systems in the 1960s to the present era of artificial intelligence and the digital economy. It highlights how IT evolved from limited institutional use to becoming an integral part of public, private, and everyday life, supported by growing infrastructure, local capabilities, and policy initiatives.

The study also explores the emergence of digital platforms, changing communication networks, the role of entrepreneurship in the tech sector, and state-driven strategies in artificial intelligence. Special attention is given to challenges posed by sanctions, censorship, and infrastructural gaps, as well as emerging opportunities in AI, big data, and e-governance. By documenting Iran's digital transformation, the thesis offers insights into the country's technological resilience and its aspirations for a knowledge-based future.

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CHAPTER 1

1. An Introduction to Iran

1.1 General Overview

The **Islamic Republic of Iran** is a sovereign state in **West Asia** occupying a strategic position between the Middle East, Central Asia, and the Caucasus. It borders **Iraq and Turkey (west), Armenia, Azerbaijan and Turkmenistan (north), Afghanistan and Pakistan (east)**, and has coastlines on the **Caspian Sea** to the north and the **Persian Gulf** and **Gulf of Oman** to the south.

Iran covers **~1,648,195 km²**, placing it among the world's larger countries (commonly listed **17th by area**) [1].

Figure 1. Main Provinces of Iran

Tehran is the capital and largest city of Iran, serving as the country's political and economic hub, with an estimated population of about 9.73 million (2025). Other major urban centers include Mashhad with approximately 3.42 million, Isfahan with around 2.29 million, Shiraz with 1.74 million, Tabriz with 1.70 million, Ahvaz with 1.32 million, and Qom with about 1.39 million inhabitants [2]. Iran's population is **~92.4 million (mid-2025)**, with a **median age ~34** and an **urbanization rate ~73%**—indicators of a relatively young and urbanizing society. The **official language** is **Persian (Farsi)**, established in **Article 15** of the Constitution, and the **official religion** is **Islam.**

Figure 2. Major cities of Iran

Religion plays a central role in shaping Iran's national identity, politics, and social life. The country is officially known as the **Islamic Republic of Iran**, and its constitution designates **Twelver Shia Islam** as the **state religion [3]**. According to the **United Nations and the U.S. Department of State**, around **99% of Iranians are Muslim**, of which about **90–95% are Shia** and **5–10% are Sunni [4]**. Shia Islam is deeply embedded in Iran's governance system; the

Supreme Leader, the highest authority, must be a Shia cleric, and national laws are required to conform to Islamic principles.

Despite its strong Islamic identity, Iran is home to number of **religious minorities**. The constitution officially **recognizes three non-Muslim religions**: **Christianity, Judaism, and Zoroastrianism [5]**. These groups are permitted to practice their faith, maintain their own schools, and have limited political representation — together, they hold **five reserved seats in the Iranian parliament** (*Majlis*) [6]. The **Christian** community, mostly Armenian and Assyrian, has a long history in Iran; the **Jewish** population, though smaller today, remains one of the oldest in the region; and **Zoroastrians** preserve Iran's ancient pre-Islamic religious heritage, especially in Yazd and Kerman.

However, some groups remain **unrecognized**, most notably the **Bahá'í community**, which the government does not recognize as a legitimate religion [7]. Bahá'ís often experience restrictions on education, employment, and property rights. Other smaller groups, such as **Mandaeans** and **Yarsanis**, also exist but lack formal recognition and protection.

1.2 Human Development Index (HDI)

Iran has made significant progress in human development over the past three decades, as reflected in the **United Nations Development Programme's (UNDP) 2023 Human Development Report [6].** With an HDI value of **0.799**, Iran ranks **75th among 193 countries**, placing it in the **"High Human Development"** category. This marks a notable improvement from an HDI of 0.626 in 1990, demonstrating steady social and economic advancement despite various internal and external challenges.

The HDI is a composite measure based on life expectancy, education, and income. In 2023, Iran's **life expectancy at birth reached 77.7 years**, indicating improvements in healthcare and living conditions. The country also recorded **14.0 expected years of schooling** and **10.8 mean years of schooling**, reflecting sustained investments in education and broader access to learning opportunities. Meanwhile, Iran's **gross national income per capita** stood at approximately **$16,100 (PPP)**, showing moderate economic growth compared to global averages.

Although Iran's HDI places it close to the threshold of "Very High Human Development," progress has **slowed in recent years**, echoing a broader global trend of stagnation in human development. Persistent economic sanctions,

regional instability, and structural limitations have contributed to this slowdown. Nevertheless, Iran's long-term trajectory reveals a commitment to improving quality of life through education, health, and human capital development. In conclusion, **Iran's 2023 HDI** profile portrays a nation that has achieved **remarkable social progress and resilience**.

1.3 Political System

Iran is an **Islamic Republic** with a unique political structure combining **theocratic and democratic elements**. The **Supreme Leader** holds the highest authority, overseeing the executive, legislative, and judicial branches, as well as the armed forces.

1.3.1 Main Parties

Iran does not have a traditional two-party system like many Western democracies; instead, its politics are dominated by two broad political **factions**: the **Conservatives (Principlists)** and the **Reformists**. The **Conservatives**, also known as *Osulgarayan* or Principlists, advocate for strict adherence to Islamic principles and loyalty to the ideology of the Islamic Revolution of 1979. They emphasize clerical authority, social conservatism, and resistance to Western influence [8].

In contrast, the **Reformists**, or *Eslah-Talaban*, seek to introduce political, social, and economic reforms within the framework of the Islamic Republic. They generally support greater political pluralism, civil liberties, and engagement with the international community. Power alternates between these two camps through elections, although both must operate under the oversight of Iran's Supreme Leader and the Guardian Council, which have the authority to vet candidates and policies [8]. This dual-faction dynamic shapes much of Iran's political landscape and defines the country's internal debates over modernization and tradition.

1.3.2 Elections and Councils

The **President**, elected by popular vote every four years, heads the executive branch. The **Parliament (Majles)** and the **Guardian Council** play key roles in lawmaking and constitutional oversight [9].

Parliament (Majles): Unicameral **Islamic Consultative Assembly** with **290 seats**, elected for **4-year** terms; legislates, approves the budget/treaties, and can question ministers [9].

Guardian Council: 12-member review body (six Islamic jurists appointed by the Leader; six jurists nominated by the judiciary head and approved by parliament) that vote candidates and reviews laws for conformity with Islam and the Constitution [9].

Assembly of Experts: Elected clerical body that **selects, supervises, and can dismiss** the Supreme Leader and members are elected every **8 years**.

1.3.2.1 Islamic City Council

The elections for the Islamic City and Village Councils are one of the main pillars of **public participation in local governance**. These elections are held **every four years** through **direct and general voting**, and citizens aged 18 and above are eligible to vote. Council members are elected directly by the people of each city or village. The **number of council members** depends on the city's population; for instance, in large cities such as **Tehran**, the council has **21 members**, while smaller cities have fewer [10].

The **supervision of the elections** is carried out by **executive boards under the Ministry of Interior** and **supervisory boards appointed by the Islamic Consultative Assembly (Parliament)**. After the elections, the elected members hold their first meeting to **elect a chairperson** and **appoint the mayor [10]**.

1.3.2.2 Duties and Responsibilities of the City Council

The City Council acts as a link between the **citizens and the municipality**, setting urban policies and overseeing local management. The most important duties [10] of the Islamic City Councils include:

1. **Electing the mayor** and supervising their performance.
2. **Reviewing and approving the municipality's budget, plans, and development projects.**
3. **Monitoring the implementation of council resolutions** and the work of the municipality and its affiliated organizations.
4. **Approving rates for urban services**, such as taxes, public transportation, and development services.
5. **Planning for cultural, social, and environmental development** within the city.
6. **Addressing citizens' complaints** against municipal services or staff.

7. **Cooperating with governmental and non-governmental organizations** to improve the quality of urban life.

1.4 Economic State

Iran's economy is one of the largest in the Middle East, driven by vast oil and gas reserves, a growing industrial base, and an educated labor force. According to the **International Monetary Fund (2025)**, Iran's nominal **GDP** stands at approximately **USD 341 billion**, with a projected real growth rate of around **0.3 percent** in 2025. The **World Bank (2024)** reports [11] that non-oil sectors such as manufacturing, agriculture, and services contributed significantly to economic expansion in previous years, though structural challenges and international sanctions continue to constrain investment and trade. Iran's **GDP per capita** is estimated at roughly **USD 5,600**, placing it in the upper-middle-income category [12].

The national currency, the **Iranian Rial (IRR)**, has experienced severe devaluation due to inflationary pressures and external sanctions. In **October 2025**, the free-market exchange rate averaged around **IRR 1,075,000 per USD** and **IRR 1,155,000 per Euro [14].**

Despite the inflation which is projected to remain above **40 percent** [13], Iran continues to maintain a sizable domestic market and resilient consumer demand, particularly in urban centers such as Tehran, Isfahan, and Shiraz.

Iran's economy is a **mixed system**, combining state-led industries with emerging private enterprises. The country holds the **fourth-largest proven crude oil reserves** and the **second-largest natural gas reserves** globally [11], while new growth has emerged in the **information technology** and **digital services** sectors. Trade partners such as China, India, and the UAE remain key markets for exports, while economic diversification and regional partnerships are central to Iran's long-term strategy for growth and stability.

1.5 Main Sources of Income

In 2025, **hydrocarbons** still underpin Iran's public finances even as policymakers emphasize "non-oil" growth. Crude oil, condensates, natural gas and petrochemicals remain the dominant earners of foreign exchange and a large share of budget resources.

Reuters' 2025 coverage shows Iranian crude exports running around 1.2–1.7 mb/d—overwhelmingly to **China**—which keeps hard-currency inflows flowing but also leaves revenues exposed to sanctions enforcement and price discounts. Downstream, gas-based petrochemicals provide an additional, steadier export stream and a non-oil cushion for external receipts.

Measured by domestic value added, industry and manufacturing are the second big pillar. **World Bank 2024 [11]** data put **industry (incl. construction)** at about **36% of GDP in 2024**, with manufacturing near **19–20%**, reflecting sizeable automotive, steel and metals, cement, textiles and mining value chains.

Even when export channels are constrained, these sectors supply the home market and feed "non-oil" trade (e.g., steel and copper), which alongside petrochemicals forms the bulk of merchandise exports outside crude.

Agriculture contributes a smaller—yet regionally significant—slice of national income and employment. In 2024 it accounted for roughly **13% of GDP [11]** on ***World Bank figures***, with high-value specialties such as pistachios and saffron complementing staples like wheat and fruit. Water stress and drought periodically drag on output and farm jobs, but agro-exports remain an important earner for rural provinces.

CHAPTER 2

2. Information Technology

2.1 The Official Introduction of Computers to Iran Before the Revolution (1960s)

Records show that since 1954, the use of machines known as IBM Unit Record machines had been common in the statistical work of the Statistical Center, in connection with the **Planning and Budget Organization** of that time [17]. The 1956 National Population and Housing Census, which was the first census in the modern sense, was carried out using these machines. These devices, were actually a generation of electromechanical systems that existed before computers in the usual sense of the word.

Although the activity and establishment of the IBM branch in Iran date back to 1947, major exchanges between IBM and Iran practically began in 1957, about two years after the Statistical Center started using the Unit Record machines [3]. After the 1979 Revolution, the Iranian branch of IBM was separated from the global IBM company and was renamed the **Data Processing Company** (*Sherkat-e Dadeh Pardazi*) [18].

Records [19] also show that until around 1960, no computer in the modern sense existed in Iran. To explain further, the so-called first-generation computers, which were few and mainly used for experimental purposes, did not reach Iran.

2.1.1 The First Computers in 1962

The first computers in the modern sense were installed and used in Iran between **1962 and 1966** in several major institutions, including the **National Iranian Oil Company (NIOC)**, **University of Tehran**, **Iran Melli bank**, and the **Statistical Center** within the **Plan and Budget Organization** [18]

In **1962**, the **first real digital computer** was officially imported into the country by the **National Iranian Oil Company**. This machine was an **IBM**

1620, and its purpose was to assist in **engineering calculations** and the **analysis of geophysical and oil drilling data** [18].

In **1963** (or possibly late 1962), the **IBM 1401** computer was purchased by the **Plan and Budget Organization**. This computer was mainly used in **accounting**, **financial resource management**, and **processing of national statistical information**. Because of its wider and more general use, it has often been **mistakenly referred to as the first computer in Iran** in many sources [19]. However, in addition to computers such as the **IBM Unit Record**, **IBM System/3**, **IBM/360**, and **IBM/370**, other computer systems were also used in Iran.

For example, **Honeywell** computers were used in the **military** (through the company *Iziran*) for **projectile simulation** and **ballistic modeling**; **CDC (Control Data Corporation)** systems like the **Cyber** were used in the **National Iranian Oil Company**; **DEC (Digital Equipment Corporation)** systems such as **PDP/7** and **PDP/11** were installed at the **University of Tehran** for **educational and research purposes** (along with introductory programming courses) and **NCR (National Cash Register)** computers were also in use [18].

2.2 Expansion of Computer Use in the 1970s

In the early 1970s, at the same time as the rise in oil prices, an opportunity arose for more **government organizations** to use **computers**, and for those already using them to adopt newer **computer systems**. By 1976, the number of **computers** installed in **Iran** reached about 600 units. Most of this equipment was imported from American companies such as **IBM** and **Electronic Data Systems**, and **software** was also mainly supplied from the **United States** [20].

During these years, **computer use** had grown at an unprecedented rate (from 100 units in 1972 to 600 units in 1976), which prompted the **government** to carry out a comprehensive study called the **"CAAS Project" (Civil Agencies Automation Study)**. The project aimed to examine **"the status of computer use in government organizations"** and evaluate the efficiency of the **systems** being used [18] [19].

2.2.1 Leading Organizations and Companies

IBM Iran Co:
IBM Iran was the largest supplier of computer equipment and support services in Iran. The company was a branch of the American corporation **IBM** and provided **mainframe computers** and **data processing equipment** for **banks, government ministries, the oil and gas industries, and universities**. It was also responsible for **training users** and **providing technical and maintenance services** for the systems [18].

NCR Co:
(National Cash Register Company**)** was a manufacturer and supplier of **mechanized financial and administrative equipment**, such as **accounting machines**, **data recording and collection devices**, and later **minicomputers** and **banking systems**. In Iran, the company's equipment was mainly used in **banks and financial institutions** for **transaction processing** and **accounting operations [18]**.

ICL (UK) Co:
(International Computers Limited**)** was a British company that operated in Iran as an **importer of computer equipment** for **administrative and agricultural organizations**. The company supplied and supported **mid-range computers** and **data processing systems** used by **government ministries**, **statistical institutions**, and **organizations involved in agriculture and rural development [18].**

2.2.2 The Formation of "Supreme Council of Informatics of the Country"

The so-called **CAAS Project** was carried out by the government in the mid-1970s with the collaboration of **foreign consultants**. During this project, the activities of all **computer centers** in the country were examined, and the final reports were published under the title **"Evaluation of Informatics in Government Organizations"** in **November 1978** (a few months before the **Iranian Revolution**) [18].

Also, at the beginning of the **Revolution** (**1979**), due to the sensitivities around this issue at the time, a commission called the **"National Informatics Commission"** was formed in the **Plan and Budget Organization** to review the state of **computer use** in **Iran**. This commission also conducted studies, and its report, titled **"Preliminary Review of National Informatics"**, was

published in **October 1980** by the commission, which was later upgraded to the **"Supreme Council of Informatics of the Country"** [19].

2.2.3 Key Developments

In the **1970s**, **Iran** witnessed significant developments in **information technology** and **computer development**. This period, accompanied by the **economic and administrative development programs** of the **Pahlavi II government**, played an important role in the **introduction and expansion of modern technologies**, including **computers**, in the country.

2.2.3.1 Installation of the IBM 360 in the Plan and Budget Organization

In the early **1970s**, **Iran** was one of the pioneering countries to introduce the **IBM System/360** series [18]. This system was one of the most advanced **mainframe computers** of its time and was used for:

- Processing national statistical data
- Running macroeconomic models
- Supporting development and budget programs
- Use in census-related projects

The installation of this system not only provided the **government** with immense **computational power** but also marked the beginning of a period of **administrative automation** and **large-scale data analysis** at the national level [19].

2.2.3.2 Expansion of Specialized Courses in Industrial Universities

During the 1970s, **Aryamehr Industrial University in** Tehran (current Sharif university) and its Isfahan branch (current Isfahan University of Technology) were pioneers in offering **computer-related courses**.

Emerging fields such as **electrical engineering with electronics and computer orientation** and **computer science** were introduced. Many instructors of these courses were either from **Western countries** or **Iranian graduates returning from the United States [19]**, and they used modern **educational resources** such as textbooks from **MIT** and **Stanford University**.

These efforts led to the training of the **first generation of Iranian programmers, system analysts, and computer project managers**. Also, resulted in the establishment of the **first computer laboratories** in universities [18].

2.2.3.3 Establishment of Initial Data Centers for Banks and Insurance Companies

In 1970s, **banks** and **insurance companies**, which had previously relied mostly on **manual** or **mechanical systems**, gradually **digitized their processes** and established **initial data centers** to manage information. The **National Bank of Iran** was among the first institutions to use **IBM systems** to manage accounts and transactions, while companies such as **Iran Insurance** began using **computers** to process **policyholder information [18]**.

These **data centers**, equipped with devices like **punch card machines**, enabled **digital storage and retrieval of customer information** and the production of **accurate financial and statistical reports**. The infrastructure established during this period played an important role in the development of **electronic banking** and **insurance automation** in the following decades. In the **1970s** (1350s), the country's **banking sector** used **22 large and medium computers** and **85 minicomputers** [19].

