

CHAPTER

6

THE KHWARIZMI-IBN SINA KNOWLEDGE CORRIDOR

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6.1 INTRODUCTION

A thousand years ago, the region stretching from present-day Syria to Kazakhstan was a vibrant center of scientific discovery and learning. It was home to brilliant minds like Al-Khwarizmi, Al-Kindi, Ibn Sina, and Ibn al-Haytham, who drew from the rich mathematical traditions of Greece, India, and China to push the boundaries of knowledge. Al-Khwarizmi's work laid the foundation for algebra, while the 8th to 13th centuries saw groundbreaking achievements in medical science. Astronomy thrived as well, leading to advancements in navigation and the creation of accurate calendars. At the heart of this golden age was Baghdad, a beacon of learning and innovation for the entire world.

Today, countries from the same regions (Afghanistan, Azerbaijan, Iran, Iraq, Kazakhstan, Kyrgyzstan, Pakistan, Syria, Tajikistan, Türkiye, Turkmenistan, and Uzbekistan) host a vast network of universities. However, the region still struggles with scientific and technological advancement. One of the major issues is the lack of focus on fostering innovation, due to which interdisciplinary research within these institutions is unsubstantial (Durrani, personal communication, August 10, 2024). Similarly, collaboration among universities and

regional mobility is also non-existent, as researchers often prefer partnerships with European and North American institutions.

This chapter proposes the "Khwarizmi-Ibn Sina Knowledge Corridor", initially comprising countries such as Afghanistan, Azerbaijan, Iran, Iraq, Kazakhstan, Kyrgyzstan, Pakistan, Syria, Tajikistan, Türkiye, Turkmenistan, and Uzbekistan (see Figure 6.1). It may expand further to include additional countries in future. This corridor will be a strategic initiative for all member countries to collaborate, address existing challenges in academia, and stimulate economic growth. The proposed initiative emphasizes minimal government oversight and maximum autonomy for universities. It will enable researchers to collaborate freely across geographic boundaries and help students and academicians solve local challenges through interdisciplinary applied research. A dedicated digital portal will inform the research community about ongoing research opportunities in this region. Additionally, launching TechnoParks & Regional Research Centers will empower universities to develop market-ready solutions tailored to regional challenges.



Figure 6.1 Countries within the Khwarizmi-Ibn Sina Knowledge Corridor

6.2 METHOD

6.2.1 Qualitative Analysis

To identify current challenges in higher education and scientific research, several discussion sessions were conducted with university researchers and administrators from Türkiye, Pakistan, Uzbekistan, Kazakhstan, Iran, and Iraq. Additional sessions were held with representatives from American universities to explore their approaches to domestic and international scientific research collaboration. Experts from think tank organizations & the diplomatic community in Washington, D.C. and New York were also consulted to examine the global implications of the proposed knowledge corridor.

6.2.2 Comparative Analysis

Iran, Pakistan, and Türkiye came together in 1985 to establish the Economic Cooperation Organization (ECO). It aimed to enhance economic development among its member states. This membership was expanded in 1992 to include Afghanistan, Azerbaijan, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan. ECO member countries established the ECO Science Foundation (ECOSF) to provide scientific advisory services to the member countries. Similarly, the ECO Educational Institute (ECOEI), founded in 1998, aims to promote educational cooperation and strengthen academic and training activities among its members. Publications of ECOEI provided valuable insights into the current challenges of education and research collaboration (Biltekin, 2023).

This chapter proposes the Khwarizmi-Ibn Sina Knowledge Corridor, encompassing all member countries of the ECO, along with Iraq and Syria. Historically, this region was a powerhouse of knowledge. Baghdad, now in Iraq, was a global hub of knowledge and innovation nearly a thousand years ago. Similarly, modern-day Syria was home to

renowned scholars like Al-Farabi, whose contributions left a lasting impact on the world.

