

Article

A Transformative State in the Wake of COVID-19: What Is Needed to Enable Innovation, Entrepreneurship, and Education in Qatar?

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Abstract: Economic diversification is vital in achieving sustainable economic development, especially for countries relying on nonrenewable natural resources, such as oil and gas, in the case of the Gulf Cooperation Council (GCC) countries. Moreover, the global crisis caused by the COVID-19 pandemic underscored the significance of boosting resilience to adverse shocks. Indeed, the pandemic highlighted the need to promote nonhydrocarbon sectors by strengthening the fundamental pillars of the knowledge-based economy: ICT, innovation, R&D, education, entrepreneurship, and the economic and institutional regime. The COVID-19 pandemic has also shown how important it is to mobilize these pillars in record time. Like the other GCC countries, Qatar is seen as a transformative state, suggesting that, although oil and gas provide its primary export revenue, the government has also pushed to diversify its economy toward a knowledge-based one. Indeed, in 2019, hydrocarbons dominated Qatar's economy, accounting for 90% of government income and 80% of export profits. However, this reliance exposes Qatar to fluctuations in the global oil and gas markets. Accordingly, economic diversification has come to the top of the government's priority list. Preceding the COVID-19 pandemic, Qatar was already in the middle of an economic transition. The economic crisis caused by the pandemic and the drop in oil prices prompted the Qatari government to increase its diversification efforts. Qatar has a solid basis for transitioning to a knowledge-based economy based on its macroeconomic stability, suitable growth rates, and good governance. However, Qatar confronts several challenges in implementing the structural changes necessary for this transition. This paper has three objectives. Firstly, it aims to present the pillars of the knowledge-based economy and their link to the COVID-19 pandemic. Secondly, the paper aims to analyze the present state of the knowledge-based economy in Qatar, including its strengths, drawbacks, and its prospect for the future. Finally, the paper presents some structural reform recommendations to enable innovation, entrepreneurship, and education in Qatar.



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1. Introduction

Since no economy can be sustainable unless it constantly adjusts to changing conditions [1], economic diversification is vital in achieving sustainable economic development, especially for countries relying on nonrenewable natural resources, such as oil and gas, in the case of the Gulf Cooperation Council (GCC) countries [2,3]. Indeed, economic diversification is a critical component of sustainable development since it improves macroeconomic stability and fosters structural and long-term change in the economy and other development pillars such as social institutions and dimensions [4]. Although hydrocarbon sectors continue to drive economic growth in the GCC, concerns about the sustainability of resource-reliant models have arisen due to systemic shocks, resource depletion, and changing demographics and consumer preferences [5]. Fluctuating oil markets and the

rapid pace of the energy transition have challenged the idea that oil incomes are enough to sustain oil economies in the near to medium term [6]. For the GCC economies, sustainability involves adapting to changing conditions, keeping prior advances in income per capita for their citizens, and perhaps reducing the gap with the wealthiest countries [1]. GCC nations are aware that economic diversification is required not simply because of the severe oil price collapse since 2014, but also because the 'oil age' is ending [7]. Economic diversification may help countries reduce their exposure to recessions, market fluctuations, and technology changes, increasing their resilience to external shocks [8]. Overall, it is commonly maintained that diversified economies are more sustainable than the oil-exporting countries in the Gulf [1].

As a result of the combined impacts of globalization, new technologies, free trade and investment, societal changes, and development imperatives, economic diversification has become a primary objective on the GCC's political agenda since the 1990s [9–11]. The majority of the GCC countries' national visions and economic development strategies (e.g., Qatar National Vision 2030, Kuwait Vision 2035, Oman Vision 2040, and Saudi Vision 2030) seek to shift away from oil and gas and toward knowledge-based economies with solid and sustainable foundations [10]. They emphasized the necessity of encouraging nonhydrocarbon sector development through developing ICT, innovation, R&D, education, entrepreneurship, and the economic and institutional regime, which are considered the fundamental pillars of the knowledge-based economy [12,13]. The concept of the knowledge-based economy refers to the growing reliance of industrialized economies on knowledge, skilled labor, and innovation. While definitions of the knowledge economy vary, the underlying notion emphasizes the importance of managing intangible assets instead of raw resources. Indeed, knowledge is a sustainable asset that grows in value rather than depreciates with use. Furthermore, the knowledge-based economy has been connected to projected positive impacts on economic development and productivity, income, environmental sustainability, social cohesion, and gender equality [12]. In today's increasingly competitive global economy, building a knowledge-based economy has become necessary to support sustainable development [14].