There were also efforts to move from **batch-offline systems** to **online and telecommunication systems**, but these attempts were largely unsuccessful. In the 1970s, a very small number of **bank card readers** were installed by the **National Bank of Iran** in cooperation with **Visa** at some **hotels** and **special stores** in the cities [19].

In a report titled **"Preliminary Review of National Informatics"**, published in **1980** (1359) by the **National Informatics Commission**, the **distribution of computer activities** in the **government** and **public institutions** was presented. After **payroll systems**, which accounted for **18%**, **banking operations** ranked **second**, with **15%** of **computers** allocated to them [23].

2.3 Consequences of the Islamic Revolution and the Iran-Iraq War

After the **Islamic Revolution** in **February 1979** and especially after the **seizure of the U.S. Embassy** in **November 1979** (Aban 1358), **Iran-U.S.**

relations deteriorated sharply. As a result, major **American companies** such as **IBM**, **HP**, **NCR**, **Honeywell**, and **Digital Equipment Corporation (DEC)** halted their operations in **Iran**. This led to the establishment of the state-owned **Iran Data Processing Company (DPI) [18]**.

IBM's withdrawal from Iran was not due to sanctions or financial problems, but because of **political tensions and pressures** at the time, leaving the company's managers no choice but to leave. After negotiations with the **Iranians**, they agreed to leave the company along with all remaining **assets**, requesting **$3 million** in return, also stipulated that the remaining company could no longer use the **IBM brand**.

2.3.1 Establishment of Internal Support Offices for Maintaining IBM and NCR Systems

As foreign spare parts, system updates and vendor support became less accessible, many ministries, banks, universities and industrial companies found that their installed computer systems (including those from IBM or NCR) lacked maintenance services.

To mitigate this, some banks and large organizations in Iran set up **internal hardware-support offices** tasked with maintenance of computers and peripherals, troubleshooting of hardware and software, and training of internal technical staff.

These units were typically **supervised by Iranian engineers** who had received **specialized training during the 1970s and 1980s**, either **domestically or abroad**, in the operation and maintenance of **mainframe computers** and **mechanized data-processing systems [19]**.

As a result, these internal support centers played a **crucial role** in achieving a degree of **self-sufficiency in maintaining foreign computer systems** and, in the long term, contributed to the **emergence of Iranian hardware and IT service companies** in the following decades.

2.3.2 Localization of Application Software and Experts Training

Under these circumstances, **universities** and **domestic research centers** played a more prominent role in **education** and **technology production**.

Major technical universities expanded or created computing programs in this period. For example, **Sharif University of Technology** established the **first**

independent Department of Computer Engineering in Iran in **1985** (admitting undergraduates from 1986), **Amirkabir University of Technology** launched its **Computer Engineering Department** in **1988**, and **Isfahan University of Technology**'s ECE department (founded **1977**) trained electrical/computer engineers in close collaboration with national industries [19].

On the technology side, the 1980s saw **local assembly and development [19]**: inexpensive PCs plus **Persian word-processing** drove imports of components assembled in Iran, while labs and institutes produced **domestic terminals (1975–1978)**, an **"M-1" minicomputer (1980)**, and a **microcomputer introduced in 1984** that was later mass-produced. Although these builds were modest, they **seeded later efforts** in local hardware and software.

2.3.3 Iran-Iraq War Era

According to the book titled "**Information Technology in Iran" [24]**, after the **Islamic Revolution**, during the Iran–Iraq War, the drive for technological self-reliance pushed several Iranian institutions to become the core of the country's emerging IT infrastructure. The **Defense Industries Organization (SAIRAN)** launched projects to develop **domestic computer systems** for **military** and **industrial applications**, focusing on **maintenance of imported systems** and the development of **local application software.** Some reports mention the production of **industrial control and automation systems** for **defense industries**.

The **Ministry of Defense** also established **computer and IT research and development centers** to support **military projects**, train **domestic specialists**, and initiate **early projects to build small computers and minicomputers** for **defense applications**. **Iran University of Science and Technology** acted as a major **R&D center for computing**, playing a key role in **training hardware and software experts**, **designing and developing application software** for **banks**, **industries**, and **government centers**, and collaborating with **government organizations** to **localize imported systems**.

These organizations laid the **initial foundations of domestic computing infrastructure** and paved the way for the **development of information technology** in the following decades.

2.4 The Personal Computer (PC) Revolution (1990s)

In the **late 1980s** and **early 1990s** (late 1360s and early 1370s), a fundamental **shift in the use of information technology** occurred in **Iran**. This period saw the introduction of **personal computers (PCs)**, marking a **milestone in the democratization of computing technology** in the country. While previously **computer use** had been limited to **government institutions**, **large organizations**, or **universities**, the arrival of **PC systems** enabled **individuals**, **training centers**, **schools**, and **small businesses** to access this technology.

2.4.1 Expansion of Hardware Imports

After the **end of the war** and the beginning of the **Reconstruction Era**, the **import of PCs** from countries such as **Taiwan**, **South Korea**, and **China** began. These were mostly **IBM-compatible systems**. Well-known brands such as **Compaq**, **IBM Clone**, **Acer**, and later **Pentium-based computers** entered the **Iranian market**, helping to **expand public access to information technology.**

Growth of Domestic Assembly Companies [25] and Local Software led to Companies such as **Madirane**, and **Iran Data Processing (DPI)** began **assembling computer components domestically**. These companies played an important role in **reducing computer prices** and **increasing public access**.

In the **software sector [**25**]**, programs like **Hamakaran Accounting Software**, **ParsiNegar**, and **warehouse and secretariat management solutions** localized the **software market**. Additionally, **localization efforts** for the **Solar Hijri calendar**, **Persian typing**, and **local systems** were undertaken, aligning the **computer experience** with the needs of **Iranian users**.

2.4.2 Introduction of General Computer Education

In the early 1990s, general computer education expanded widely in Iran [24]. **ICDL** classes and basic computer skills courses were offered in private training centers and some schools, and computer education was officially integrated into the curriculum of middle and high schools [18]. Technical and vocational schools, private institutions, and many high schools offered courses such as computer fundamentals, **DOS** operating system, programming with **BASIC** and **Pascal**, use of application software like **WordStar**, **DBase**, and **Lotus** 1-2-3, as well as database concepts and form design with **FoxPro** and **Clipper**.

This trend played a major role in improving digital literacy and preparing a workforce for the IT sector in the country [19].

Alongside the expansion of education, companies and small business units quickly adopted computers. This was facilitated by factors such as relatively lower system prices, the ability to install accounting and customer management software, and the lack of need for large, specialized equipment like mainframes.

2.4.3 Introduction of Networking and the Internet

Although **public Internet access [27]** in **Iran** was not available until the **late 1990s** (around **1998 / 1377**), during this period **basic concepts of local area networks (LANs)** and **inter-system communications** were introduced in **technical training**. Activities included **installing peer-to-peer networks** using **coaxial cables**, working with **network operating systems** such as **Novell NetWare**, and becoming familiar with **modems** and **file transfer via BBS (Bulletin Board System)**. These trainings laid the **foundation for the development of networking and Internet culture** in the following decades.

2.4.4 Socio-Cultural Effects of Personal Computers

The introduction of **personal computers (PCs)** brought widespread changes across different layers of **society**. With the **expansion of computer use**, a **digital culture** emerged, and working with computers became part of the indicators of **"modern literacy."**

New **jobs** were created, such as **computer operators**, **professional typists**, **digital graphic designers**. **Content production** also became easier, and **publications**, **forms**, **posters**, and **reports** were designed and printed using **computer software**. Ultimately, general **familiarity with digital concepts** provided the **cultural foundation** for the **advent of the Internet** and the **communication era**.

2.5 Domestic Development (2000s–2010s)

The **1380s and 1390s** in the Iranian calendar (2000s–2010s) can be considered the **period of consolidation of Information and Communication Technology (ICT)** in **Iran's national structure**. After two decades of **importing and applying technology**, the country's focus shifted from **technology**

consumption to **production, localization, and development of national infrastructure**. This movement was not only **economic** and **scientific**, but also **strategic** and **security-oriented**.

In **2006**, the **Institute for Fundamental Sciences** and **Sharif University of Technology**, in collaboration with the **Ministry of Defense**, launched a project to design the **first Iranian 32-bit microprocessor**. This processor, known as **"Aristo" [27]**, was based on **RISC architecture** and designed using **VHDL**. The **Aristo processor**, with a clock frequency of approximately **200 MHz**, was intended for **embedded applications**, **security systems**, and **educational purposes**.

Interestingly, the Iranian **Aristo processor** went beyond just the design stage — **Taiwan Semiconductor Manufacturing Company (TSMC)** even produced a prototype of it using a **0.18-micron lithography process**. However, no benchmarks or technical details about this project were ever released, and it is said that only a **very limited number of units** were manufactured.

There is no concrete information about the reasons for abandoning the project, but it can be assumed that since **mass production was never planned**, the **manufacturing costs** for Iran would have been extremely high. Moreover, with well-established and reputable companies such as **Xilinx, STMicroelectronics, Fujitsu, Atmel, NXP, Broadcom,** and others already present in the market, **neither foreign nor domestic companies** were likely to adopt Aristo. Using **proven foreign alternatives** that were **cheaper and more efficient** would have been a much more logical choice.

2.6 Internet Explosion and Societal Digitalization

Beginning in **2010**, Iran entered a decade of rapid and unprecedented Internet expansion that fundamentally reshaped its social and technological landscape. At the start of the decade, Internet access remained relatively limited and uneven. Most users connected through **dial-up or early ADSL services**, concentrated in urban centers, universities, and government offices. Penetration rates were below **20 percent**, and the digital divide between rural and urban regions was significant. Internet use was primarily educational and administrative, with limited presence in everyday life.

A major turning point came after **2013**, when the government prioritized the development of national information infrastructure. The launch of **third-generation (3G)** and later **fourth-generation (4G)** mobile networks by providers such as **Hamrah-e Aval (MCI)**, **MTN Irancell**, and **Rightel**

transformed the accessibility of online services Internet connectivity rapidly shifted from fixed-line computers to **mobile devices**, marking the beginning of the "mobile Internet era" in Iran.

Between **2014 and 2016,** according to reports from the Statistical Center of Iran [28], the **internet penetration rate**, which was estimated at around **30 percent in 2013 (1392)**, rose to **over 45 percent by 2015 (1394)** and surpassed **half of the country's population by early 2016 (1395)**. This surge was primarily driven by the **declining cost of smartphones**, the **expansion of mobile internet networks**, and **easier access to data services**.

The **mid-to-late 2010s** saw the full emergence of **digital society in Iran**. Social media platforms such as **Telegram**, **Instagram**, and **WhatsApp** became central to communication, news distribution, and small-scale business operations. Domestic applications and online services like **Aparat** (video sharing), **Cloob** (social networking), **Digikala** (e-commerce), and **Snapp** (ride-hailing) appeared, reflecting a shift toward digital entrepreneurship and consumer culture. Online payment systems and **e-government portals** became more common, integrating citizens and institutions into a growing digital.

By **2020**, Iran had effectively transitioned from limited, localized Internet use to a **broadly connected and digitally active society**. Internet access had become an essential part of education, commerce, media, and social life. Mobile broadband subscriptions surpassed **70 million**, and household Internet usage exceeded **60 percent** nationally. The 2010s thus represent the crucial decade in which Iran moved from the stage of early adoption to full-scale **societal digitalization**, setting the foundation for future developments in both national and global digital integration.

CHAPTER 3

3. Internet

3.1 Historical Overview of Iran's Digital Transformation

*From an article of **Hamshahri** newspaper (Article code: 42907)* [31].

The first steps to connect Iran to the global network happened in 1989. It all started with a trip. Mahmoud Boroujerdi, the son-in-law of the founder of the Islamic Republic, went to Italy for a research opportunity. There, he became familiar for the first time with email and the idea of an international network. Mahmoud Boroujerdi was a faculty member at **Shahid Beheshti University**, a former deputy minister of higher education (now the Ministry of Science), and Iran's former ambassador to Finland. He got to know early academic networks that were not yet the modern internet, known at the time as **BITNET**.

When he returned to Iran, he suggested connecting to this academic network to Javad Larijani, the head of the Institute for Theoretical Physics. Further research showed that the key to making the connection was held by EARN (the European Academic Research Network). In the fall of 1992, with Larijani's signature, the Institute for Theoretical Physics was connected to Linz University in Austria through the EARN network. A few months later (on January 1, 1993), data was exchanged for the first time between Iran and Austria using the NJE protocol.

Shortly after this connection, the **TCP/IP** protocol was introduced globally, and about a year later, Iran also adopted this new protocol through the same university in Vienna. Around this period, Iran began efforts to establish an independent connection to the global network. To achieve this, a formal request was sent to **InterNIC** — the organization that managed the global network before **ICANN** was founded — and Iran's national network addresses were officially registered.

Four subdomains were defined for different sectors: **.ac** for universities, **.co** for companies, **.or** for organizations, and **.net** for network services. At the time, Iranian officials were fascinated by the concept of email and electronic

communication. Those who had more international exposure recognized its potential and took steps to expand and develop this new technology within the country.

3.1.1 Connection to BITNET in 1989

Before the creation of the Internet, an earlier generation of global computer networks called **BITNET [31]** was in use. BITNET was a computer network established in 1981 through the collaboration of several U.S. universities. It operated using dial-up connections, and its main difference from today's Internet was that it relied on **point-to-point connections** rather than continuous online communication. Finally, Iran's Institute for Research in Fundamental Sciences (IPM) connected to BITNET in **1989.**

3.1.2 The 1990s: Iran Says Hello to the Global Internet

The first computer in Iran to access the Internet was located at the **Institute for Research in Fundamental Sciences**. Until **1992 (1371 in the Iranian calendar)**, only a few universities in Iran — including **Sharif University of Technology** — had access to the Internet [32], and the necessary infrastructure for public access was not yet available.

By the **end of 1993 (1372)**, the **TCP/IP protocol** was finally implemented in Iran, making true Internet connectivity possible. At that time, Iran's network operated as a **subnetwork of the University of Vienna [31]**, so Iranian email addresses ended with **"univie.at"**, the Austrian university's domain. In essence, Iran joined the Internet about a year after most European universities.

The connection speed was extremely low — the country's total bandwidth was only **9.6 kb per second**. However, since web services and graphical content did not yet exist, this speed was sufficient for sending and receiving emails. In fact, the **modern form of the Internet** was introduced to Iran in **1993 (1372)**, primarily for **academic and research use**.

3.1.2.1 First Internet Service Provider

The year **1994 (1373)** was a pivotal moment in the history of the Internet in Iran. At the beginning of that year, the **".ir" domain** was officially registered [31], giving Iranian websites their own national online identity. Public Internet access became available for the first time through the company **Neda Rayaneh**

[31]. This organization introduced **dial-up Internet service** in Iran and, after launching the country's **first bulletin board system (BBS) [33]**, went on to create **Iran's first domestic website** within a year. **Neda Rayaneh** also published the **Hamshahri newspaper** online in Persian, making it the **first official Iranian newspaper on the web**. Later that same year, after connecting to the Internet via the Canadian satellite network **Cadvision**, Neda Rayaneh began its commercial operations as **Iran's first Internet service provider (ISP)**.

3.1.2.2 The Unicode Project

In **1998 (1377)**, the **Unicode project [31]** in Iran was launched under the title **"Farsi Web"**. The project was initiated through a contract with the **Supreme Council of Informatics**, in collaboration with the **Knowledge and Art Foundation** in the UK, and was technically supervised and managed by **Sharif University of Technology**. The main goal of the project was to **fully integrate the Persian alphabet into the Unicode standard [32] [31]**, ensuring that Persian publishing on computers — especially on the Internet and the web — would follow a standard format. The project also aimed to **solve the problems caused by non-standard fonts** in Iranian software.

Two years after Iran's first connection to the global network, the **Islamic Consultative Assembly (Parliament)** approved [31] the establishment of the company **"Data Communications Affairs"** under the **Iran Telecommunication Company**, granting it **exclusive responsibility** for developing data services across the country. By the end of **2000 (1379)**, Iran had only **418,000 Internet users [34]**. However, with the start of the 2000s, the development of network infrastructure accelerated, and Internet usage gradually increased across the country.

3.1.3 From Dial-Up to High-Speed Internet

In the early years of public Internet access in Iran, connectivity was achieved almost entirely through **dial-up connections** using ordinary home or office telephone lines. Users would install a **modem**—a device that converted digital computer data into audio tones—and then **dial the access number** provided by their Internet service provider (ISP). If the **username and password printed on prepaid Internet cards** were entered correctly, the modem established a temporary connection that allowed users to access the global network.

Typical dial-up connections in Iran offered speeds between **33.6 kbps and 56 kbps**, and in some cases up to **64 kbps** under ideal line conditions. Despite the slow speed, this technology was **revolutionary** for its time. It opened the way for **email communication**, **text-based web browsing**, and **early online chat services**—introducing thousands of Iranian households and offices to the digital age for the first time.

Throughout the **late 1990s and early 2000s (1370s – 1380s)**, Internet cafés began to appear in major cities, offering public dial-up access. By the mid-2000s, as demand grew and telephone congestion became an issue, Iran Telecommunication Company and private ISPs began rolling out **ADSL (Asymmetric Digital Subscriber Line)** and **wireless broadband** connections [34]. These new technologies marked the transition from noisy, slow dial-up modems to **"always-on" high-speed Internet**, enabling faster access to multimedia content and local Persian-language websites.