6.3 FINDINGS

The region encompassing Afghanistan, Azerbaijan, Iran, Iraq, Kazakhstan, Kyrgyzstan, Pakistan, Syria, Tajikistan, Türkiye, Turkmenistan, and Uzbekistan is home to over 1,900 universities, serving a collective population of more than 540 million people. According to 2025 QS World University Rankings (QS Ranking, 2025), none of these universities are ranked in the top 150 universities in the world. Moreover, only 48 of these institutions are ranked among the top 1,000 universities in the world. Most universities in this region are teaching institutes rather than research universities. Many of these universities are private and have been established in the last three decades to meet the growing demand for higher education due to population growth. Many of these newer institutions, particularly private universities, lack a strategic emphasis on research and innovation. Commercialization of higher education is a profitable business in the region (Durrani, personal communication, August 10, 2024; Malik, personal communication, September 2, 2024).

Universities in the countries mentioned above collectively produce a substantial volume of publications. Most of these publications are driven by departmental promotions rather than solving local challenges through scientific inquiry. An academic title within a university staff is a matter of social prestige. Assistant professors are looking to become associate professors, and so forth. Social and cultural values in this region are very similar, and social importance is given to individuals with higher titles and administrative authority (Tütüncü, personal communication, August 6, 2024).

The quality of education is a key factor behind the lack of innovation and productive applied research (Hussain, personal communication, 4 October 2024). Many teachers are not adequately trained, and courses are often not taught effectively. For example,

problem solving is a critical skill for computer science students; however, it is not given the attention it deserves in many universities. The International Collegiate Programming Contest (ICPC), recognized as the world's most prestigious programming competition for computer science students, held its 48th World Final competition in September 2024 in Kazakhstan. Teams from all over the world competed, but Sharif University of Technology in Iran was the only institution from this region to make it into the top 20. Most universities in the Khwarizmi-Ibn Sina Knowledge Corridor region struggled to perform well, with a few exceptions in Kazakhstan. Hussain (personal communication, 4 October 2024) also notes that talented teachers are leaving the region in search of better opportunities. To tackle this issue, it is crucial to introduce strong incentives that encourage faculty to stay and contribute to improving education standards across the region.

Interdisciplinary research is uncommon in this region, as these universities prioritize student enrollment over research (Anwar, personal communication, 22 August 2024; Durrani, personal communication, August 10, 2024). This teaching-dominated organizational structure hinders the ability to contribute meaningfully to solving regional problems through scientific collaboration and innovation.

Only a small proportion of international students from the proposed Knowledge Corridor member countries choose to study within this region. Uzbekistan stands out, with 78.9% of its students choosing to stay within the region for their higher education. Figure 6.2 illustrates the percentage of outgoing students who opt to study within this region compared to the total number of students studying abroad from each country.

For instance, very few students from Pakistan choose regional destinations for their studies abroad, whereas an impressive 66.6% of outgoing students from Afghanistan pursue higher education within the region. This disparity highlights a significant variation in regional mobility preferences among students from different member countries (Kireçci, 2023).

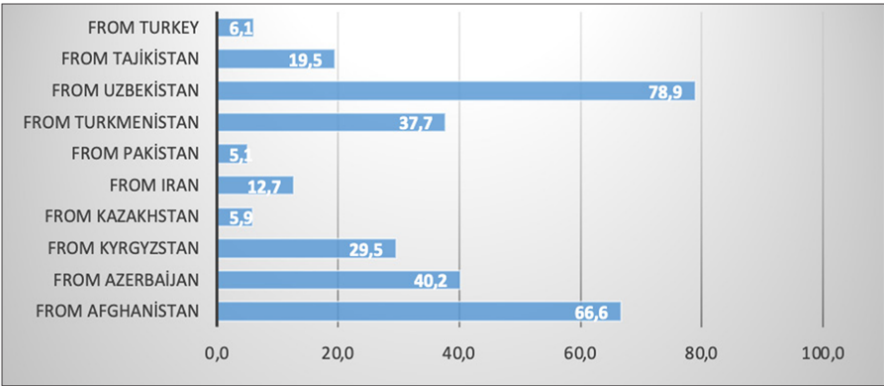


Figure 6.2 Regional student mobility rate within the member countries (Source: Biltekin, 2023)