Located in the Arabian Peninsula, Qatar is a small country covering an area of 11,437 km² and has a population of 2.723 million as of September 2020 [15]. Qatar is a small oil producer, but with 12.4% of the proven global gas reserves, it ranks third behind Russia and Iran [16]. These massive gas reserves have placed Qatar as the world's fifth largest gas producer, second largest gas exporter, and largest liquefied natural gas (LNG) exporter [17]. As a result, hydrocarbons remain the backbone of Qatar's economy, accounting for 80% of exports and 90% of government revenue in 2019, as there is presently no form of taxation in Qatar [17,18].

Like the other GCC nations, Qatar was hit twice by the COVID-19 outbreak. Low oil prices weaken external balances, and budgetary pressures in higher-debt nations are visible [19]. Containment measures saved lives, but they also caused domestic demand and supply shocks [20]. Qatari authorities have taken various initiatives to mitigate economic loss, including tax packages, cash infusions into the banking sector, etc. With the pandemic resulting in massive government spending to deal with the resultant health and economic consequences, there were concerns about how this may affect long-term economic development objectives [21]. Further, the pandemic's consequential economic crisis and oil price drop forced the government to intensify its diversification efforts. A renewed sense of urgency has arisen around diversification [22]. Moreover, the current COVID-19 pandemic has undeniably acted as a significant test of its digital technology to date. In this regard, the whole GCC area has demonstrated considerable digital resilience [23]. The global crisis caused by the pandemic underscored the significance of boosting resilience to adverse shocks. Further, countries and organizations must cope with the consequences of globalization, technological transformation, and mandatory digitalization, which forces entrepreneurs to demonstrate remarkable resilience. The COVID-19 pandemic has also

shown how important it is to mobilize the knowledge-based economy's pillars in record time [24].

The pandemic has heightened the need for Qatar to reduce reliance on oil, boost economic diversification, improve private sector competitiveness, and emphasize the negative consequences of doing so if reforms are postponed [20]. Since 1995, the Qatari government has continuously invested, reorganized, and implemented effective governance and regulatory systems. Simultaneously, Qatar has made significant investments to improve the state of ICT, education, innovation, and entrepreneurship, as shown by progressively good results in important international indices published by a variety of international organizations [25]. As a result, Qatar is seen as a transformational state, implying that, although oil and gas production supply the majority of its export earnings, the government has tried to diversify its economy toward a knowledge-based one [18]. Qatar has a strong foundation for shifting to a knowledge-based economy, thanks to its macroeconomic stability, appropriate growth rates, and good governance [26].

Additionally, the economic crisis created by the COVID-19 pandemic could be an opportunity to boost diversification efforts toward a knowledge-based postoil economy. However, implementing a knowledge-based economy is challenging for all countries, particularly for small ones such as Qatar, given the obstacles associated with its size [27]. This transformation faces a range of challenges that need to be resolved by applying systemic reforms regarding the different pillars of a knowledge-based economy.

This paper has three objectives. Firstly, it aims to present the pillars of the knowledge-based economy and their link to the COVID-19 pandemic. Secondly, the paper aims to analyze the current state of the knowledge-based economy in Qatar, including its strengths, drawbacks, and its prospect for the future. Finally, the paper presents some structural reform recommendations to enable innovation, entrepreneurship, and education in Qatar.

2. The Knowledge-Based Economy and the COVID-19 Pandemic

Classical and neoclassical economists acknowledged labor and capital as production factors, whereas knowledge, education, and intellectual capital were all considered external elements, meaning that they were determined outside of the system and might alter it. With the work of Solow, Lucas, and Romer, the "new growth theory", or "endogenous growth theory", claims that the driving factor behind economic development is technological progress [28]. Further, according to these theories, growth is generated by the growing rewards associated with new knowledge. Romer [29] modified the neoclassical growth model by including technology and knowledge as endogenous forces in the economic system. He highlighted that technological change gives an incentive to maintain capital accumulation, and capital accumulation and technological change combined account for a large portion of the rise in productivity [30]. According to Romer [30], the emergence of new technology may serve as a technical platform for future innovation, and the influence of this technological platform is critical to economic growth. Furthermore, new growth theories have shown that knowledge is a precious component in production, considering the unique properties of information and knowledge as sustainable assets that grow in value rather than depreciate with use [31].

With these notions in mind, various international institutions, such as the OECD and the World Bank, have included the concept of a "knowledge-based economy" in their work and reports since the 1990s. The knowledge-based economy describes countries where wealth is generated primarily by producing goods and services with significant intellectual content rather than natural resources or industrial-era manufacturing processes [32]. One of the most widely accepted definitions of a knowledge-based economy states that it is: "... production and services based on knowledge-intensive activities that contribute to an accelerated rate of technological and scientific advance as well as equally rapid obsolescence. The key components of a knowledge-based economy include a greater reliance on intellectual capabilities than on physical input of natural resources, combined with efforts to integrate improvements in every stage of the production process." [32]

(p. 199). Chen & Dahlman [33] defined it from a systemic standpoint as the economy “that utilizes knowledge as the key engine of economic growth. It is an economy where knowledge is acquired, created, disseminated and used effectively to enhance economic development” (p. 4). While definitions of the knowledge economy vary, the underlying notion emphasizes the importance of managing intangible assets instead of raw resources. Indeed, knowledge is a sustainable asset that grows in value rather than depreciates with use [34,35].