3.1.3.1 PAP (Private Access Provider) License

In **2003 (1382)**, another significant development occurred. The **Ministry of Post, Telegraph, and Telephone** issued **ADSL Internet service licenses (PAP licenses)** to **13 companies**, after collecting a **license fee of 15,000,000 billion IRR [31]**. Two companies immediately withdrew, leaving **11 companies** to operate.

The license allowed these companies to **establish permanent or temporary wired or wireless connections** between any fixed terminal connected to the licensed equipment, other licensed network terminals, and other data transmission networks within the country. The main technical challenge for these companies was their **dependence on government-owned telecommunications infrastructure** and the **outdated equipment**, which affected the rollout of ADSL services.

Despite these challenges, this phase marked the **beginning of high-speed Internet in Iran** and paved the way for **private companies to enter the Internet services market**. At that time, the **minimum cost for high-speed Internet** was about **500,000 Rls [34]**, which was considered expensive and placed a significant financial burden on households.

During the **eighth government of Iran**, officials who granted **ADSL licenses to PAP companies** insisted — both at the time and later — that these licenses were issued **without specifying the data transmission technology**. This meant that license holders were **not required to use copper wires** for data

transfer. However, the subsequent government **did not accept this interpretation** and stated that **wireless data transmission licenses would be issued separately**.

Even with this "new" Internet technology at the time, **home users were effectively limited to speeds of 128 kbps**. It may seem surprising today, but for a long time, it was **not possible to get home Internet faster than 128 kbps**, despite the availability of ADSL technology.

3.1.3.2 FCP and ISP Licenses

In **2008 (1387)**, **WiMAX technology [30]** — a wireless method for Internet access — arrived in Iran. Licenses were granted to **four companies**, but with an important restriction: they were allowed to offer **only fixed WiMAX services**. As a result, **mobile Internet access was not possible**, and widespread mobile connectivity had to wait for the launch of the **third mobile operator in Iran**.

Although WiMAX operators began offering services about a year after receiving their licenses, they **did not bring a major shift to the market**. **PAP companies** (providing public data transmission services and high-speed ports) remained the **main players in Iran's Internet market**, despite ongoing challenges and limitations.

In **2014 (1393 in the Iranian calendar)**, **TIC (Telecommunication Infrastructure Company of Iran)** decided to **organize and consolidate the large number of Internet service providers** in the country [35]. This led to the introduction of **two types of licenses**:

- **Fixed Communication Provider (FCP):**
  FCPs are allowed to **build and operate their own independent communication networks**. By installing necessary equipment in telecommunication centers, they can directly provide services to consumers.
- **Internet Service Provider (ISP):**
  ISPs must deliver services **through a host network**, such as an FCP or the **Telecommunication Company of Iran**, and **cannot establish their own aggregation network**. This category is also referred to as **Servco**.

Companies holding an **FCP license** can provide a range of services beyond **high-speed ADSL Internet [35]**, including:

- Fixed-line telephone
- IP-based telephony (VOIP)
- 4G TD-LTE Internet
- Wi-Fi services
- Fiber-optic connections
- Other related communication services

Eligible companies gradually receive their **FCP licenses** from the **Communications Regulatory Authority** and can expand existing services or launch new ones.

3.1.3.3 The Bitstream Negotiations

Three years after the announcement by the **Communications Regulatory Authority**, the **Bitstream [36] regulation** was approved. This regulation allows **non-Telecommunication companies** to provide **ADSL, VDSL, or FTTH Internet services** over **fiber-optic lines** owned by the Telecommunication Company of Iran.

Under the decree:

- The **fiber-optic infrastructure of the national telecom** is shared with **licensed FCP and Servco companies**.
- The goal is to **end the monopoly of the national telecom**, improve **service quality**, and give **customers more options** for Internet providers.

However, in practice, the implementation of the Bitstream regulation has faced **technical and administrative challenges**, which have affected the speed and efficiency of its rollout.

Disputes over **wholesale tariffs**, **misaligned economic interests**, and **technical difficulties in sharing fiber-optic infrastructure** have prevented the policy from being fully realized. The **Telecommunication Company of Iran**, as the owner of the main access network, plays a **key role**, and effective collaboration with **FCP and Servco operators** requires **complex technical, legal, and financial agreements**, which have been difficult to finalize.

Furthermore, government and regulatory promises — such as the **allocation of millions of VDSL ports** to expand high-speed Internet services — have often been **delayed or implemented on a limited scale**. This gap between **official regulations and actual implementation** highlights a **fundamental challenge** in transforming Iran's **fixed-line Internet access network**.

3.1.3.4 Introduction of the CNSP/UNSP License

In **2021 (1400)**, Iran's **Communications Regulatory Authority (CRA)** introduced a new type of license called **CNSP** — later renamed **UNSP [37] (Unified Network and Service Provider)**. This license allows operators to offer **both fixed and mobile communication services** under one framework — something that had never been allowed before in Iran.

The goal of the UNSP license is to **increase competition** and **reduce the monopoly** of the **Telecommunication Company of Iran (TCI)** by giving other operators the right to provide integrated, "converged" services (for example, broadband, mobile, and voice together).

However, mobile operators like **Irancell** were cautious. They argued that the **license terms** made it **financially unattractive** because:

- The **government's revenue share** was too high,
- **Tariffs** (prices) were limited or fixed by regulation, and
- They had to **cover remote areas**, which increased costs.

These conditions created a conflict between the government's desire for **nationwide service and tax income** and the operators' need for **profitability**. After feedback from operators, the CRA revised and renamed the license as **UNSP**, adjusting some rules to make it more practical and appealing for future investment.

3.1.4 The Emergence of Social Media in Iran

From the launch of Internet services by **Neda Rayaneh** until about **nine years later**, **only dial-up Internet** was available in Iran. During the 2000s (**1380s**), as more Iranians gained access to the Internet through **ADSL**, social media began to spread and attract users.

Although the most serious efforts to develop social networks globally date back to the **late 1990s**, this new form of media was introduced in Iran in the **mid-2000s**, with the arrival of **Facebook**. It quickly drew a variety of users, particularly **young Internet users**, who became some of the platform's earliest active members in the country.

3.1.4.1 Facebook and Twitter

In **2007**, **Facebook** became the first social media platform to significantly influence Iranian society, quickly gaining popularity among users. However, in **2009**, the platform was **permanently blocked** by the **Supreme Council of Cyberspace** of Iran, due to its use in **political campaigns, news dissemination, organizing movements, and protests**. At that time, protesters used Facebook to coordinate the **time and location of demonstrations**, prompting the government to restrict access.

The blocking of Facebook caused its popularity in Iran to **decline sharply**, though the platform, along with **Twitter**, still retains some users. According to the latest **ISPA [39] survey**, **3.7% of Iranian Internet users** use Facebook, and **3% use Twitter**. Twitter was introduced globally around the same period and attracted some Iranian users, but it **never reached Facebook's level of popularity**. Both platforms were **blocked by the Supreme Council of Cyberspace in 2009 (1388)** following the presidential elections in Iran [38].

3.1.4.2 From Broadband Expansion to the Rise of Messaging Apps

In the **2010s (1390s)**, Internet access in Iran expanded dramatically. According to the **Communications Regulatory Authority**, **broadband penetration** grew from **7.6% in 2013 (1392)** to **127% by the end of 2021 (1400) [39]**. Fixed broadband subscriptions increased from **58,000 in 2013** to **over 9 million in 2021**, while **mobile broadband subscriptions** rose from **zero in 2013** to **over 95 million in 2021 [39]**.

This decade is also considered the **era of messaging apps** in Iran. The widespread adoption of **smartphones** fueled the growth of mobile messaging platforms. Although earlier services like **Yahoo Messenger** and **Nimbuzz** were used, the popularity of smartphones significantly **expanded the number and use of messaging apps** worldwide. In Iran, apps such as **WeChat, Viber, LINE, WhatsApp**, and others became widely installed, offering users **new ways to communicate**. However, some of these platforms, including **WeChat and Viber**, were **blocked by the Supreme Council of Cyberspace** early in the decade, restricting access for Iranian users.

Telegram, whose **first public version was released in 2013**, quickly gained global popularity and attracted millions of users, including a large audience in Iran. Its features, such as the ability to create **groups and channels**, made it

especially appealing to Iranian users. By **2017 (1396)**, nearly **60% of Iranian Internet users** were actively using Telegram [39].

The popularity of Telegram in Iran was also fueled by disruptions in other messaging apps like **Viber** and **LINE**, as well as Telegram's **speed, security, and ease of migration** from older platforms. Additionally, Telegram offered significant advantages: **group member limits increased from 50 in Viber to 200,000**, and users could **share files of virtually unlimited size**.

However, the Iranian government repeatedly considered **blocking Telegram** and imposed various **access restrictions**. User access was frequently disrupted, most notably during the **protests on January 8, 2018 (1396)**, when Telegram was **blocked for over a week**. The service was **restored on January 13, 2018 (1396)**, but access continued to face intermittent disruptions. On **April 30, 2018 (1397)**, Telegram was **once again blocked in Iran** by a judicial order. According to the decree issued by the **Tehran Prosecutor's Office**, Telegram was to be **filtered in a way that would make it inaccessible even through tools like VPNs or proxies**. This marked a stricter phase of restriction compared to previous disruptions, aiming to **completely prevent user access** to the platform.

According to ***ISPA* statistics [39]**, among popular social networks in Iran, **Instagram** ranks **second after WhatsApp**, with nearly **50% of Internet users** active on the platform. This **image-focused social network** began gaining popularity among Iranian users in the **early 2010s (early 1390s)** and gradually attracted a large audience. By the **end of the decade**, Instagram had become **one of the most popular social media platforms** in the country.

3.1.5 Internet Filtering in Iran

As Internet usage grew in Iran, **filtering became a major policy issue** and was actively pursued by authorities. In **2001 (1380)**, the Supreme Leader issued the **"General Policies for Computer Information Networks"**, marking the start of formal legislation regarding Internet filtering in the country.

The following year, a **three-member committee [39]** was formed, consisting of representatives from the **Ministry of Intelligence, the Ministry of Culture and Islamic Guidance, and the Islamic Republic of Iran Broadcasting (IRIB)**, to oversee Internet content. Early in its work, this committee **compiled a list of 111,000 prohibited websites [38]** and instructed Internet service providers to **block them**. That same year, additional sites were **filtered by judicial order**. As a result, more than **20 years have passed since the**

beginning of Internet filtering and content restriction in Iran, shaping the country's online environment and regulatory approach.

The **peak of Internet restrictions** in Iran occurred in **November 2019 (Aban 1398)**, when the **entire country's Internet was shut down for several days** by the government. Experts estimate that the **economic losses** from this shutdown exceeded **one billion dollars**. During the **2022 (1401) protests**, mobile Internet was again **disrupted or cut off for weeks**, severely affecting communication. Global reports provide a clear picture of Iran's Internet performance. In terms of **speed and quality**, Iran ranks **97th among the top 100 countries [41]**. The **data round-trip time** is so high that Iran is grouped with countries like **Sudan and Ethiopia**. Experts attribute much of this poor performance to **domestic policies and intentional filtering**, rather than solely to international sanctions.

One of the most **controversial** policies in Iran is what people call the **"class-based Internet.[42]"** In this model, specific groups—such as **university professors, certain journalists, or selected companies**—have access to the **unfiltered Internet**, while ordinary citizens remain subject to the usual restrictions. Critics argue that this approach **increases dissatisfaction and a sense of inequality**.

Officials have repeatedly stated that the goal of filtering is **"cultural protection" and "national security,"** but experts note that the Iranian government uses **advanced technologies to detect and block even many VPNs**. Meanwhile, citizens continuously seek **new ways to bypass restrictions**. Alongside economic and social costs, security experts warn that the **thriving market for circumvention tools** has itself become a potential **vector for abuse**.

Media analyses and unofficial reports also suggest that a portion of Iran's **VPN market may be under the influence or control of government-affiliated entities**. Although no official documents confirm this, experts argue that the **high profitability and lack of transparent oversight** make the market a fertile ground for intervention by powerful actors.

Internet access in Iran has been **restricted for many years**, with the government continuing to enforce **strict filtering policies**. At the same time, citizens **constantly find new ways to connect**, making the daily effort to bypass restrictions more than just a technical necessity. For many Iranians, it has become a **form of civil resistance**, reflecting a desire for **freedom of information and communication** despite ongoing limitations.

3.1.5.1 The Birth of Iranian Messaging Apps

From the **mid-2010s (mid-1390s)**, and even **before Telegram was blocked**, several **domestic messaging apps** were developed and launched in Iran. Despite extensive efforts to attract users, **foreign platforms remain more popular** than their domestic counterparts. Popular Iranian messaging apps include **Gap, iGap, Soroush Plus, Eitaa, Bale, and Rubika**.

According to app executives, monthly active users of these platforms range between **4 to 5 million**, while a recent survey by the **Iranian Students' Polling Agency (ISPA)** [39] indicates that only **1.8% to 5.7% of users** rely on these apps. **Trust issues**, particularly with apps like **Rubika**, remain a significant challenge. During the **November 2019 protests (Aban 1398)**, the **temporary shutdown of Telegram and other foreign apps** by the Ministry of Communications aimed to prevent misuse and limit protest organization, which contributed to a **notable increase in domestic messaging app usage**. Platforms like **iGap and Rubika** were heavily promoted across **TV channels, public groups, and supergroups**, further boosting adoption.

Most of these apps receive **government support**. According to the **Supreme Council of Cyberspace**, the **Ministry of Communications** has a key role in organizing and developing domestic messaging platforms. The ministry is tasked with providing support to licensed domestic apps to **create competitive advantages** over foreign alternatives **[43]**, including:

- Offering **low-interest loans** to domestic developers
- Reducing **bandwidth costs**
- Providing **network, storage, and security infrastructure**
- Enabling **interconnectivity with other IT and communication service providers**
- Supporting **public electronic services** (e.g., e-government, banking, municipal services) through domestic apps
- Assisting in the **international expansion** of domestic platforms to enhance Iran's influence in cyberspace

Support is structured in **three phases—initial, intermediate, and national**—based on metrics such as **user adoption, traffic generation, service delivery, and innovation**.

This framework reflects a **strategic effort to promote domestic messaging apps**, balancing **regulatory control, infrastructure support, and user incentives**, while attempting to reduce dependence on foreign platforms.

3.1.5.2 NIN (National Information Network)

Beyond messaging apps, Iran has pursued multiple initiatives to **develop domestic digital platforms and localize its Internet infrastructure**. These efforts aim to **reduce reliance on foreign services, increase national control over data, and support local technology development**.

The **National Information Network (NIN)**, also known as the **National Internet** or **National Internet Network**, is Iran's **domestic intranet** designed to provide a **secure and stable national information infrastructure**. According to *Article 46 of the Fifth Development Plan and the Supreme Council of Cyberspace*, the network is defined as:

A network based on **Internet Protocol (IP)** with switches, routers, and data centers, designed so that **requests for internal access and data stored in domestic data centers are not routed through foreign networks**. It also enables the creation of **secure internal and private intranets**.

The concept was first proposed in **2005 (1384) [45]** within the **Ministry of Communications and Information Technology** under the names "National Internet" and "National Internet Network." Initial studies were conducted during the **ninth government**, and in **2010 (1389)**, it was officially included in the **Fifth Development Plan** as the **National Information Network**, with the goal of completion by **2016** (end of the Fifth Development Plan).

By the end of the **tenth government**, design modifications and **pilot phases** were carried out. During the **eleventh government**, after the Supreme Council of Cyberspace defined the network's requirements, the **initial version** was launched. This version included:

- A **national traffic exchange center**
- A **national domain name server**
- The ability to **separate domestic and international network traffic**

The network aims to **increase domestic content production, encourage use of local traffic, reduce costs, and improve speeds** for Iranian users. Proponents of the **National Information Network** argue that it can **reduce domestic Internet costs** by keeping traffic within Iran, eliminating the need to purchase **international bandwidth** for accessing locally produced content. They also claim that the network can **enhance security** for both the country and individual users.

Despite ongoing efforts, the network has **not yet fully achieved its intended objectives**. According to the *latest reports from the **Supreme Council of***

Cyberspace, as of **July 2022 (Tir 1401)**, the NIN had reached approximately **43% completion**, with plans to increase progress to at least **66% by the end of the year [45]**.

3.1.5.3 The Protection Bill (Tarh-e Siyanat)

Before Iran's 2021 presidential election, lawmakers began discussing a new proposal aimed at **regulating and controlling foreign messaging platforms**. These discussions quickly drew widespread attention and controversy. Finally, in July 2021, the **"User Protection Bill in Cyberspace"** was officially placed on the parliament's agenda. The declared goal of this bill was to "protect users' rights," "organize online platforms," and "support domestic digital services." The proposal, prepared by the **Parliament's Cultural Commission**, included the creation of a body called the **"Supervisory and Regulatory Committee for Social Media Platforms."**

Members of this committee would be appointed from key government institutions such as the **Ministry of Communications,** the **Ministry of Intelligence**, the **Islamic Republic of Iran, Broadcasting (IRIB),** the **IRGC**, the **police**, the **Judiciary**, and the **Supreme Council of Cyberspace [44]**. This body would have broad authority to issue licenses, monitor activities, and even impose penalties on social media platforms.

According to the initial draft, **foreign platforms** would only be allowed to operate in Iran if they **registered locally and complied with national laws**. Otherwise, the Ministry of Communications would be required to **block access to them**. This clause in particular sparked a strong **public backlash**, as it implied that popular global platforms like WhatsApp and Instagram could be banned. The bill also called for **mandatory user identification**, **criminal penalties for using VPNs**, and even **punishment for users who continued to access blocked apps**. After the draft was published and faced heavy criticism from internet users, tech experts, and some government bodies, parliament temporarily withdrew it and introduced a **revised version**, which lawmakers claimed [44] was "over 70% changed." However, public concern about the **future of internet freedom in Iran** remains strong.