According to the UNESCO Institute for Statistics (2024), the number of internationally mobile students worldwide tripled between 2000 and 2019, increasing from two million to six million. By 2019, North America and Western Europe collectively hosted 49% of these international students, reaffirming their position as the leading destinations for higher education. While the COVID-19 pandemic may have temporarily disrupted global student mobility, future projections suggest that the number of internationally mobile students could reach 10 million by 2030, highlighting the growing demand for cross-border education.

High-income families from the Khwarizmi-Ibn Sina knowledge corridor region increasingly choose to send their children to study in the United States or European countries. Several factors contribute to this preference, including concerns about student safety, the openness and inclusivity of host countries, and the higher Gross Domestic Product (GDP) per capita (Kireçci, 2023). Additionally, many host countries offer work visas to outstanding students upon completing their degrees, further incentivizing this trend. This dynamic has led to a significant brain drain from the region, as highly skilled graduates often remain abroad to pursue better opportunities, depriving their home countries of valuable human capital.

There aren't many opportunities for students in the Khwarizmi-Ibn Sina knowledge corridor region once they finish their studies. That's why many of them head to the United States of America (USA) or Western Europe for graduate programs. These places make it easier for international students by offering financial aid, which helps them settle in more comfortably. On top of that, advanced tech jobs are easier to find there, giving young people a sense of financial security and career growth. Big companies, especially Fortune 500 ones, are constantly hiring talented graduates from universities in the United States, Canada, the United Kingdom, Germany, France, Switzerland, Belgium, Sweden, and the Netherlands. They rely on the talent from these institutions to create innovative products and services for customers worldwide (Malik, personal communication, September 2, 2024). Take Apple, for example. The company does most of its product research in the USA, but the actual manufacturing happens in China and other East Asian countries. This setup helps them save costs and boost profit margins.

One major challenge in this region is the lack of an exchange program similar to the European Union's Erasmus program, which significantly supports student mobility and research collaboration. Erasmus offers students in participating countries a chance to study abroad while experiencing new cultures and broadening their horizons. Financial grants to the students in the Erasmus program are making the program accessible to students from middle- and low-income families. This support helps make studying abroad a realistic and affordable opportunity (Jakubayeva, personal communication, October 21, 2024). Beyond academics, exchange students often pick up new languages, develop a stronger sense of independence, and build lasting friendships. These experiences shape their personal growth and create connections that can last a lifetime.

Students in the Khwarizmi-Ibn Sina knowledge corridor region aren't aware of the educational opportunities available in neighboring countries. There's no centralized portal where they can explore academic programs or short-term research opportunities across the 1,900 universities in the region. This lack of digital connectivity makes

it harder for research collaboration (Durrani, personal communication, August 10, 2024). For example, Pakistani students have no idea about the advanced mathematical research being conducted in some of the Iranian universities. Research work in mathematics by these Iranian universities is comparable with top-ranked American institutions. Similarly, groundbreaking research in aviation science is happening in Türkiye, while some universities in Pakistan are leading in computer engineering. Uzbekistan is making great progress in automotive engineering (Raza, personal communication, December 2, 2024). Unfortunately, because there's no shared platform to highlight these efforts, students and researchers in neighboring countries remain unaware of these opportunities. This gap holds back potential collaboration and growth that could benefit the entire region.

Most of the universities in this region don't have dual degree programs. A dual degree program is a study path that allows students to earn two degrees from two different institutions, typically in two different countries. Azerbaijan Technical University introduced dual diploma programs in collaboration with universities in Germany, Ukraine, and Türkiye (Vatankhah, 2023). Students can experience different cultures and build professional networks through dual-degree programs. The transfer of credit hours between universities remains a significant challenge due to the absence of a standardized accreditation process. Exchange students studying in the neighboring countries often face difficulties in getting courses completed abroad recognized by their home institutions for graduation. This issue further hampers student mobility across the region (Biltekin, personal communication, December 2, 2024).

The Pak-Turk Researchers' Mobility Grant Program 2017 was a key result of Turkish-Pakistani cooperation aimed at enhancing the internationalization of their higher education systems. The program was implemented by the Council of Higher Education (CoHE) in Türkiye and the Higher Education Commission (HEC) in Pakistan. Its primary objective was to establish new scientific and technological collaborations between Turkish and Pakistani higher education

institutions by supporting the mobility of graduate students and academic staff. As per the decision of the Turkish government, this program is suspended until further notice.

A unicorn company is a privately held company that is evaluated at over USD1 billion. These companies are not listed on any stock market. These startup companies are often the result of interdisciplinary research, driven by the creativity and curiosity of innovative minds. The United States leads the global innovation landscape with 676 unicorns, with a combined valuation of over USD2.2 trillion. China follows with 164 unicorns valued at USD636 billion.

In contrast, Türkiye has only two unicorns, and Uzbekistan has one, while countries such as Afghanistan, Azerbaijan, Iran, Iraq, Kazakhstan, Kyrgyzstan, Pakistan, Syria, Tajikistan, and Turkmenistan currently have none. This disparity highlights the region's innovation gap. Despite a population exceeding 540 million across the Khwarizmi-Ibn Sina Knowledge Corridor, there are only three unicorns in total.

The lack of innovative enterprises in these countries is a major challenge. Governments and think tanks need to take bold steps to shake up the status quo and build a culture of innovation that can compete on the global stage. Table 6.1 clearly shows the scale of the problem, highlighting the urgent need for policies that encourage innovation and stronger investments in research and development (Younus, personal communication, July 31, 2024).

Technoparks, or technology development zones, are specialized areas designed to support high-tech businesses and startups, particularly those focused on research and development (R&D). Located near universities and research institutions, Technoparks in Türkiye offer companies access to academic resources, skilled talent, and cutting-edge technological advancements. These parks play a crucial role in helping Türkiye transition toward a knowledge-based economy by enhancing the country's R&D capacity, facilitating technology transfer, promoting innovation, and supporting new ventures.

Table 6.1 Global Unicorn Club: Private companies valued at USD1B+

Country	Number of Unicorn as of September 30, 2024	Valuation (USD)
United States	676	2,250.00
China	164	636.00
India	71	186.00
United Kingdom	54	188.00
Türkiye	2	5.00
Uzbekistan	1	1.00
Rest of the World	309	722.00

Some of the leading technoparks in Türkiye are İTÜ ARI Teknokent, ODTÜ Teknokent, TÜBİTAK Marmara Teknokent, Bilkent Cyberpark, Ege Technopark, and Hacettepe Technopark. These technoparks host companies from various sectors, including information technology, electronics, healthcare, biotechnology, agriculture, energy, aviation, and defense.

6.4 RESULT AND DISCUSSION

The nations of Afghanistan, Azerbaijan, Iran, Iraq, Kazakhstan, Kyrgyzstan, Pakistan, Syria, Tajikistan, Türkiye, Turkmenistan, and Uzbekistan share a rich cultural history. These countries have been connected through science, religion, philosophy, literature, music, and architecture for centuries. Their shared cultural and religious roots are deeply influenced by ancient civilizations that continue to shape their identities today in the 21st century. These nations share economic ties along with religious and linguistic traditions (Kireçci, 2022). Central Asia, Pakistan, Türkiye, Iraq, Syria, and Afghanistan have experienced significant influence from Turkic cultures throughout history.