The internet in Iran has had a **long and turbulent journey**, facing numerous challenges and surviving repeated attempts at limitation and control. Today, as new policies are being introduced, the question remains: can the internet in Iran continue to exist and function as it has before, or is it on the verge of entering a **new and more controlled era** in its history?

3.2 Current Internet Landscape in Iran

3.2.1 Penetration rates (mobile and broadband)

According to the latest report from the **Communications Regulatory Authority (CRA)** in **spring 2025**, Iran's telecommunications indicators depict a fully saturated market in the **mobile internet** sector and slow growth in **fixed internet** services.

The **CRA's report** [**46**] on the state of communications in the country reflects the familiar dual-market landscape in the internet sector: on one hand, the **mobile communications** field continues to grow with an impressive penetration rate and intense competition between the two main operators—**Hamrah Aval (MCI)** and **Irancell**. On the other hand, the **fixed internet** segment, especially **fiber optics**, despite investments and expanding coverage, has still not succeeded in attracting a significant number of subscribers.

Category	Spring 2024	Spring 2025	Growth Rate
Mobile Phone Penetration Rate	180.11%	189.68%	+5.31%
Fixed Phone Penetration Rate	37.32%	36.37%	−2.55%
Mobile Broadband Penetration Rate	132.56%	140.07%	+5.67%
Fixed Broadband Penetration Rate	12.93%	13.02%	+0.77%

Table 2. Penetration rates

Subscribers (in Millions)	Spring 2024	Spring 2025	Growth Rate
Mobile Subscribers	146.19	154.87	+6.55%
Mobile Broadband Subscribers	113.99	121.31	+6.41%
Fixed Telephone Subscribers	28.64	27.97	−2.34%
Fixed Broadband Subscribers	11.15	11.27	+1.47%

Table 3. Number of subscribers

3.2.1.1 Growth in Mobile and Internet Penetration

According to the report, the **mobile phone penetration rate** in Iran has shown a noticeable increase — rising from **180%** in spring of the previous year to around **190%**. This figure means that the number of **active SIM cards** in Iran is roughly **twice the country's population [46]**.

In total, there are more than **154.8 million active SIM cards** in Iran. Despite the **5% growth** in mobile penetration, the **fixed-line telephone penetration**

rate has **declined by 3%**, indicating the continued decline of this **traditional service [46]**.

The **mobile broadband penetration rate**, which stood at **132%** during the same period last year, has reached **140%** this spring [46]. In contrast, **fixed broadband internet** has experienced only a **very modest growth of 0.77%**, reaching **13%**, revealing a **deep gap between the development of mobile and fixed internet services**.

3.2.1.2 Operators' Market Share: Close Competition

The statistics in the report show that **Iran's mobile market** remains dominated by the two main operators. **Hamrah Aval (MCI)**, holding **54%** of the market share of active mobile subscribers, continues to be the **largest operator** in the country. **Irancell**, with a **42%** share, is the **main competitor**, closely following behind [46].

When analyzed by **technology**, the **4G network** overwhelmingly dominates with a **94% share** of all mobile internet connections. The **3G network** accounts for **4%**, and the most advanced **5G technology** currently represents only **2%** of users [46].

Together, these two operators control **over 96%** of the total market. Meanwhile, **Rightel**, with a **4%** share, ranks **third** and maintains only a small portion of the market compared to the two dominant players.

3.2.1.3 Fiber-Optic Situation

One of the most important pieces of data in the report is the **status of the fiber-optic (FTTx) project**, for which new statistics have been released after a long time. While all the quarterly CRA reports in **2024** had recorded the number of **households and businesses using this technology** at **8,069,000**, by **spring 2025 [47]**, the number of subscribers covered by FTTx had increased only slightly to **8,227,000 [47]** across the country. This modest growth highlights that, the **adoption rate of fiber-optic services** remains relatively low.

Although Iran's Ministry of ICT and several private operators have announced wide national coverage plans, multiple Iranian sources point out that **the challenge lies in converting passive coverage into active subscriptions**. In many regions, the physical infrastructure has been laid but remains underutilize "the infrastructure exists, but the will does not," as **SSN News** report describes

it [54]. Analysts in **KhabarOnline [55]** News also note that **a lack of strategic governance and coordination** between ministries, municipalities, and telecom companies has slowed implementation.

Another major obstacle is **economic and structural**: building fiber to the home (FTTH) networks requires large upfront investment, while Iran's existing copper-based DSL infrastructure still dominates. Consequently, operators often prioritize mobile broadband, which offers quicker returns and lower installation costs. As ***KhabarOnline*** (2024) observed, the country "started early in fiber development but failed to keep pace with regional peers" [55].

Overall, the **spring 2025 report [46]** confirms that the **future of communications in Iran** is strongly **tied to mobile networks**, while the **fixed-line sector** still has a long way to go to become competitive and gain users' trust.

3.2.1.4 5G Services

On **July 21, 2020 (1 Mordad 1399)**, the **Research Center of Communications and Information Technology** hosted **Iran's first 5G site**, which was inaugurated via **video conference** by the then President.

Irancell, in cooperation with the **Ministry of Communications and Information Technology (MICT)**, launched **Iran's first 5G site** at the **Research Center of Communications and Information Technology** in Tehran [48]. Following this, Irancell set up additional sites in **Tehran, Shiraz, Kish, and Mashhad**, and in **2021 (1400)**, recorded a **speed of 3.9 Gbps**. **Hamrah Aval (MCI)** also entered the 5G field from **March 2021 (Esfand 1399)**, launching sites in **Mashhad** and **Tehran**, achieving speeds of **3.66 Gbps**. Meanwhile, **Mobinnet** has been providing **5G FWA (Fixed Wireless Access) services** to **home and business users** since **2020 (1399) [48]**.

Yet, **5G mobile services in Iran have not fully launched for public use**. Although **many sites have been installed**, the **allocated frequency remains experimental**, and **operators have invested several thousand billion rials** in this sector [49].

3.2.1.4.1 Obstacle for 5G

Despite the progress made, **users still do not feel the presence of 5G in the country**. This issue is largely due to **problems with mobile phones**.

A research report by **Counterpoint [49]**, indicated that the share of **5G-capable smartphones** in the Iranian market in **2023** ranged between **20% and 50%** of all phones. However, even if these figures are accurate, a **larger problem remains**.

A significant portion of Iran's mobile market is dominated by **Samsung phones**, yet the company has **not enabled 5G services for Iranian users**. In other words, **5G is locked on most Samsung phones available in Iran**, and only **Xiaomi phones** can currently access the service.

Moreover, some **iPhone models** also support 5G, but since versions **later than iPhone 13** are **not registered (**government-mandated system requiring all mobile phones and SIM cards to be officially registered to prevent smuggling and ensure network access**) in Iran**, the **5G penetration among iPhones** remains limited as well. Mobile operators have repeatedly stated that they have conducted **correspondence with phone manufacturers** and even the **International Telecommunication Union (ITU)** regarding this issue.

3.2.1.4.2 Challenges and Prospects

The **Ministry of Communications** and the **Iranian Regulatory Authority** have undertaken multiple initiatives to develop **5G technology**. At the outset, a research project titled **"Guiding the Transition of the National Communication Network toward Fifth-Generation Mobile Communication Technologies"** was launched [53]. Based on its results provided by ***ITAnalyze*** [56], in the **Communications Regulatory Commission** approved the **"Conditions and Terms for Allocating the 3600–3800 MHz Frequency Band for Nationwide Mobile Communications"** in **August 2023**. After revisions in **February 2025 (Bahman 1403)**, this decision was implemented through a **public auction among operators** to enhance internet quality and expand 5G services.

Additionally, issues regarding the **activation of 5G licenses on imported phones** were resolved through cooperation between **mobile brands** [53] and the **14th government**, so that now most 5G-compatible phones can access the network.

However, the development of 5G in Iran faces additional challenges. One of the most significant technical challenges in developing fifth-generation mobile networks (5G) in Iran is the failure to release the 700 and 800 MHz frequency bands [**57**] by the Islamic Republic of Iran Broadcasting (IRIB).

These frequency bands were previously used for analog television broadcasting, but according to the international GE06 agreement and with the transition to digital television, they were supposed to be freed up for telecommunications services and the expansion of mobile broadband networks. However, IRIB still retains control of these bands and has refused to release them.

Sanctions have also restricted the supply of advanced radio equipment, increasing network deployment costs. Furthermore, **high CAPEX and OPEX**, challenges in **integration with existing networks**, and **frequency allocation limitations for some operators** have slowed development. For example, **Irancell Operator** cannot access the 3600–3800 MHz bands due to submitting a lower bid in the auction and must make **network modifications** to provide 5G services [56].

3.2.2 Major ISPs and Mobile operators

3.2.2.1 Top Internet Service Providers in Iran

The best internet service providers in Iran include **Shatel**, **Asiatech**, **HiWEB**, **Sabanet**, **Pars Online**, **Telecommunications Company of Iran (Mokhaberat)**, and **Pishgaman**. Each offers unique advantages in terms of quality, speed, coverage, and variety of plans [50]:

- **Shatel** *(Private)* – Known for strong customer support and high service quality; consistently ranks high in surveys.
- **Asiatech** *(Private)* – Offers diverse and competitive plans, especially suitable for high data usage.
- **HiWEB** *(Private)* – Leading in providing services in both urban and rural areas, and an official partner for Iran's national broadband projects.
- **Sabanet** *(Private)* – Considered an economical option, particularly for home users.
- **Pars Online** *(Private, now part of HiWEB Group)* – One of the oldest providers
- **Telecommunications Company of Iran (TCI / Mokhaberat)** *(State-owned)* – Has the widest coverage due to ownership of national telecom infrastructure, though service quality may vary by region.
- **Pishgaman** *(Private Cooperative)* – A major fiber-optic internet provider, delivering higher and more stable speeds.

3.2.2.2 Mobile Network Operators in Iran

The first phase of Iran's mobile communication network was launched in **August 1994 (Mordad 1373)** in **Tehran**, marking the beginning of the country's cellular era. Operated by the **Mobile Communications Company of Iran (MCI)** under the **Telecommunications Company of Iran (TCI)**, the system began with **176 transmitters and receivers** across **24 radio stations** and an initial capacity of **9,200 phone numbers [58]**.

3.2.2.2.1 Network-Based Operators (MNOs)

A **Mobile Network Operator (MNO)** is a company that **owns the physical infrastructure of a mobile network** and, using its **independent telecommunications equipment**, provides **voice calls, SMS, and mobile internet services** directly to subscribers [51].

These operators receive **dedicated frequency spectrum licenses** and, by investing in **radio network development**, **base transceiver stations (BTS)**, and the **core network**, have **full control over their service delivery**.

To operate as an **MNO in Iran**, obtaining a **license from the Communications Regulatory Authority (CRA)** is mandatory. This license covers:

- Utilization of **radio spectrum**,
- Provision of **nationwide services**,
- Compliance with **quality of service (QoS) requirements**
- **Interconnection** with national and international communication networks.

Additionally, MNOs must adhere to the **technical and security standards** defined by the **Ministry of Information and Communications Technology (MICT)**.

3.2.2.2.2 Mobile Virtual Network Operators (MVNOs)

A **Mobile Virtual Network Operator (MVNO)** is a company that provides **mobile communication services** to subscribers **without owning independent physical infrastructure**. These operators **lease capacity** from **network-based operators (MNOs) [51]** and offer **SIM cards under their own brand**.

MVNOs typically focus on:

1. **Enhancing user experience**
2. **Offering competitive pricing**
3. **Providing specialized or value-added services**

- Hamrah-e Aval (MCI) - The First Official Mobile Operator

The **Mobile Communications Company of Iran (MCI)** began its first phase of operations in **August 1994 (Mordad 1373)** in **Tehran**, deploying **176 transmitters and receivers** across **24 radio stations** and providing an initial capacity for **9,200 mobile lines [52]**.

Following the **unexpectedly high public demand**, the **Telecommunications Company of Iran** decided to **expand the network** beyond Tehran to cover the entire country. By **1995 (1374)**, the number of active mobile lines had increased to **15,907**. In **1996 (1375) [51]**, an additional **28 cities** were added to the network, bringing the total number of active lines that year to **59,967 [51]**. By the end of **2003 (1382)**, the number had grown dramatically to **3,449,878** [51] active lines.

In line with the government's policy of providing communication services to both large and small cities, the number of cities covered by the mobile network reached **667** by the end of **2003 (1382)** and **1,167** by **mid-2012 (1391) [52]**.

Hamrah Aval, officially known as the **Mobile Communication Company of Iran (MCI)**, is the **first and largest mobile network operator (MNO)** in the country. Currently, It has sold approximately **57 million SIM cards**, of which **52 million are active [51]**, covering **67,000 kilometers of roads** across the country.

Hamrah Aval also offers **international roaming services** with **269 operators in 111 countries [52]** worldwide. It provides **nationwide coverage** across all provinces and cities and operates using:

- 2G (GSM)
- 3G (UMTS)
- 4G / LTE

and in some areas, **5G networks.**

According to reports from the **Communications Regulatory Authority (CRA) [46]**, Hamrah Aval ranks **first in radio network development** and holds a **significant share of Iran's mobile internet subscribers**.

- Irancell – Second operator

The **second mobile network operator in Iran** entered the country's telecommunications market in **2006 (1385)**. **Irancell** was established through a partnership between the **Iranian Communication Services Company (Irancell)** and its foreign partner, **MTN Group** from **South Africa [51]**.
It officially began operations on **Saturday, October 21, 2006 (29 Mehr 1385)**, by distributing **350,000 SIM cards**, each priced at **1,500,000 Rls**, in the cities of **Tehran, Tabriz, and Mashhad [52]**.

Today, this operator is **best known for its prepaid SIM cards**, which make up about **90% of its active lines**. The network currently covers **1,874 cities**, **22,000 villages**, and **20,000 kilometers of main and secondary roads** across Iran [52].

It also offers **international roaming services [52]**, including:

- **Voice roaming** with **287 operators**
- **Prepaid roaming** with **86 operators**
- **Data roaming** with **139 operators**

In addition to **network expansion and quality improvement**, the operator continues to focus on offering **value-added services (VAS)** and **customer-oriented plans**. By focusing on **high-speed mobile internet** and **digital services**, Irancell has captured a **significant share of Iran's telecom market**. It was the **first operator in Iran to launch 4G (LTE) services**, and is also considered one of the **pioneers in testing and deploying 5G networks** in the country [51].

With around **21 million active subscribers**, the company claims to hold approximately **45% of Iran's mobile market share**.

- Rightel – Third Operator

Rightel, owned by the **Social Security Investment Company (Shasta)**, officially entered Iran's mobile market in **2012 (1391)**. It began its operations

by focusing on **third-generation (3G)** services and was, for a time, the **only operator licensed to offer 3G** in the country [51].

By providing **affordable call and data packages**, Rightel managed to attract specific user segments. However, compared to **Hamrah Aval (MCI)** and **Irancell**, it has faced challenges in **network coverage** and **investment in newer generations of mobile technology**. In recent years, the company has made efforts to **upgrade its network** and **participate in 4G and 5G projects**.

In the **enterprise services [52] sector**, Rightel offers a range of business solutions, including:

- **Dedicated corporate lines**
- **High-speed internet services**
- **Corporate communication platforms**
- **Mobile Device Management (MDM) systems**

These services make Rightel a **specialized provider for organizational and enterprise connectivity solutions** in Iran.

3.2.2.2.3 Active Mobile Virtual Network Operators (MVNOs) in Iran

The **licensing of Mobile Virtual Network Operators (MVNOs)** in Iran began in **2016 (1395)** under the supervision of the **Communications Regulatory Authority (CRA)**, with the goal of enhancing competition, diversifying services, and expanding consumer choice in the mobile communications sector [52].

MVNOs lease network capacity from existing operators such as **Hamrah Aval (MCI)**, **Irancell**, or **Rightel**, and operate under their own brand names. This regulatory move opened the market to new players who could offer innovative services without building their own network infrastructure, thereby fostering greater flexibility and service variety for consumers.

Among the prominent MVNOs [52], **Shatel Mobile**, **ApTel**, and **SamanTel** stand out as leading examples of this new wave of service providers. **Shatel Mobile**, a subsidiary of the Shatel Group, was the first active MVNO in Iran and remains the only **Full MVNO** with its own independent core network, offering smart SIM cards, customizable plans, and advanced data management tools.

ApTel [52], formed through a partnership between **Asan Pardakht (AP)** and **TCI**, focuses on integrating mobile connectivity with **fintech services**, enabling fast and secure financial transactions. Similarly, **SamanTel [52]**, affiliated with **Saman Bank**, operates as a **Light MVNO** and provides mobile, internet, and financial services in a unified platform. Together, these operators represent Iran's efforts to merge telecommunications and digital finance, enhancing both innovation and customer experience in the mobile sector.

3.2.3 Iranian's Internet usage & Digital trends

As of early 2025, Iran's digital ecosystem demonstrates extensive connectivity and a maturing online population. With high rates of mobile subscriptions, expanding internet access, and significant social media engagement, the country continues to experience gradual yet steady digital integration across economic and social dimensions.

According to **DATAREPORTAL 2025** Report [59], Iran's population in January 2025 was **92.0 million**, marking a **1.0 percent** annual increase from 2024. Urbanization remains high, with **77.9 percent** of residents living in cities and **22.1 percent** in rural areas. The population is relatively balanced in terms of gender distribution (49.2% female; 50.8% male), and the **median age of 34 years** reflects a young, digitally active demographic.

Age segmentation shows that a considerable share of the population (approximately 24% aged 18–34) falls within the key digital adoption group, supporting the expansion of online services, social media use, and mobile-based commerce.

3.2.3.1 Connectivity

According to **GSMA Intelligence [59]**, Iran recorded **152 million active mobile connections** in early 2025, equivalent to **166 percent** of the total population. This high ratio indicates widespread multi-device usage and the prevalence of multiple SIM ownership, often for personal, business, or data-specific purposes.

Between 2024 and 2025, mobile connections grew by **4.2 percent**, adding over **6.1 million new lines**. Additionally, **93.1 percent** of these connections qualify as broadband (3G, 4G, or 5G) [59]. By January 2025, Iran had **73.2 million internet users**, representing **79.6 percent** of the total population. Internet

adoption increased modestly by **1.0 percent** year-on-year, adding around **721,000 new users [59]**.

Despite this growth, roughly **18.8 million Iranians (20.4%)** remained offline, illustrating ongoing digital divides, particularly in rural and lower-income segments [59]. It is also worth noting that data collection delays may lead to a slight underestimation of current internet penetration rates, meaning actual figures could be higher.

According to **Ookla data [59]**, Iran's mobile internet download speed increased by **7.06 Mbps (22.2%)** over the 12 months leading up to January 2025. During the same period, fixed internet speed grew by **3.27 Mbps (25.6%)**. Although these improvements may seem significant at first glance, Iran's lag in internet performance becomes evident when compared to global figures. In **DataReportal's** report for India, for instance, the country's mobile internet speed reached **100.78 Mbps** — a difference of more than **60 Mbps**.

Iran recorded **48.0 million active social media user identities** in January 2025 — about **52.2 percent** of the total population. This figure has remained stable year-over-year. While ***DataReportal*** [59] cautions that these numbers may not represent unique individuals (due to account duplication or data corrections), the results still indicate strong engagement levels among connected users. In particular **65.5 percent of internet users** accessed at least one social media platform, showing that social networks remain a central aspect of Iran's online behavior and communication.

3.2.3.2 Social Media

The latest report from the **Iranian Students Polling Agency (ISPA)** once again highlights the **failure of the government's filtering policies**, as Iranian users continue to **prefer blocked foreign platforms** over domestic alternatives.

According to **ISPA's** most recent survey [60], conducted between **September 10 and 14, 2024 (20–24 Shahrivar 1403)** through **in-person interviews with 3,990 respondents**, **82.2% of Iranians** use at least one **social media or messaging platform**. Among these, **Instagram** remains the most widely used platform in the country.

The **ISPA** chart [60] shows that in **June 2022 (Khordad 1401)**—before Instagram was blocked—**71%** of respondents used the platform. By **January 2024 (Dey 1402)**, usage had dropped to **46.5%**, but by **September 2024**

(Shahrivar 1403), it had risen again to **50.6%**, indicating a steady recovery despite restrictions.

The survey [60] also compared the popularity of various domestic and foreign platforms. After Instagram, **Telegram** ranked second with **39.3%** of users, followed by **WhatsApp** in third place with **33.3%**. These results show that, despite years of filtering and state promotion of local apps, **foreign platforms continue to dominate Iran's digital landscape**.

3.2.3.2.1 Growth of Iranian Platforms After Filtering

Among domestic platforms, **Eitaa** has a usage rate of **28.9%**, followed closely by **Rubika** at **28.5%**, and **Bale** at **9.7% [60]**. According to **ISPA's** report [60], the trend chart of domestic platform usage shows that before the filtering of foreign platforms in **June 2022 (Khordad 1401)**, usage of **Eitaa, Rubika, and Bale** was **below 10%**. However, since **March 2023 (Esfand 1401)**, there has been a noticeable **increase in their user base**.

At present, these three platforms have reached their **highest levels of usage since their launch**, largely driven by restrictions on access to international platforms and the promotion of domestic alternatives.

3.2.3.2.2 Top Domestic Messaging Apps

- **Rubika** –In terms of structure, **Rubika [62]** has a **messaging-style interface** (chat, groups, channels), but it is largely viewed as an **all-in-one platform**, where users can not only communicate but also **enjoy entertainment, shopping, and payment services**. However, one of the **main criticisms** directed at Rubika concerns **public doubts about privacy protection** and **potential access by government authorities** to user data. Some users claim that because the app operates with **official support from telecom operators and the Ministry of ICT**, they do **not fully trust it**.

- **Eitaa** [63] – A cloud-based messaging app similar in design to Telegram, widely used among students, government agencies, and religious organizations Eitaa is known as one of the **government-endorsed Iranian messengers** and is **frequently used by official, academic, and religious institutions** in Iran.

- **Bale** [64] – Is one of Iran's **domestic messaging apps**, designed with a **special focus on integrating messaging and financial/banking services**. The app's financial infrastructure is supported by **Bank Melli Iran**. Features include: text, voice, and video chat; money transfers between users, card-to-card transactions, bill payments, mobile top-ups, group and channel creation, and enterprise services for businesses. The platform's main goal is to let users communicate and manage their finances simultaneously.

3.2.3.2.3 Social Media Usage by Age, Education, and Location in Iran

The **ISPA** report **[61]** also highlights clear **differences in social media usage across age groups**. Iranians aged **18 to 29** use foreign messaging apps and social networks **more frequently** than those aged **30–49** or **over 50**. In the **18–29 age group**, **71.7%** use **Instagram**, **57%** use **Telegram**, and just over **39%** use **WhatsApp**.

Education level also plays an important role. **University-educated individuals** use foreign platforms **more often** than those with a high school diploma or lower education. Among university graduates, **57%** use **Telegram**, **44%** use **WhatsApp**, and **63.6%** use **Instagram**, which remains the most popular platform in this group.

Geographic location further influences access and usage. **Residents of provincial capitals** are more likely to use foreign platforms than those in **smaller cities or rural areas**. Instagram leads across all regions, with **55.7% usage in provincial capitals**, **50% in non-capital cities**, and about **44% among rural residents**. These findings suggest that **younger, urban, and more educated Iranians** remain the **primary users of international social media platforms**, despite ongoing filtering and restrictions.

3.2.3.3 E-Commerce in Iran

A recent report by the **E-Commerce Development Center of Iran (TETA) [65]** reveals a **quiet but powerful transformation** underway in the country's digital economy — one that is steadily reshaping **Iranian lifestyles, consumption patterns, and business structures**.

According to the report [66], the **total value of e-commerce transactions in Iran** reached **55,000 trillion IRR** in **2024 (1403)** — the **highest figure in Iran's history**. This represents a **73% growth** compared to the previous year, achieved despite an **annual inflation rate of 32.5%**. The significant gap between these two rates points to a **structural shift** and a **permanent change in the economic behavior** of millions of Iranians.

However, the report also notes that **e-commerce still accounts for only about 7% of Iran's total economy [65]**, a figure that remains **considerably lower than in many neighboring countries**. This suggests that while the momentum for digital trade is strong, **Iran's e-commerce sector still has vast untapped potential** for expansion and modernization.

3.2.3.3.1 Public Key Infrastructure

One of the most interesting findings in the **report** [66] concerns the use of **electronic signature certificates**. Since the launch of Iran's **Public Key Infrastructure (PKI)** system, more than **1.94 million digital signature certificates** have been issued. The share for **2024 (1403)** shows a remarkable **59% growth compared to the previous year**.

This sharp increase reflects the **growing acceptance of digital authentication and trust tools** in Iran's **official, administrative, and commercial processes**. It marks an important step toward **modernizing digital governance and enabling secure electronic transactions**, signaling a broader cultural and institutional shift toward **digital trust and identity verification** in the country's economy.

3.2.3.3.2 Social Commerce Trends

It is worth noting that **social media penetration in Iran** is estimated at **around 56.7% [61]**, with approximately **48 million active users**. This vast online community represents not only a **large consumer market** but also a **powerful platform for marketing, branding, and direct sales**. The growing influence of social networks in shaping purchasing behavior highlights the **emerging power of social commerce** in Iran — a trend expected to play a **major role in the country's digital economy** in the coming years.

The **55,000 trillion IRR** transaction value and **73% annual growth [65]** only tell part of the story. To better understand the scale, it's enough to note that **e-commerce now accounts for 32% of all transactions processed through**

Iran's Shaparak payment network system [66]. In other words, **one out of every** thirty **Rials** spent via this national system is now related to **online purchases**.

One of the most revealing insights from the report [65] comes from the **average value of each e-commerce transaction**, which reached **11.66 million IRR** in **2024 (1403)** — a **43% increase** compared to the previous year. This growth, which **far exceeds the inflation rate**, carries two important messages:

Increased consumer trust — Iranians are now comfortable making **higher-value purchases online**, indicating stronger confidence in digital payment systems and e-commerce platforms.

A more diverse and substantial shopping basket — the **range and value of online purchases** have expanded significantly, reflecting a shift from buying small items to **larger, more varied consumer goods**. Of course, part of this increase can still be attributed to **inflation**, but overall, the trend signals a **maturing and more confident online marketplace** in Iran.

3.2.3.3.3 Foreign Social Networks Dominate Online Commerce in Iran

Another key finding from the 2024 **TETA** [66] report reveals the **overwhelming dominance of foreign social media platforms** in Iran's e-commerce landscape. According to the data, **54.1% of businesses** use **foreign messaging and social media platforms** for sales and marketing, compared to only **21.2%** that rely on **domestic alternatives**. This highlights a **deep gap in user engagement and business adoption** between global and local platforms.

The main reason behind this imbalance is the **wider reach and massive user base** of platforms like **Instagram** and **WhatsApp**, which offer merchants access to **larger and more diverse audiences**. For Iranian sellers, these global apps remain **essential tools for visibility and customer interaction**.

However, this trend also serves as a **serious warning for domestic platforms**. Merely existing or offering similar features is **not enough to compete**. To gain traction, Iranian platforms must create **distinct and tangible value**, such as better user experience, business tools, or integration features that can **genuinely attract both users and merchants**.

3.2.3.3.4 Blurring the Line Between Physical and Online Retail

Data from the 2024 **TETA [66]** report reveals an interesting trend in the **evolution of business models within Iran's e-commerce sector**.

About **35.4% of online businesses** had already established a **strong physical presence** before entering the digital space. This indicates that for many Iranian companies, **e-commerce is not seen as a replacement** for traditional retail but rather as a **complementary channel** to **expand reach, enhance visibility, and boost overall sales**.

This integration of online and offline operations shows how the **boundaries between physical and digital commerce are increasingly fading**, giving rise to a **hybrid retail model** that combines the trust of in-person shopping with the convenience and scalability of online platforms.

Interestingly, **27% of businesses [66]** in Iran have gone in the **opposite direction**—they first **established a strong online presence** and then opened **physical stores** after gaining brand recognition and customer trust in the digital space. This shows that **successful e-commerce ventures can strengthen, or even revive, traditional retail models**. These businesses use their physical locations to **enhance credibility**, provide a **more complete customer experience**, and **finalize sales** through in-person interaction.

At the same time, the **significant share of fully online businesses**—whether home-based or office-based—demonstrates that Iran's **digital economy is maturing rapidly**. New, **flexible, and agile business models** are emerging alongside hybrid ones, signaling a **vibrant ecosystem where online and offline commerce increasingly complement each other**.

3.2.3.3.5 Financing Bottlenecks in Iran's E-Commerce Sector

Despite notable achievements, the **TETA report [66]** also identifies several **key challenges** that continue to hinder the growth of Iran's e-commerce ecosystem. Data presented in the section titled *"Main Challenges of Online Businesses"* paints a clear picture of the **structural and financial bottlenecks** limiting further development.

Among these, **access to financing** stands out as one of the **most critical obstacles**. Many online businesses—particularly startups and small enterprises—struggle to **secure investment or credit facilities**, which restricts their ability to **scale operations, innovate, and compete** effectively. The report

suggests that without addressing this **financial gap**, Iran's digital commerce sector will face difficulties sustaining its current growth momentum.

According to the **TETA** report [66], **financing remains the top challenge** for online businesses in Iran, accounting for **28.4%** of all reported obstacles. This figure reflects the **weak investment structure** in the digital economy, **limited access to banking resources**, a **shortage of venture capital investors**, and **complex loan procedures**. As a result, many startups and growing e-commerce firms face **liquidity shortages during scaling stages**, slowing down the **cycle of innovation and expansion**.

The **second major challenge** is **market and sales issues**, with a share of **25.3%**. These stem from **market instability**, **unfair competition**, **restrictive advertising policies**, and **unequal access to digital marketing platforms**.

In **third place** comes **low-quality technical and internet infrastructure** (18.1%), which directly affects **productivity** and the ability to **deliver stable, high-quality services**.

Additional concerns include a **shortage of skilled professionals** (12.5%) and **cultural and social barriers** (8.3%) such as **low trust in online transactions** and **reluctance to adopt innovation**.

Finally, **governance and policy-related issues** represent **7.5%** of total challenges—highlighting how **regulatory ambiguity** and the **overlap of decision-making authorities** continue to hinder the healthy growth of Iran's digital ecosystem.

The statistical distribution sends a powerful message: Iranian online businesses are not struggling due to poor management or lack of demand, but rather because of the absence of stable financial and policy infrastructure. Without a coherent financing system for innovation, streamlined regulatory frameworks, and fair access to digital markets, the share of e-commerce in Iran's economy will remain limited.

The heavy weight of financial and infrastructural challenges also highlights a crucial insight—if reforms in these two areas are implemented, the path toward digital economic acceleration will become smoother than ever.

The **2024 Iranian E-Commerce Report** [66] portrays an ecosystem that is vibrant, evolving, yet constrained. Despite remarkable growth, major players continue to face systemic obstacles, including the fragmentation of regulatory authorities, shortage of private investors, weak internet and logistics infrastructure, and restrictions on IPO opportunities for tech companies. E-

commerce in Iran has evolved from a fragile phenomenon into a central force in the national economy, but its future success depends on overcoming critical bottlenecks.

3.2.3.3.6 Online services in Iran

In the past decade, Iran has witnessed rapid growth in online services and the emergence of companies that, despite international restrictions, limited foreign investment, and infrastructural challenges, have managed to build a dynamic local digital ecosystem.

From online shopping to urban transportation, and from e-learning to video streaming, digital businesses have become an essential part of everyday life for millions of Iranians.

In the following, we examine the most prominent online platforms operating in Iran — the key players that dominate their respective markets and effectively serve as the pillars of the country's digital economy.

- #### Snapp Group — Iran's Largest Digital Ecosystem

Snapp Group [67] is widely regarded as **the largest digital ecosystem in Iran**, offering a comprehensive suite of online services that cover nearly every aspect of daily life. The group currently operates a diverse range of platforms, including:

- **Snapp Taxi** (urban ride-hailing)
- **Snapp Food** (online food delivery)
- **Snapp Market** and **Snapp Express** (online grocery and delivery services)
- **Snapp Trip** (hotel and flight booking)
- **Snapp Doctor** (telemedicine and health consultations)
- **Snapp Pay** (digital payments and credit services)
- **Snapp Box** (motorbike courier delivery)

Today, Snapp boasts **over 40 million registered users**, with **millions of daily transactions** across its ecosystem. Its key innovation lies in the creation of a **"super app"** — a single application through which users can book rides, order meals, shop online, pay bills, and even consult with doctors using the same account.

- ## Digikala — The Symbol of E-Commerce in Iran

Digikala [67] is widely recognized as **the flagship of Iran's e-commerce industry**. With **over 40 million monthly visitors**, it holds a **dominant share** of the country's online retail market and has effectively become the **main reference point for product prices, reviews, and purchases**.

The company operates on a marketplace business model, meaning that **thousands of independent sellers** list their products on Digikala's platform, while the company provides **payment processing, warehousing, logistics, and customer support**.

Over the years, Digikala has expanded its ecosystem through a range of specialized services:

- **Digistyle** – fashion and apparel
- **Digipay** – digital payments and financial services
- **Digikala Jet** – instant delivery of fast-moving consumer goods
- **Digikala Business** – B2B and corporate sales

Thanks to its **dedicated logistics network**, Digikala has achieved 24-hour delivery within cities and under-72-hour delivery nationwide — a major milestone in Iran's online retail infrastructure. Today, **Digikala** stands as **the backbone of Iran's digital commerce**, playing a pivotal role in shaping consumer habits and setting operational standards for the entire e-commerce ecosystem.

- ## TAPSI — Iran's Second-Largest Ride-Hailing Platform

TAPSI [67] is the **second-largest ride-hailing platform in Iran**, competing closely with Snapp by focusing on **service quality**, **driver transparency**, and **customer trust**.

Currently operating in **over 50 cities nationwide**, TAPSI made history in **2022 (1401)** by becoming **the first Iranian startup to be publicly listed on the Tehran Stock Exchange** — a major milestone for the country's startup ecosystem.

In addition to its **classic ride-hailing service**, TAPSI offers several innovative features, including:

- **TAPSI Phone** – for users without smartphones, enabling rides via a call center,
- **TAPSI Motor** – a motorbike delivery and transport option,
- **TAPSI Ham-Safar (Carpool)** – a carpooling service to reduce costs and traffic.

- Divar — Iran's Leading Online Classifieds Platform

Divar [67] is one of the most influential online platforms in Iran, often compared to Craigslist or Facebook Marketplace for its role in connecting millions of users to buy, sell, or advertise goods and services. Through Divar, users can post listings for virtually anything — from cars and real estate to home appliances, job offers, and local services.