This chapter proposes the "Khwarizmi-Ibn Sina Knowledge Corridor", where the initial member countries will be Afghanistan,

Azerbaijan, Iran, Iraq, Kazakhstan, Kyrgyzstan, Pakistan, Syria, Tajikistan, Türkiye, Turkmenistan, and Uzbekistan. Later on, member countries can expand. The Khwarizmi-Ibn Sina Knowledge Corridor will be a strategic initiative for member countries to collaborate on research to address current challenges in academia and stimulate economic growth.

To establish a successful knowledge corridor among the initial 12 countries, a unified framework is essential. This includes standardized processes, procedures, and a legal support structure to ensure smooth operations within the corridor for research and educational collaboration. Government processes within these countries are lengthy and time-consuming, and most of these countries are not in high ranking according to World Bank data for doing business (World Bank Group, 2024, see Table 6.2). Kazakhstan, Türkiye, and Azerbaijan are doing significantly well compared to other countries in terms of doing business. Government organizations have a lot of centralized control in this region, making everything complicated for any initiative to succeed.

Table 6.2 World Bank data for doing business

Country	Country Rank for Ease of Doing Business	Overall Ease of Doing Business Score as of Current Data (0–100)
Kazakhstan	25	79.6
Türkiye	33	76.8
Azerbaijan	34	76.7
Uzbekistan	69	69.9
Kyrgyz Republic	80	67.8
Tajikistan	106	61.3
Pakistan	108	61.0
Iran, Islamic Rep.	127	58.5
Iraq	172	44.7
Afghanistan	173	44.1
Syrian Arab Republic	176	42.0

Iran, Pakistan, and Türkiye founded the Regional Cooperation for Development (RCD) in 1964 to enhance economic, technical, and cultural cooperation among the three member states. This organization was rechristened as the ECO in 1985. In 1992, its membership expanded to include Afghanistan, Azerbaijan, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan. The ECO Region is home to over 470 million people and extends over eight million square kilometers of land. The proposed Khwarizmi-Ibn Sina Knowledge Corridor includes all ECO member countries, along with Syria and Iraq. The Khwarizmi-Ibn Sina Knowledge Corridor connects the north to the south and the south and east to the west.

The ECO member countries established the ECOSF to provide scientific advisory services and foster innovation across the region. Similarly, the ECOEI, founded in 1998, aims to promote educational cooperation and strengthen academic and training activities among its members (Biltekin, personal communication, December 2, 2024). Within the Khwarizmi-Ibn Sina Knowledge Corridor, each country has its own higher education commission responsible for funding, overseeing, and regulating higher education initiatives. While some collaborative efforts have occurred at the level of higher education commissions, they often lack continuity. For instance, Türkiye's Council of Higher Education (CoHE) and Pakistan's Higher Education Commission (HEC) launched a program for joint research, but it was later discontinued.

Universities across the region have taken the initiative to sign memorandums of understanding (MOUs) with one another, showcasing a genuine eagerness to collaborate. Al-Farabi Kazakh National University has signed over 600 MOUs with other universities (Jakubayeva, personal communication, October 21, 2024). However, these efforts often feel disjointed and lack the cohesion needed to drive meaningful progress. Without a centralized administrative framework to coordinate and sustain these partnerships, the full potential of academic and scientific collaboration remains untapped. Building such an administrative structure could be the key to transforming these scattered

ambitions into a powerful, united force for innovation and growth (Raza, personal communication, December 2, 2024).

This chapter proposes the creation of a central administrative body to bring the Khwarizmi-Ibn Sina Knowledge Corridor to life under the umbrella of the ECO. Rather than starting from scratch, existing ECO agencies like the ECOEI and the ECOSF could take on this role. To make this vision a reality, funding will be needed to hire experienced professionals who can lead the effort without creating unnecessary layers of bureaucracy. These individuals will focus on the practical work—developing processes to ensure the knowledge corridor operates smoothly across borders, crafting legal frameworks to formalize research collaborations, and protecting the intellectual property that emerges from joint projects (Raza, personal communication, December 2, 2024).