Today, Divar ranks among **Iran's most widely used apps**, with **24.4 million installations**. In recent years, the platform has introduced several key features, such as **verified user identity**, **in-app chat**, and **premium business tools** for professional sellers.

Beyond second-hand trading, **Divar** has evolved into a **vital digital marketplace for small businesses and local services**, playing a central role in Iran's **peer-to-peer and community-based economy**.

- Cafe Bazaar— Iran's Largest Android App Marketplace

Cafe Bazaar [67] serves as **Iran's equivalent of Google Play**, standing as the **largest Android app marketplace** in the country. With **over 40 million active users**, it functions not only as a platform for **downloading and updating apps**, but also as a **vital hub for Iranian developers** to distribute their applications and generate revenue.

In recent years, Cafe Bazaar has focused on **enhancing app security**, **user data analytics**, and **targeted in-app advertising**, helping developers reach their audiences more effectively. The platform has also expanded into new areas such as **entertainment and gaming** through its services **"Bazaar Video"** and **"Game Plus"**. In the absence of Google's official services, Cafe Bazaar has become **one of the core pillars of Iran's Android ecosystem**.

- ## Aparat — Iran's Leading Video-Sharing Platform

Aparat [67] is the **largest video-sharing platform in Iran** and, in the absence of YouTube, effectively serves as the **country's primary hub for online video content**. In recent years, Aparat has expanded its ecosystem with new services like **Aparat Kids**, a child-friendly version of the platform, and **live streaming**, offering broader functionality for both users and creators.

Despite occasional **content restrictions** and **regulatory challenges**, Aparat remains the **backbone of Persian-language online video**, providing a space for creativity, learning, and digital expression in Iran's internet landscape.

- ## Filimo — Iran's Premier Streaming Platform

Filimo [67] is Iran's leading video-on-demand (VOD) and streaming service, which has experienced remarkable growth in recent years and now attracts millions of active users. With exclusive original productions, has effectively filled the gap left by Netflix in the Iranian market.

In addition to its extensive library of Iranian and international films and series, **Filimo** offers features like HD quality streaming, offline viewing, and smart TV compatibility, providing users with a high-quality and seamless entertainment experience.

Beyond entertainment, the platform has also expanded into educational and cultural content, solidifying its role as a major player in Iran's digital media ecosystem and a symbol of the country's growing creative industry online.

- ## Torob — Iran's Leading Price Comparison Platform

Torob [67] is a **shopping search engine** that aggregates **millions of products** from **thousands of Iranian online stores**, allowing users to **compare prices** and find the best deals across the web. With its **simple interface** and **automated price updates**, Torob has significantly contributed to **greater transparency in Iran's online marketplace**.

Today, it is one of the **most trusted tools for online shoppers** — many Iranians check prices on Torob **before making a purchase**, making it a **key influencer of consumer behavior** and a **critical player in shaping the dynamics of Iran's e-commerce market**.

- ## Alibaba.ir — Iran's Largest Online Travel Platform

Alibaba.ir [67] is the **leading online travel platform in Iran**, offering a full range of booking services for **flights, trains, buses, and hotels**.

The company has earned **widespread user trust** through its **user-friendly interface**, and **flexible refund policies**, setting a new standard for convenience and reliability in Iran's travel industry. Today, Alibaba.ir stands as **one of the few brands that successfully popularized online travel booking** among Iranian consumers, making digital trip planning and ticket purchasing a **mainstream habit** across the country.

- ## IranServer — A Pillar of Iran's Internet Infrastructure

IranServer [67] is one of the **most reputable web hosting and server providers** in Iran, offering services such as **VPS (Virtual Private Servers)**, **cloud hosting**, **domain registration**, and **cybersecurity solutions**.

In an environment constrained by **international sanctions** and **limited access to global server networks**, IranServer plays a **crucial role in maintaining and expanding the country's internet infrastructure**.

In recent years, the company has invested heavily in **new data centers** and **cloud technologies**, making it the **top choice for startups and online businesses** seeking reliable, secure, and scalable hosting within Iran's borders.

- ## ArvanCloud — Iran's Leading Cloud Infrastructure Provider

ArvanCloud [67] is a high-tech Iranian company specializing in cloud infrastructure, CDN (Content Delivery Network), web security, and video streaming services.

Operating under the slogan "The Integrated Iranian Cloud," ArvanCloud aims to deliver modern, scalable cloud solutions without relying on foreign infrastructure. Today, the company manages dozens of data exchange points across Iran and several other countries, providing services to major public and private sector clients. ArvanCloud stands as a symbol of Iran's technological capability in the field of cloud computing and internet infrastructure.

3.3 Internet Current Condition (Quality)

According to ***Zoomit*** report [68], the latest "**Internet Quality Report of Iran**," released by the **Internet and Infrastructure Commission of the Tehran E-Commerce Association**, has once again sounded the alarm for policymakers.

In this latest report—just like the previous editions—the **Internet Quality Index** was compiled using **data from multiple credible internatonal sources**, and the **average performance of Iran** across these datasets was used to determine its final ranking.

Specifically:

- The **latency index** (representing connection delay and parts of overall instability) was derived from **Google CRUX** data.
- The **restriction index** was measured using the **OONI** (Open Observatory of Network Interference) database, which tracks censorship and access limits.
- The **speed index** was calculated based on data from **Cloudflare Radar**.

Iran ranks **97th out of 100 countries** in overall internet quality — a stark indicator of its digital challenges. The user experience, as summarized in the report, can be captured in **three words**:

- **"Slow"** (ranked 84th),
- **"Unstable"** (ranked 92nd), and
- **"Restricted"** (ranked 99th).

This combination underscores the **critical state of Iran's connectivity**, where persistent technical weaknesses, policy restrictions, and limited infrastructure continue to undermine access and performance across the country.

Structural disruptions **—** including **BGP** outages**, advanced DPI (Deep Packet Inspection), and UDP blocking — have made Iran's internet increasingly unstable.** The report [68] suggests that **filtering has evolved beyond content-level control to a structural and behavioral stage**, where even **core internet protocols such as TLS and SSH** are being disrupted.

During the period of **Israel's attack**, connectivity issues persisted **before, during, and after** the conflict, indicating deliberate or sustained throttling measures. Moreover, **the adoption rates of HTTP/3 and IPv6 have not**

recovered to their previous levels, signaling long-term degradation in the country's network modernization and resilience.

According to the report [68], **Iran has the most restricted internet in the world after China**.
Widespread filtering — spanning **social networks, news outlets, and even educational websites** — has forced **84% of users to rely on VPNs and circumvention tools** to access blocked content. Even **excluding the period of Israel's attack on Iran**, which had further intensified disruptions, the report shows that **overall internet conditions have remained largely unchanged** compared to the **fourth edition**.

This **data-driven and scientific approach** has drawn **criticism from the Ministry of Communications**, which labeled the report as having "technical flaws." However, the **E-commerce Association**—which produced the study—has **defended the accuracy and credibility of its data sources**. The report also examines **six-month trends**, noting a **rise in the use of Starlink connections** and **persistent disruptions affecting newer internet protocols such as HTTP/3.**

3.3.1 Censorship

Filtering — originally imposed under the pretext of national security — has, according to the association's report, now become a major security threat itself. The report [68] emphasizes that the widespread internet restrictions have brought no tangible benefits to the country; on the contrary, they have driven millions of users toward unsafe and **unregulated VPNs**.

This forced reliance has not only increased household expenses but also compromised national cybersecurity. The proliferation of unreliable circumvention tools has polluted the digital network environment and, more critically, led to several security incidents, highlighting the unintended and counterproductive consequences of restrictive internet policies. Filtering has caused **enormous economic and social damage** — from the **collapse of startups** to the **migration of skilled professionals** and the **flight of capital**.

In its second report **[68]**, the **E-commerce Association** described **poor internet quality** as a key driver of the **digital economy crisis** in Iran. On a global scale, **Digital Economy Reports [69]** confirm that **digital restrictions hinder e-commerce growth**. In Iran, these restrictions — when combined with **international sanctions** — have **deepened the country's digital divide**, isolating its economy from global innovation and competitiveness.

One of the most puzzling policies highlighted in the fifth report is the blocking of domestic websites for foreign users. Nearly 80% of government websites — including those of the Parliament and various ministries — are inaccessible from abroad.

According to the report [68], after the publication of the fourth edition, some domains were unblocked, but an even larger number were newly restricted. The recent hacking of financial platforms from domestic servers has further exposed the ineffectiveness of this policy — a costly measure with no real benefit, much like the country's broader internet filtering strategy.

3.3.1 Statement of 100 Startups: A Call to Lift Filtering and Improve Infrastructure

More than 100 Iranian tech companies — including Digikala, Fanap, Abr Arvan, Snapp, Tapsi, Divar, Jabama, and Alibaba — have issued a joint statement at the invitation of the Internet and Infrastructure Commission of the E-Commerce Association, demanding the lifting of social media bans, expansion of international bandwidth, and unblocking of modern web protocols such as HTTP/3 and IPv6.

The statement, featured in the **Fifth Internet Status Report**, stresses that **filtering has brought no benefits** and has instead created **economic and security problems**. Startups warn that **without reform, the digital economy will collapse** — a warning already voiced in the **Fourth Report**, which noted a **20-fold increase in Starlink users** as a symptom of public frustration.

The report [68] also references a **joint survey** conducted by the **E-Commerce Association** and the **ISPA [60] [61] (Iranian Students Polling Agency)** in **June 2025**, prior to the Israeli cyberattacks. The findings are stark:

- **86%** of users rely on VPNs.
- **Instagram** remains the primary platform for **63%** of users and a source of income for **60%** of online businesses.
- 62.2% of respondents said they had no need for VPNs before the 2022 filtering wave.
- Among **young users under 30**, **93.8%** use VPNs.

These figures **align with the Third Internet Report**, which found **84% of Iranian users dependent on VPNs**, confirming that **filtering policies have only deepened digital dependence rather than control it**.

3.3.1.2 Most popular VPNs being used by the users [40]

Modern Tunneling & VPN Protocols:

1. **V2Ray** – a modular framework that supports multiple encrypted transport protocols.
2. **VMess** – an authenticated, encrypted protocol used within the V2Ray platform.
3. **VLESS** – a lightweight V2Ray protocol designed for simpler authentication and lower overhead.
4. **Shadowsocks (SS)** – an encrypted proxy protocol known for its speed and minimalism.
5. **Trojan** – a TLS-based tunneling method that uses standard HTTPS as its wrapper.
6. **WireGuard** – a modern VPN protocol built around fast performance and strong cryptography.
7. **OpenVPN** – a widely trusted VPN protocol known for high security and configurability.
8. **L2TP/IPSec** – a traditional VPN combination using IPSec for encryption and L2TP for tunneling.

VPN Applications / Services:

9. **Psiphon** – a circumvention tool that mixes VPN, SSH, and proxy technologies.
10. **Hotspot Shield** – a well-known VPN app using proprietary optimization technology.
11. **TurboVPN** – a free mobile VPN app focused on providing quick, simple connections.
12. **VPN Master** – a mobile VPN application offering basic encrypted tunneling.
13. **FreeVPN** – a general term for free VPN apps that provide simple encrypted tunnels.
14. **BetterNet** – a widely used VPN app offering one-tap encrypted sessions.
15. **Freedom** – a VPN-style privacy app aimed at secure browsing.
16. **Ultrasurf** – a long-standing privacy tool using encrypted proxy technology.
17. **DorVPN** – a VPN app marketed for basic encrypted browsing.

Commercial / Premium VPN Services:

18. **NordVPN** – a global VPN service emphasizing speed, privacy tools, and large server networks.
19. **Surfshark** – a commercial VPN service offering multi-device support and privacy features.

3.3.1.3 Authorities Responsible for Internet Restrictions in Iran [70]

In Iran's **highly centralized and monopolized internet structure**, the enforcement of filtering and online restrictions is a **state-level decision**, implemented by **Internet Service Providers (ISPs)** under directives from various **governmental and judicial bodies [70]**. These regulatory institutions primarily focus on **monitoring, censoring, and controlling online content** — including social media platforms, messaging apps, and websites.

Experts emphasize that in this system, **legislators and policymakers have near-total control** over the national internet infrastructure. As a result, **they can impose disruptions or restrictions at any time**, regardless of cost or public impact.

Amir Nazemi, a member of the **Scientific Policy Research Center**, explained in an interview: "Filtering in Iran is a complex issue, tied to an intricate administrative system that has become a labyrinth serving political interests." He added that the **laws and regulations governing content control**, such as traffic interference or filtering, are set by **high-level national authorities**. According to Nazemi, the **main legal body responsible for internet filtering** in Iran is the **Committee for Determining Instances of Criminal Content (CDICC) [71]**.

The committee's **secretariat operates under the Judiciary (Attorney General's Office)**. It consists of **12 members**, **half of whom are government representatives**. Alongside this primary authority, there are **other entities** capable of ordering filtering or disruptions in exceptional cases:

- The **Supreme National Security Council (SNSC)**,
- The **Supreme Council of Cyberspace (SCC)**, and
- **Judicial rulings** from courts.

However, Nazemi clarified that these latter channels are typically used only in **high-level or national security matters**, while the **CDICC remains the main operational authority** behind Iran's internet censorship and restrictions [71].

3.3.2 Domestic Internet Structure

The **Telecommunication Infrastructure Company (TIC)** — a **fully state-owned enterprise** — serves as the **exclusive gateway for internet access in Iran [70]**. This company holds a **complete monopoly** over the **import and distribution of international bandwidth** across the country.

In practice, TIC **purchases global internet capacity on behalf of all Iranian users** and then **supplies it to domestic Internet Service Providers (ISPs)**. These ISPs, in turn, deliver connectivity to individuals, businesses, and institutions.

A portion of the bandwidth provided by the **Telecommunication Infrastructure Company (TIC)** is allocated to **research and academic institutions**, particularly through the **Institute for Research in Fundamental Sciences (IPM)**. This network primarily serves **universities and research centers**, and has **little interaction with commercial users or the general public [70]**.

For regular users and businesses, internet access is delivered through two main channels:

- **Fixed Communication Providers (FCPs)** – companies that offer **home and enterprise broadband services** (such as ADSL, VDSL, and fiber).
- **Mobile Network Operators (MNOs)** – mobile carriers that provide **cellular internet access** (3G, 4G, and 5G).

Another crucial element of Iran's internet architecture is the **Internet Exchange Points (IXPs)**. Internet Exchange Points — known as **IXPs** — are **network hubs** where **internet service providers (ISPs)**, **content delivery networks (CDNs)**, and **major organizations** interconnect to exchange traffic directly. The main goal of IXPs is to **route domestic traffic within national borders**, improving **speed, latency, and cost efficiency** by avoiding unnecessary routing through international links.

From the early days of Iran's internet, ISPs had to create **individual (one-to-one) connections** to exchange data, which was inefficient and costly. This problem was resolved in **2015 (1394)** with the establishment of the first official **Internet Exchange Points**, creating a **centralized and optimized domestic routing system**.

At present, **six IXPs** operate across the country [70], strategically located in major cities. Among them, the **Tehran IXP** is the largest and most critical — it handles **over 90% of all domestic internet traffic** in Iran.

Data centers, form another core layer of the infrastructure. They are the **storage and hosting facilities** that hold the data for websites, cloud services, and mobile applications, ensuring that users across Iran can access content and services.

3.3.3 NIN (National Information Network) Outline

According to the official framework of the **National Information Network (NIN) [71]**, Iran's internet structure is organized into **three main layers**:

- **Infrastructure Layer**
- **Service Layer**
- **Content Layer**

1. Infrastructure Layer: This foundational layer is divided into **two main sublayers — Communications Infrastructure** and **Information Infrastructure**.

1.1 Communications Infrastructure: This is the **core backbone of internet connectivity** in Iran. It includes all **Internet Service Providers (ISPs)** and the **interconnection points** between them. It is further categorized into:

- **Public Networks:** These cover all fixed and mobile internet operators, providing access to the general public and businesses.
- **Private Networks:** These are closed government networks (G2G), used exclusively for inter-organizational communication and data exchange between state entities.

1.2 Information Infrastructure: This sublayer consists mainly of **data centers and storage providers** that host digital information and enable **data exchange and internet access** through the communication networks. These

facilities form the **backbone of Iran's cloud and hosting ecosystem**, ensuring the availability of national digital services.

2. Service Layer: This layer includes **digital and online service providers**, such as cloud computing platforms, financial gateways, government e-services, and application programming interfaces (APIs) that rely on the infrastructure layer to function.

3. Content Layer: The content layer encompasses all websites, applications, digital media, and local platforms that deliver information, entertainment, and communication to end users.

3.3.4 Sanctions

3.3.4.1 Network Infrastructure and Hardware

The sanctions imposed by the **United States** and the **European Union** have **severely restricted Iran's access to critical infrastructure technologies**. Most telecommunications and networking equipment — such as **routers, switches, firewalls, enterprise servers, and fiber-optic systems** — are classified as **"dual-use goods,"** meaning they can be used for both civilian and military purposes. According to the regulations of the **U.S. Office of Foreign Assets Control (OFAC) [72]**, exporting such items to Iran requires a **special license**, which is **rarely, if ever, granted**.

As a result, the **Telecommunication Infrastructure Company (TIC)** and Iranian operators are forced to **procure their equipment through informal intermediaries** or from countries such as **China, Russia, and the United Arab Emirates**. This practice has led to several negative consequences:

- Equipment prices up to twice the global average;
- **Reduced internet quality** due to hardware incompatibility and outdated systems;
- **Dependence on a small number of unreliable suppliers**;
- **Increased cybersecurity risks** resulting from the use of low-quality or potentially compromised products.

According to studies by **Freedom House (2024) [73]** and the **Internet Society**, more than **65% of Iran's international internet routes** rely on **non-Western hardware and network systems**, which has contributed to **lower bandwidth quality** and **reduced network stability** during periods of crisis.

3.3.4.2 Software, Cloud Services, and Tech Company Sanctions

Technology sanctions on Iran extend far beyond hardware — they also encompass **software, cloud computing, and developer tools**. Major global companies such as **Google, Amazon, Microsoft, and Apple** refuse to provide cloud infrastructure, developer accounts, or international payment services to Iranian users.

Examples include [74] [75]:

- **Google Cloud** and **AWS** have no active servers in Iran and **block access from Iranian IP addresses**.
- **GitHub**, the world's largest code-sharing platform, **suspended Iranian developer accounts** until 2023 due to U.S. export control laws.
- **Apple** prohibits the publication of Iranian apps on the **App Store**, while **Google Play** was **blocked for Iranian users** until late 2024.

These restrictions have forced Iranian companies and developers to rely on **unofficial versions, cracked software, and foreign VPN-based services**. As a result:

- **Cybersecurity risks have sharply increased**
- **Software updates and patches are delayed**

And **Iranian developers are effectively excluded from global competition** in open-source and commercial ecosystems.

3.3.4.3 Economic and Social Consequences for Users and Businesses

Digital sanctions have had **direct and profound impacts** on the daily lives of Iranian users and on the operations of technology-driven companies. Due to the **blocking of international financial services** such as **PayPal, Visa, and Mastercard**, Iranian users are **unable to access** global educational, scientific, and software platforms.

Examples include:

- Iranian students **cannot officially subscribe** to academic journals or enroll in online courses like **Coursera** or **Udemy**.
- **Startups** are unable to use **digital marketing tools** such as **Meta Ads** or **Google Ads**.

- **Content creators** are excluded from **global monetization programs** like **YouTube's Partner Program**.

As a result, Iran's digital ecosystem **loses over $5 billion in potential annual economic value** (**Internet Society, 2024**) [75]. Moreover, these restrictions have **pushed users toward state-controlled domestic platforms** such as **Rubika**, **Eitaa**, and **Soroush**, which have faced **widespread criticism** for **privacy violations** and **limited freedom of expression**.

3.3.4.4 Security and Political Implications

Beyond their economic effects, sanctions have **indirectly strengthened state control** over Iran's digital space [75]. When international tech companies **refuse to serve Iranian users**, the government gains greater leverage to **enforce surveillance, censorship, and data localization** through domestic platforms.

During the **nationwide protests of 2019 and 2022**, **international internet connectivity was completely shut down**, while **domestic services remained operational**, ensuring continued state communication and control. **VPNs and circumvention tools** are **continuously targeted and blocked**, sometimes even at the **DNS and TLS protocol levels [75]**.

Internet Service Providers (ISPs) are **legally required** to store all user data **inside the country**, making monitoring and data access easier for authorities. From a **cybersecurity standpoint**, sanctions have also isolated Iran from global threat intelligence networks such as **FIRST** (Forum of Incident Response and Security Teams) and **CERT** (Computer Emergency Response Team) **International**. This isolation has led to **slower, fragmented responses** to major cyberattacks — including incidents like **Stuxnet** and **BlackEnergy** — leaving Iran's digital infrastructure more vulnerable to both domestic and external threats [75].

CHAPTER 4

4. Artificial Intelligence

Iran's current AI trajectory is shaped by an explicit push for state coordination alongside practical constraints. Iran's AI market is still small but present—estimated at **~$30 million in 2024** by the **Iran AI Index [76]**. Consumer-facing AI is active and concentrated. Web analytics (**StatCounter**) [77] show that, as of **October 2025**, **ChatGPT accounts for ~80% of AI-chatbot usage in Iran**, with Microsoft Copilot (~11%) and Perplexity (~8%) far behind—so most everyday experimentation with AI happens through a single interface. That dominance tracks the global pattern of heavy traffic to ChatGPT.

Yet, policy is moving toward **centralized coordination**—Parliament has **approved creating a National AI Organization** and advanced an AI plan—signaling a shift from scattered pilots to a formal program. But **readiness remains mid-tier** by international benchmarks [79], and progress is tempered by **export controls and sanctions** that limit access to advanced GPUs and certain AI technologies—factors that slow large-scale training and enterprise deployment relative to consumer use.

Net-net: usage is **rising from the bottom-up (consumers/SMEs) faster than from the top-down (government/large enterprise)**, with policy trying to close the gap.

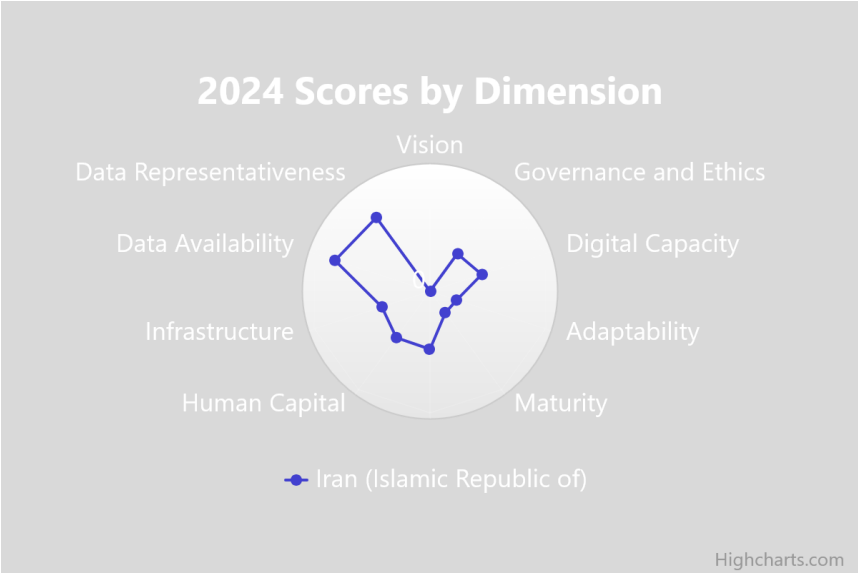

Figure 3. Oxfordinsights – Government AI readiness [78]

Major Iranian Universities in AI, Internet, and Computer Research:

University	City	Notable ICT/AI expertise (examples)	Indicative capacity
University of Tehran (UT)	Tehran	AI/Robotics & Information Science research at the School of ECE; announcement of a **National AI Laboratory** within the College of Engineering	Dedicated AI/Robotics & Info Science research institute; National AI Lab announced in
Sharif University of Technology (SUT)	Tehran	Multiple CE labs in ML/AI (e.g., **Data Science & ML Lab**, **Machine Learning Lab**)	"Substantial number" of specialized CE research labs; active ML/AI groups.
Amirkabir University of Technology (AUT)	Tehran	**High-Performance Computing Research Center (HPCRC)** and **SSAIL**; GPU cloud, supercomputing, **LLM** development	One of Iran's leading HPC/AI centers providing cloud/HPC services for research and industry.
Iran University of Science & Technology (IUST)	Tehran	Center of Excellence in Future Networks; topic-specific labs spanning AI/data systems	School of CE lists **14+ research labs** plus 2 research centers.
Isfahan University of Technology (IUT)	Isfahan	**Pattern Analysis & Machine Learning Lab**; AI Lab in robotics/ML/computer vision	Multiple active AI/ML labs within ECE; machine-learning focus areas documented.
Ferdowsi University of Mashhad (FUM)	Mashhad	Computer Engineering dept; **Web Technology Lab** (AI in health, smart city, data mining)	Department-level AI/SE programs; WT-Lab with several AI-oriented research teams.
University of Tabriz	Tabriz	**Computational Intelligence & Machine Learning (CIML)**; (Computerized Intelligence Systems)	Multiple AI/ML labs active across ECE/CE faculties.
K. N. Toosi University of Technology (KNTU)	Tehran	Faculty of Computer Engineering includes **Artificial Intelligence** department plus networks/SE/architecture	CE faculty with dedicated **AI department**; university enrolls ~7,000 students across programs (scale indicator).

Table 4. Major universities involved in AI and IT

4.1 The Beginning of Government policy-making in Artificial Intelligence

4.1.1 The Formation of a National Perspective on AI

The concept of *artificial intelligence* entered Iran's major policymaking discussions around the late 2010s (roughly between 2018 and 2020). At that time, the world was experiencing a new wave of *deep learning* and *data mining* applications across various industries. During this period, the **Supreme Council of the Cultural Revolution** and the **Vice-Presidency for Science and Technology** started the first discussions about the need to develop a National AI Roadmap.

In those same years, Iran saw a sharp rise in the number of scientific papers it produced. According to *Tehran Times* (2023) [80], Iran ranked first among Islamic countries in the field of artificial neural networks. These advancements led the government to consider artificial intelligence as one of the main pillars of the National Digital Transformation program.

4.1.2 Drafting the National Artificial Intelligence Document

In 2021 (1400), the **Ministry of Communications and Information Technology**, together with the **Vice-Presidency for Science and Technology**, released a draft of the National AI Development Document [81].

The main goal of this document was:

"To turn the Islamic Republic of Iran into the leading power in the region in developing and applying artificial intelligence technologies by 2030 (1408)."

This document includes several key areas:

Strategic Area	Description
Developing national data and computing infrastructure	Building domestic cloud platforms, national data centers, and localized GPUs for AI model training.
Training specialized human resources	Educating 50,000 experts at the bachelor's, master's, and PhD levels in fields like machine learning, data science, and robotics.
Supporting knowledge-based companies and startups	Providing financial support, tax exemptions, and access to government data for companies working in AI.
Strategic national applications	Using AI in energy, healthcare, security, agriculture, and smart education.

Table 5. AI document subjects

4.1.3 Establishment of Specialized Institutions and Research Centers

Alongside the drafting of the national AI document, several specialized centers and organizations were established or strengthened:

4.1.3.1 National Center for Artificial Intelligence and Big Data [82] *(under the Ministry of Communications),* tasked with designing the national AI platform and managing the country's big data resources. The open-source **National AI Platform** is a comprehensive and integrated framework for the development, deployment, and sharing of AI models and algorithms.

Designed and implemented by Iranian researchers and specialists, the platform aims to establish a national AI ecosystem. It enables researchers, developers, knowledge-based companies, and AI enthusiasts to collaboratively work on AI projects, share knowledge, and benefit from the latest advancements in the field.

4.1.3.2 University of Tehran AI Innovation Center – focuses on research in Persian language processing, recommender systems, and computer vision.

4.1.3.3 AI-focused accelerators such as Sharif Innovation Station, aimed at supporting and nurturing AI startups.

Sharif Innovation Station was established in **August 2018 (Mordad 1397)** [83] with the goal of providing a suitable base for **startups, early-stage companies, accelerators, research and technology funds**, and other actors in Iran's innovation ecosystem. Spanning **over 27,000 square meters**, the campus—adjacent to Sharif University of Technology—offers space, services, and a collaborative environment to help technology teams settle and grow.

The Station's **core mission** is to **ease the entry and expansion of Iranian entrepreneurs** within the domestic tech ecosystem. With successful companies from diverse sectors present on site, it enables **broad networking**, knowledge exchange, and the **launch of joint projects**, accelerating commercialization and market development for innovators.

4.1.3.4 Iran Information Technology Organization (IITO) -

responsible for developing data frameworks, setting standards, and coordinating with the private sector.

4.2 Investment and Infrastructure Development in Iran's Artificial Intelligence Sector

4.2.1 National Investment and Government Funding

Around 2021 (1400), the Iranian government officially launched a targeted investment program for AI infrastructure. According to ***SpecialEurasia*** (2025) [84], Iran allocated about $115 million in national funding for the development of artificial intelligence and big data technologies. This investment was distributed among several key institutions as part of the Comprehensive Digital Technologies Plan.

Responsible Institution	Share of Budget	Focus Area
Ministry of Communications and Information Technology	35%	Developing cloud computing infrastructure and national data centers
Vice-Presidency for Science and Technology	30%	Supporting knowledge-based companies and academic research
Ministry of Science, Research, and Technology	20%	Expanding educational programs and university research in AI
Ministry of Defense and Armed Forces Logistics	15%	Security-related applications and intelligent defense systems

Table 6. Budget sharing per institution

4.2.2 Developing Computing and Data Infrastructure

One of the main challenges in advancing artificial intelligence in Iran has been the lack of sufficient computing infrastructure — including GPUs, high-performance servers, and large-scale data centers. In response, the government has launched several major initiatives:

4.2.2.1 National AI Platform (pilot 2024/1403)

Iran piloted a **National AI Platform [85]** to offer shared compute and storage for universities, firms, and research groups—meant to cut reliance on foreign clouds and speed model training and deployment. Public reports describe a **prototype unveiled in March 2025** with academic participation (notably **Sharif University of Technology**), framed as a national infrastructure for secure AI services and data hosting.

4.2.2.2 National Open Data Network ("Open Data Iran")

The "**Open Data Iran**" initiative is a government effort to unify and publish public datasets in a machine-readable form to facilitate cross-agency use, research, and innovation—foundational infrastructure for training Persian-language models, benchmarking, and data-driven analysis.
The national portal [86], makes catalogs, datasets, and APIs available to everyone, meanwhile, the transparency pages of Iran's **Information Technology Organization** (ITO) [87] set out data-governance goals—such as standard formats, usage licenses, and publication requirements. The result is a coherent platform that provides stable access to government data and strengthens the country's data-driven research and product ecosystem.

4.2.2.3 National Cloud Center

Iran's National Cloud Center is best understood as the core of the country's "**Cloud Iran**" program [88]—a coordinated stack of policy, facilities, and services meant to localize critical computing for government, universities, and industry. Rather than a single building, it functions as a national capability: standardizing access to compute and storage, setting governance rules, and reducing dependence on foreign clouds for sensitive workloads. The **Information Technology Organization (ITO)** anchors the policy layer, while campus and research operators provide the technical backbone.

At the infrastructure level, two pillars matter most. First, the **Iran National HPC Network [89]** links supercomputing sites and service portals so researchers can schedule jobs and share resources across institutions. Second, the **"Simorgh" supercomputer [90]**—launched at **Amirkabir University**—adds GPU-enabled capacity aimed at training and serving AI models and handling large data analytics. Together, these pieces form a shared utility for

computer-intensive tasks, from scientific simulation to machine learning, and offer a domestic alternative when import controls or sanctions complicate access to cutting-edge hardware and global cloud platforms.

Around this backbone, ecosystem hubs such as **Pardis Technology Park** help convene vendors, labs, and startups, turning raw capacity into applied capability. The strategic bet is straightforward: by pooling national compute, enforcing common standards, and co-locating talent with infrastructure, Iran can accelerate AI and data-driven services in the public sector while giving researchers and firms more predictable access to resources. The model won't remove every constraint — especially around next-gen GPUs—but it does provide a clearer path for scaling domestic AI and cloud workloads under national governance.

4.3 Top Iranian AI Tools

Iranian platforms are offering features with fully Persian interfaces, rial-based payments, and no need to change your IP. Some provide an all-in-one toolkit—chat with language models, image and video generation, file analysis, and even developer APIs.

Others focus on a single domain: for example, pure content generation, chat only, or speech-to-text. Some are completely free, while others use subscription plans to unlock more capabilities. A few are lightweight and simple, and some are built more seriously for companies and technical teams.

4.3.1 Rakhshai

In the realm of Persian-language AI, Rakhshai stands out as a model that's hard to overlook. Its strength isn't only its local roots; it's the way it strives to offer a deeply personalized experience that speaks to the language, culture, and thinking of Iranian users.

Rakhshai [91] runs on the "Zāl" model, which has now been released in three versions. In its latest iteration, **Zāl 3**, you can even design your own custom assistant. The AI isn't limited to text either: its image engine, called **"Shahrzād,"** can generate pictures with a distinctly Iranian, culturally informed aesthetic compared with similar tools.

Once inside **Rakhshai**, you can interact with different personas—from a psychologist and financial advisor to an SEO specialist, programmer, historian,

and even a language tutor. Each character is trained on dedicated datasets to offer more precise, domain-specific answers. Unlike more general-purpose services, the emphasis here is on depth and practical specialization.

For payments, **Rakhshai** uses an internal credit system called **"Dārik."** New users receive a free starter pack named **"Siāvash,"** which covers up to **5,000 words or 5 images**. Different models consume credits at different rates: for example, a single message on **Zāl 2** uses around **15 Dārik**, while lighter models consume less. There's also a **developer API**, so you can integrate the model into your own software project or website if you wish.

Technical point of view (Core building blocks):

- **Rakhshai [91] Graph-based NLP:** A research library that converts Persian text into various graphs (co-occurrence, text/document graphs, dependency) and implements **GCN/GraphSAGE** (with experimental GAT) for tasks like classification, extractive summarization (TextRank), hate-speech detection, and recommenders. Comes with CLI (rgnn-cli), tests, and docs—useful for academic and prototype pipelines.

- **Cyrus AI (RAG assistant):** A **Django** Persian QA assistant that uses **hybrid retrieval** (FAISS vector + BM25 lexical) with a local **LLaMA** generator. It supports CPU/GPU FAISS, env-based config, domain allowlists for crawling, and a REST endpoint (/api/ask/). It's explicitly designed to run **without external cloud services**, emphasizing data residency/offline operation.

- **Persian NLP Django API Service (beta):** A lightweight, **offline-capable** REST service for normalization (Hazm), lexicon-based **sentiment**, simple **NER**, and background jobs via **Celery + Redis**; includes a Q&A example that falls back to Persian Wikipedia when needed. Good fit for on-prem deployments or constrained environments.