When designing the processes and procedures for this administrative body, the priority will be to ensure that universities across the 12 countries have as much autonomy as possible to collaborate freely. The goal is to minimize red tape and maximize efficiency, allowing researchers to focus on their work rather than getting bogged down in administrative tasks. A similar approach is seen in the United States, where universities operate with considerable independence, enabling them to partner with other institutions with minimal government involvement. This model allows researchers to dedicate more time to innovation and less to navigating bureaucratic hurdles (Malik, personal communication, September 2, 2024).

The ECOEI has started the initiative to build a portal, StudyinECO.org. This platform will help students explore study opportunities in ECO member countries. This user-friendly portal will bring together all the essential information students need, including details about degree programs, along with tuition fees, scholarships, living costs, health insurance, accommodation, transportation, and even language prep courses (Kireçci, 2023). It's a fantastic initiative to make studying in the region easier and more accessible for everyone.

This chapter suggests expanding StudyinECO.org to include science & technology research opportunities within ECO countries. Beyond

being a repository of information, the platform could evolve into a dynamic hub where students can directly apply to programs and researchers can initiate collaborative research projects. This integration could further enhance academic and scientific collaboration across the region.

The Khwarizmi-Ibn Sina Knowledge Corridor will enable intra-departmental research within the member countries. For example, imagine a civil engineering researcher teaming up with another civil engineering researcher at a different university. This kind of partnership allows researchers to dive deeper into their area of expertise and make more significant progress in their field.

The Khwarizmi-Ibn Sina Knowledge Corridor will solve the main academic issue in this region: interdisciplinary research. Interdisciplinary research is a collaborative approach that combines knowledge and methods from multiple disciplines to solve complex problems. It can involve information, data, tools, techniques, perspectives, concepts, and theories from two or more disciplines. The lack of interdisciplinary research is a real blocker for solving common problems through scientific research in this region. American and European universities have figured out that they need to do inter-departmental research to solve humanity's challenges (Khan, personal communication, 3 October 2024).

Environmental science combines disciplines like geology, chemistry, physics, ecology, and oceanography to solve environmental issues. Knowledge management combines studies from computer science, economics, information systems, organizational behavior, philosophy, psychology, and strategic management. Material science covers the scientific and engineering aspects of materials. It covers the design and application of new materials by incorporating physics, chemistry, and engineering.

Modern medicine is the best example of interdisciplinary research and collaboration, in which new devices are being developed through collaboration in medicine, physics, mathematics, and engineering.

Dual degree programs can be beneficial for interdisciplinary research between two universities. Students can gain broader skills and more diverse academic experience. Azerbaijan Technical University introduced dual diploma programs in collaboration with universities in Germany, Ukraine, and Türkiye. These programs have greatly facilitated the growth of student mobility (Vatankhah, 2023). Similar dual-degree programs can be replicated at other universities in this region. It will require the implementation of a quality assurance mechanism and accreditation system to maintain high educational standards across the knowledge corridor member countries.

There has been an increase in the number of universities in this region for the last three decades. There is more demand for higher education due to population growth, and the private sector has contributed to establishing new universities. Most of these new universities are teaching universities whose focus is student enrollment and offering various programs (Durrani, personal communication, August 10, 2024). As departmental promotions are linked with the number of publications, this region has produced a significant number of publications recently. While the number of publications has increased, we have not seen a correlation between patents and product development. There is a need to focus on applied research that contributes to society and facilitates the economic development of local communities. The solution to the local problems will attract private businesses to fund those research activities (Khan, personal communication, 3 October 2024). World Bank and Asian Development Bank can fund these research activities with the central government's assistance. Universities within the Khwarizmi-Ibn Sina Knowledge Corridor have the opportunity to apply for European Research Council (ERC) grants by partnering with universities in Türkiye. This collaboration opens up access to significant funding and resources, enabling researchers to take their projects to the next level (Tufan, personal communication, November 30, 2024). The Human Development Index (HDI) will improve in this region with research

activities focusing on solving local problems. Interdisciplinary research is critical for solving local and regional problems.