- **Naghz (toolkit):** A minimal **Python/CLI** toolkit for Persian NLP: normalization, tokenization, **POS** and **dependency parsing** via **Stanza**, colloquial→formal conversion, extractive summarization, and lexicon sentiment. It exposes a registry to swap models and returns **UD/CoNLL-U**-compatible parses—handy for pipelines and scripting.

- **Technical posture:** The org prioritizes **local, Persian-aware processing** and **dependency-light deployments** over training frontier LLMs. Strengths include: (1) clear **offline/on-prem** story (no cloud dependency in Cyrus and the API service), (2) modular design (retriever/generator stores, graph constructors, CLI tools), and (3) coverage of the **classical NLP stack** plus **RAG**. It's well-suited for institutions that need **data control**, reproducible research, or to stand up **baseline Persian NLP** and **RAG** services quickly, while leaving room to swap in stronger generators later.

- **Licensing & maturity:** All highlighted repos are **MIT-licensed**, with recent commits in 2025 and basic tests/docs—appropriate for experimentation, teaching, and integration into internal systems, provided you validate on your domain data.

4.3.2 Hoshyar24 Artificial Intelligence

Hoshyar24 [92] is another leading Iranian platform in the field of artificial intelligence.
Focused on generative language models such as **GPT-4**, **Llama 3.1**, **and Claude 3**, this platform gives Iranian users access to the world's most advanced AI technologies — without the need for foreign payments, international SIM cards, or VPN tools.

Technical Point of View:

- **System role & model access:** Houshyar24 functions as a **model-orchestrator** rather than a single proprietary LLM. The platform exposes multiple **frontier models** behind a unified Persian UX and handles **server-side routing/normalization** so users can pick tasks while the backend selects an appropriate model/pipeline.

- **Agents (persona workflows):** Beyond plain chat, it offers **agent/assistant creation** with task templates (content, coding, research). This implies **context management** (per-thread memory), prompt scaffolding, and policy guardrails over heterogeneous models.

- **Multimodal toolchain:** The tools menu includes **image generation and editing** (background removal, color replacement, restyle). Technically, these appear as discrete endpoints that wrap specific image models or pipelines with post-processing steps—i.e., a **microfeature architecture**.

- **Localization & access:** It's **Persian-first**, supports **rial payments**, and is designed for use **without VPN**, removing common access frictions (foreign cards/SIMs). From an ops view, that points to localized **auth**, **quota/billing**, and rate-limiting at the edge.

4.3.3 AvalAI

AvalAI [93] operates as a **model-aggregation and orchestration platform** rather than a single proprietary model. It exposes a catalog of frontier and open-source models behind a **unified Persian UI and an OpenAI-compatible API**, letting users and developers switch among providers while keeping one account, billing, and usage dashboard. The docs/blog note **100–150+ models** available through the API, plus organization-level controls (monthly budgets, IP/endpoint restrictions), which implies middleware for **routing, metering, RBAC, and provider abstraction**.

On the **end-user side**, AvalAI ships a consumer app (Android) with **multi-model chat**, **vision (GPT-4o/Gemini 1.5)**, and **dozens of image pipelines**; the product pages highlight a broad toolset for content creation and file handling. This packaging suggests server-side **prompt scaffolding**, **context management**, and **task-specific endpoints** (e.g., image generation/editing) layered over upstream APIs.

For **business/developers**, the API advertises **provider-rate pricing (no extra fee)**, OpenAI SDK compatibility, **usage analytics/budgets**, and **access controls**—signals of a multi-tenant gateway designed for **cost control and compliance** while enabling quick swaps between OpenAI, Anthropic, Google, DeepSeek, etc. In practice, AvalAI's sophistication is strongest in **systems integration and governance** (orchestration, billing, quotas, access), with model quality tracking the **best available upstream providers** the platform connects to.

4.4 Major startups in the field of AI – *From **Maktabkhoone** article about "Iranian Artificial Intelligence Companies"* [29]

4.4.1 Part AI research center

The crown jewel of this ecosystem is none other than ***Part***. The company was founded in 2017 (Iranian year 1396). Over the years, Part has faced many challenges; however, under the leadership of its CEO, Ali Rasoulizadei, it has succeeded in becoming the largest AI company in Iran.

More than 150 individuals in this company are classified as AI specialists. Part has formed four major teams: machine vision, natural language processing, speech processing, and data mining. Some of the products developed by this company include:

- **Sahab**: intelligent cloud service
- **Shahab**: intelligent cloud network
- **iQuant**: algorithmic trading platform
- **Farashnasa**: electronic identity verification system
- **Avasho**: intelligent text reader
- **Avanagar**: intelligent text-to-speech converter
- **Noyesenegar**: intelligent image-to-text converter

4.4.2 Dataak Company

Dataak is another Iranian artificial intelligence company that operates in the field of information technology. It was established in 2017 (Iranian year 1396). Among the company's most important objectives are developing tools for information retrieval, natural language processing, machine learning for knowledge extraction, and more. Its main clients include the Presidential Office of Iran, Snapp, Bank Shahr, and several government organizations such as the Planning and Budget Organization. Also, its key products—Smart Data Processing Platform, Dataak Tele-Bot, and the Public Relations System—are all developed in the Java programming language.

4.4.3 Farayand Madar Pishro

This knowledge-based company began its operations in 2017 (Iranian year 1396), focusing on accelerating business workflows and improving software solutions for organizations.

Its products include the *Kasco* bot, the *AI System*, the *Organizational Planning System*, and the *Sarkhabar News Panel*. Kasco is one of the first voice-based AI chatbots in Iran. This tool is used in service-desk management, call centers, banking interactions, financial applications, weather services, navigation apps, and more.

4.4.4 Amn Mowj

One of the strengths of this company's products is their ability to detect and re-identify objects in images and videos. For this reason, it is considered one of the most successful AI companies in Iran. The company's efforts in producing 360-degree content, enabling search within image and video files, and similar capabilities have been fruitful, and these products are now used across various businesses.

Amn Mowj has focused on developing software for platforms such as Android, iOS, and Windows, as well as creating a wide range of additional applications. The outcomes of these initiatives include apps such as Rezvan, Todeed, an algorithmic trading system for the Tehran Stock Exchange and Commodity Market, a news-analysis system, and several other software products.

4.4.5 Datamoon

Datamon is one of the companies that, according to official documents, has participated in the **"Internet Protection Plan."** The main purpose behind its technologies is text and image censorship. ***Khodnegar*** and ***Rakhnegar*** are among its most important products. The company's CEO, launched the business in 2019 (Iranian year 1398). Its primary clients include businesses and government organizations.

The **Khodnegar AI system** is used in traffic-monitoring cameras and is highly capable of automatically and accurately reading vehicle license plates. Other technologies developed by Datamon include image-background removal, image-to-text conversion, object detection, speech-to-text conversion, and even text-to-speech. The company's products are available with approximately one month of free usage, after which a subscription is required.

4.4.6 Fanap

Another major artificial intelligence company in Iran is **Fanap**, which began its operations in 2005 (Iranian year 1384). ***ArvanCloud*** and ***AIO Services*** are among the most important products of this Tehran-based company. The first Internet television platform in Iran was launched by this company.

Fanap has developed tools and systems for transportation services, banking, the stock market, financial-transaction management ***Behnama*** and ***Bekhan*** are two of Fanap's most prominent products. They support law-enforcement agencies by enabling image-based monitoring, license-plate recognition, and traffic surveillance and control.

The company's major clients include banks, the Tehran Traffic Control Organization, and other large institutions.

4.4.7 Ebo

Eboo was originally created with the purpose of developing software and designing websites. It later succeeded in producing a tool that converts images and PDF files into Word documents.

This Iranian platform has also developed a speech-to-text conversion service. Irancell and Hamrah-e Aval are among the company's clients in northern Iran.

Some of Eboo's most important services include:

- Developing websites for online purchasing, sales, and accounting
- Creating online testing platforms for job-applicant assessments used by government organizations
- Converting images and PDF files into Word documents in editable text format

4.5 Barriers and Challenges in the Development of Artificial Intelligence in Iran - Based on the article [94] *by **Atwood, B. (2025). Artificial Intelligence in Iran: National Narratives and Material Realities. Iranian Studies***

In recent years, artificial intelligence has been recognized as one of the strategic fields of scientific and technological development in Iran. The government, universities, and the private sector have all been working to

promote AI as both a driving force of the knowledge-based economy and a symbol of national progress.

However, there remains a significant gap between the official narratives of "technological advancement" and the practical and infrastructural realities of the country.

According to Blake Atwood's article in *Iranian Studies* (Cambridge University Press, 2024), the development of AI in Iran faces a range of structural, technological, economic, and cultural obstacles that prevent the full realization of national goals. The following section systematically examines these key challenges.

4.5.1 Technological and Infrastructural Dependency

One of the main challenges in developing artificial intelligence in Iran is the country's strong dependence on foreign hardware and technologies. Projects such as the "**Simorgh**" supercomputer and the Martyr **Haj Qassem Soleimani Data Center** (MHQSDC) have been presented as national symbols of AI infrastructure development.

However, as noted in the *Cambridge* article [94], these projects are "highly reliant on international supply chains," with much of their equipment being imported or acquired through grey and black markets. This dependency has caused the slogan of "technological self-sufficiency" to remain mostly at the rhetorical level. In practice, the system continues to be vulnerable to sanctions and fluctuations in the global market.

4.5.2 Weak Data Infrastructure and Lack of Local Datasets

Artificial intelligence relies heavily on large-scale datasets for model training. However, Iran still suffers from the absence of a national open data network, lack of clear standards for data sharing, and restricted access to public datasets.

As Atwood (2025) [94] notes, the country's data resources are "scattered across ministries, research institutions, and private organizations," often with no interoperable standards or public access mechanisms. This fragmentation prevents researchers from leveraging the scale and diversity of data needed to develop advanced AI systems.

A major technical and institutional barrier lies in the absence of a national open data framework — a structured policy and infrastructure that would allow

datasets to be shared securely across sectors while maintaining privacy and ethical standards. Currently, most datasets remain siloed within government agencies or universities, accessible only through personal networks or administrative permissions. The lack of standardized metadata, documentation, and APIs for data retrieval further complicates reuse and reproducibility in research.

Furthermore, **data governance restrictions and internet filtering** indirectly exacerbate this weakness by isolating Iranian developers from global repositories like Kaggle, Hugging Face Datasets, or OpenAI's open research community. Without consistent access to open global data ecosystems, **Iran's AI models remain constrained to narrow, localized data distributions**, limiting their generalization and real-world applicability.

As a result, machine learning and Persian language processing models in Iran often depend on small or non-local datasets, which significantly reduces their performance and accuracy.

4.5.3 Lack of Innovation and Commercialization Culture

Despite significant scientific growth in engineering and academic research, a genuine culture of technological innovation has not yet been fully established in Iran.

As **Atwood (2025)** emphasizes, much of Iran's AI development "remains confined to academic and exhibition spaces, rather than industrial deployment." According to her analysis, innovation is often **performed symbolically — "used as a slogan, not as a continuous process of production and market creation."** This observation captures the structural disconnect between Iran's research community and its commercial ecosystem: innovation tends to be celebrated rhetorically rather than institutionally sustained through funding, venture capital, or industrial partnerships.

The result is that **many AI initiatives stall at the prototype or pilot stage**. University laboratories and government research programs frequently produce technically sound projects that lack business integration, intellectual property (IP) frameworks, or pathways to commercialization. **Technology transfer mechanisms** — such as spin-offs, incubators, and public–private collaborations — remain weak or underdeveloped, preventing ideas from evolving into viable market solutions.

Startups such as Snapp and Tap30, while using AI algorithms to manage their services, still do not represent a broader social and economic model of innovation-driven growth.

In fact, many actors are not truly **"AI-first"** but rather **AI-enabled** — meaning that while the **core of their business** lies in areas like **platforms, marketplaces, or fintech**, they still maintain **data science teams** and use **machine learning models** to enhance their services.

4.5.4 Conflict Between the National Narrative and Material Reality

At the **discursive level**, the Iranian government presents artificial intelligence (AI) as a powerful **symbol of national sovereignty, technological independence, and resistance to Western sanctions**. In official statements and policy documents, AI is portrayed not merely as a scientific or economic tool, but as a marker of national prestige — a technology through which Iran can assert autonomy in a global system shaped by technological dependency.

However, as **Atwood (2025)** argues, this **national narrative of self-reliance often clashes with the material realities of Iran's technological development**. While state discourse emphasizes independence and endogenous innovation, the country's AI ecosystem remains **structurally tied to global supply chains**, foreign software frameworks, and open-source platforms originating in the West and East Asia.

In practice, Iranian AI research and startup ecosystems depend on **international hardware (GPUs, cloud services), open-source models** (e.g., PyTorch, TensorFlow), **and global data repositories**, many of which are affected by export restrictions and sanctions. This contradiction places Iran in a **dual position**: on one hand, it aspires to achieve **self-sufficiency and digital sovereignty**; on the other, it remains **embedded in — and constrained by — the global technology market** that it rhetorically seeks to resist.

4.5.5 Impact of Sanctions and International Restrictions

U.S. sanctions and export control regimes on advanced technologies constitute one of the **most formidable barriers to the growth of artificial intelligence in Iran**. These restrictions extend beyond financial or trade limitations — they directly constrain access to the **core technical infrastructure** required for modern AI research and industrial application.

Since 2018, under renewed U.S. sanctions and the broader framework of the **Export Administration Regulations (EAR)**, Iranian institutions and companies have been **denied access to high-performance computing hardware** such as NVIDIA and AMD GPUs, AI accelerator chips (e.g., Tensor Processing Units), and edge devices essential for model training and deployment.

Even open-source cloud providers such as **Google Cloud, AWS, and Microsoft Azure** enforce geographic IP bans on Iranian users, making it nearly impossible to access scalable computing or collaborative development environments. Consequently, research teams and startups are often **forced to acquire GPUs through intermediaries or unofficial markets**, resulting in inflated costs, limited scalability, and heightened cybersecurity risks.

The cumulative effect of these constraints has been a **slowdown in large-scale AI initiatives**, particularly in computationally intensive domains such as **natural language processing (NLP), robotics, and deep learning**. For instance, developing Persian-language foundation models or multimodal systems requires massive datasets and parallel GPU clusters—resources that are often beyond the reach of Iranian researchers under current sanctions. As a result, local AI development remains fragmented, reliant on smaller-scale academic projects or government-funded prototypes, a

CHAPTER 5

5. Conclusion

Iran's trajectory in information and communication technologies is best understood as the result of a constant tension between **external constraints** and **internal mismanagement**, on the one hand, and **significant latent potential**, on the other. International sanctions, chronic governance problems, and the absence of up-to-date technology have repeatedly prevented Iran from keeping pace with more advanced countries, even when basic infrastructural capacity existed. Instead of a linear path of digital modernization, the country's ICT development has unfolded through cycles of partial progress, disruption, and stalled implementation.

Sanctions have played a decisive role in shaping this path. Restricted access to cutting-edge hardware, global platforms, cloud services, and international research networks has forced Iran into a largely reactive and inward-looking model of development. While this has sometimes stimulated domestic ingenuity and localized solutions, it has also locked the country into semi-isolated technological cycles, limited technology transfer, and hindered full integration into global value chains. As a result, Iran has often been unable to adopt or scale the most recent technologies at the same pace as advanced economies, especially in strategic domains such as high-performance computing, 5G, and artificial intelligence.

At the same time, **internal governance and management failures** have significantly weakened the effectiveness of what Iran has managed to build. The state's dominant role in setting priorities, regulating markets, and often operating key infrastructure has created a system that is strong in control but weak in coordination and innovation. Overlapping institutions, inconsistent policies, and an emphasis on security and sovereignty over openness and competition have contributed to a persistent gap between infrastructure and actual use. Iran has expanded mobile broadband coverage and invested in fiber networks, yet service quality, digital services, and innovation ecosystems have lagged. In practice, misaligned incentives, regulatory unpredictability, and limited support for a competitive private sector have prevented ICT policies from fully delivering on their stated goals.

This combination of sanctions and mismanagement has also shaped Iran's Internet governance model. Efforts to build national platforms, strengthen the National Information Network, and enforce restrictive content and platform policies have sought to increase digital sovereignty, but often at the cost of user trust and global connectivity. The resulting environment is neither fully closed nor fully open: citizens routinely rely on circumvention tools, while certain actors enjoy more privileged access. In this hybrid system, the government's approach to ICT has frequently prioritized control over enabling broad-based digital innovation and integration with international standards.

Yet the picture is not solely one of constraint and failure. Iran remains a country with a **large, young, and digitally active population**, as well as a strong pool of STEM graduates and researchers. These human resources, combined with a clear social demand for connectivity, digital services, and economic opportunity, constitute a substantial hidden potential. The problem is not an absence of capacity or ambition, but the presence of powerful negative factors—sanctions, outdated technologies, fragmented governance, and restrictive policies—that prevent this potential from being fully realized.

In conclusion, Iran's ICT trajectory reflects a structural contradiction: it is a country with the demographic and intellectual foundations for significant digital advancement, but whose progress has been systematically constrained by external pressure and internal mismanagement. Overcoming this contradiction will require more than technical upgrades. It depends on a shift toward more coherent and transparent governance, greater policy stability, a genuinely competitive telecom and digital market, and a reorientation of state intervention away from restrictive control and toward enabling innovation. Only if these conditions begin to change can Iran's latent digital potential translate into sustained, broad-based technological development that narrows the gap with more advanced countries.

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