Many researchers believe that a lack of funding is the main obstacle to research and innovation in this region (Anwar, personal communication, 22 August 2024). While this may be true to some extent, this chapter argues that applied research focused on local challenges could attract private investment. Venture capital is flowing globally, with companies in the Far East pitching ideas to investors in places like New York and San Francisco. As long as research ideas have business potential, funding can be found. Access to capital is much easier now than it was 30 years ago.

The Higher Education Commission (HEC) of Pakistan has established several National Centers, each comprising consortia of labs from multiple universities across the country. These centers aim to strengthen national capacity for research and development (R&D) in modern technologies and provide solutions to local challenges through a startup-oriented mindset. The national centers include the following:

- (1) National Center for Cyber Security (NCCS)
- (2) National Center of Robotics and Automation (NCRA)
- (3) National Center in Big Data and Cloud Computing (NCBC)
- (4) National Center of Artificial Intelligence (NCAI)
- (5) National Center for Livestock Breeding, Genetics & Genomics (NCLBG&G)
- (6) National Center of GIS and Space Applications (NCGSA)
- (7) National Center of Industrial Biotechnology

By involving universities from across the Khwarizmi-Ibn Sina Knowledge Corridor in these national centers (such as the one shown in Figure 6.3), collaboration and innovation could really be boosted (Khan, personal communication, 3 October 2024). These centers should be elevated to a regional level, encouraging universities from different countries to work together on shared problems and create solutions that truly benefit the entire region.

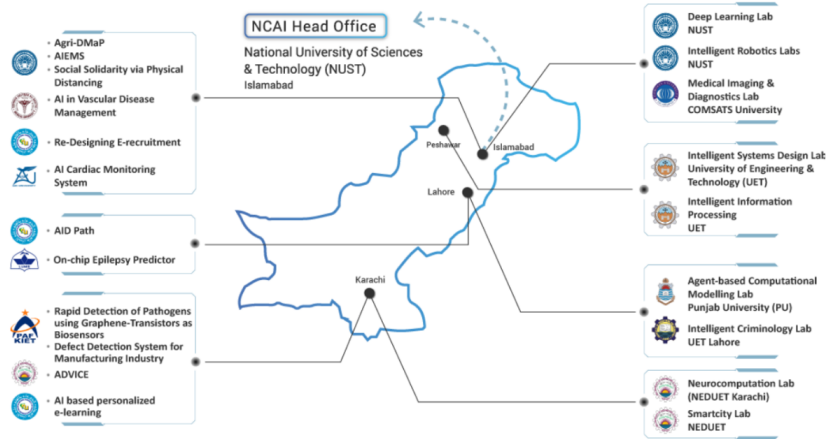


Figure 6.3 National Center of artificial intelligence

The next 25 years are all about automation and the use of artificial intelligence (AI) to improve quality of life. Since 2012, significant progress has been made in AI for commercial use. AI is not a new subject, but since 2012, commercial AI software products have been solving problems using a minimal workforce. In the past, research teams needed a lot of AI specialists to build and train AI models. Now, with the help of commercial AI products, human resources requirements have decreased considerably. Cloud computing has made access to hardware infrastructure easier for research organizations. This chapter proposes leveraging AI through interdisciplinary research to solve local problems. AI is projected to boost global GDP by up to 7% (equivalent to USD7 trillion) over the next decade. This increase in global GDP is driven by increased productivity across various sectors due to automation and improved decision-making through AI. Two thirds of occupations could be partially automated by AI over the next decade. Member countries of the Khwarizmi-Ibn Sina Knowledge Corridor should start investing in AI. Universities should help local businesses to solve their productivity challenges through AI-enabled automation (Hussain, personal communication, 4 October 2024). This strategic change can boost the GDP of this region tremendously. Iran can play a

vital role in this strategic change, as its AI capabilities in universities are among the most advanced in the region.

Technoparks or technology parks are critical components of research and innovation, achieved through the collaboration of universities and competitive businesses. The technology Park concept was initiated in 1951 with the Stanford Research Park, which later became Silicon Valley's cornerstone. By February 2022, Türkiye had 92 technoparks, with 16 more under construction. They've become an important source of employment and innovation in the country. Technoparks contribute to solving national and regional problems by increasing employment and reducing brain drain. Technoparks breathe new life into struggling industrial areas and help turn university research into practical solutions. They support companies by boosting their R&D efforts, improving workforce skills, and creating a solid environment for entrepreneurs to thrive. For new tech startups, they offer the tools and guidance needed to get off the ground and succeed. Therefore, it is crucial to establish technoparks in the Khwarizmi-Ibn Sina Knowledge Corridor member countries. While some of the countries are establishing their technopark structures, they can work with other countries like Türkiye, Kazakhstan, and Pakistan, where technoparks are more established. The University of Michigan generated 580 inventions, 145 new USA patents, and more than 300 license and option agreements with the industry in 2023. The university launched over two dozen new startup companies, with projects spanning from bioinformatics to autonomous vehicles; all of this work is helping humanity and boosting the economy (Malik, personal communication, September 2, 2024). The University of Michigan alone has more productive research than all of Pakistan, a country with 250 million people.

Researchers within the Khwarizmi-Ibn Sina Knowledge Corridor need government support to make travel between member countries easier (Hussain, personal communication, 4 October 2024). Ideally, visa requirements should be waived, but if that's not possible, the process must be simplified, faster, and more affordable for the research

community. Additionally, member countries should provide travel grants and accommodation allowances to ensure researchers can focus on their projects without worrying about financial burdens. Creating opportunities for regional students to gain work experience is essential, allowing them to recover part of their investment in education (Hussain, personal communication, 4 October 2024). Many of these students may choose to stay and become valuable contributors, helping to boost the economy and foster innovation over time.

When students and researchers connect with people from different backgrounds, they gain so much more than knowledge. Diverse environments provide students the chance to build strong relationships, broaden their views, and spark innovation through collaboration. American universities are a wonderful example of how diversity drives success (Jakubayeva, personal communication, October 21, 2024). Google was born at Stanford University thanks to an American and a Russian researcher working together, while YouTube was founded by a Bangladeshi-German, a Taiwanese, and an American after their undergraduate degrees. These stories show what can happen when curious, diverse minds come together.

Common language allows researchers to share their knowledge, collaborate on projects, and understand complex problems. English has become the global common language of science and technology, facilitating collaboration and innovation. As the British Empire expanded, English emerged as the preferred language in many of its colonies, contributing to its evolution into a global common language for academic and scientific discussions. Member countries of the proposed knowledge corridor need to ensure that students receive English language education from elementary schools. Private elementary schools in these countries teach their students in English, but public schools only teach young students in local languages. Local languages are essential to society, but English should be taught at elementary school levels to excel in science and technology in the 21st century.

Asia's focus on infrastructure connectivity is epitomized by China's Belt and Road Initiative (BRI), often referred to as the "New Silk Road" of the 21st century. Launched in 2013, this ambitious project links East Asia to Europe through an extensive network of land-based infrastructure. Since 1978, China has significantly improved its Human Development Index and invested heavily in research and development, driving its GDP to an impressive USD19 trillion. The twelve member countries of the proposed Khwarizmi-Ibn Sina Knowledge Corridor hold strategic geographic importance within the BRI framework. Now is the time for these countries to prioritize scientific research and invest in human development. They can unlock the region's potential for collective growth and prosperity by supporting one another.

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