According to the OECD [36], in the era of the knowledge-based economy, the production of economic value will result from sustained investments in (1) research and development (R&D) and techno–scientific innovation; (2) human resources training and education; (3) new and more efficient forms of organization and management of work. Knowledge economies arise when advanced scientific and technological research platforms, entrepreneurial business activities, and creative thinkers come within a specific place. High-performing knowledge economies generally have a well-educated and well-trained workforce, quality research institutions and infrastructure, an entrepreneurial business climate, an enabling legal environment, and a culture that values learning, creative expression, and risk acceptance [35]. Consequently, many scholars established that ICT, innovation, R&D, education, entrepreneurship, and the economic and institutional regime are fundamental pillars and dimensions of the knowledge-based economy [12].

- ICT investment and use: the term “knowledge economy” refers to the growing importance of ICT in various industries. Many views see ICT as the primary driver of a fundamental techno–economic transition toward a knowledge economy. The ICT sector stimulates development, innovation, entrepreneurship, and employment creation [37–39].
- Human resource skills and knowledge are critical to a country’s transition towards a knowledge-based economy. A well-educated and highly skilled labor force is critical for knowledge-economy success. Human capital accumulates throughout time due to investments in education and training [40]. Human development is vital for nations such as Qatar that are pursuing a significant transition from a resource-based economy to knowledge-based, sustainable development [5,41].
- Knowledge: knowledge production, R&D, creativity, and their practical use are the core features of a KBE and prerequisites to all types of innovation [12].
- Entrepreneurship: greater levels of entrepreneurship in reaction to fast technological change and prospects for innovation. Entrepreneurship is one of the most dynamic paths to socioeconomic change and growth. It is inextricably linked to private-sector development strategies, micro-, small-, and medium-sized (SME) business policies, job creation, innovation, and competitiveness [42]. Further, private firms, particularly SMEs, have been identified as critical and effective ways of supporting healthy economic diversification, boosting economic growth, and guaranteeing equitable income sharing and distribution [2,43].
- Economic and institutional regimes offer excellent economic policies and structures that allow for efficient resource allocation and utilization and stimulate innovation and incentives for efficient production, distribution, and integration of existing knowledge. Policymakers play a vital role in transitioning to a knowledge-based economy by developing an advanced ecosystem with sufficient ICT infrastructure, a highly sustainable business environment, and a lifetime learning system [44].

These pillars are interlinked, and investments in—and adequate performance on—each is considered a prerequisite for achieving a prosperous knowledge economy. Besides, creating a knowledge-based economy requires a well-trained and educated workforce, a “knowledge-conducive” economic environment, and an innovation system capable of developing, utilizing, and implementing knowledge to produce new products, methods, and knowledge [27].

Despite the economic hurdles brought on by COVID-19, the pandemic has shown how important it is to mobilize the knowledge-based economy’s pillars in record time [24].

Firstly, as a critical factor in the battle against COVID-19, ICT has thoroughly demonstrated its utility and made a difference to maintain connectivity among states, institutions, and individuals [20]. Companies raced to adopt digital and automation technologies, significantly speeding up trends occurring much slower before the crisis. Work went remote; shopping, entertainment, and medicine became more accessible online; and companies worldwide raced to implement digital systems to keep up with these changes [45]. Indeed, the COVID-19 crisis highlighted the crucial role of ICT through remote work, online education, and e-commerce for societies' continued functioning [46]. Digitization has stepped up to fill the gaps left by mandatory shutdowns and societal distancing policies [47]. The pandemic has illustrated digital innovation's value in building resilience [48].

Moreover, countries and organizations that adopt digital technologies have greater flexibility in adversity, allowing them to rebound quicker and more effectively [47]. The ICT industry will become even more relevant to a digital economy in a postpandemic world. The movement to digital technologies pushed by the COVID-19 epidemic will probably recover, with customers shifting to online shopping, schools and universities turning to online learning, banks moving to remote services, and offices arranging more remote work [49]. For example, the widespread adoption of digital financial solutions, which was previously expected to take years, was shortened to just a few months due to the global pandemic. The issues posed by COVID-19 have necessitated the need for accelerated adoption of digital financial services, providing significant opportunities for FinTech firms [50]. Additionally, as indicated by Iandolo et al. [51], big data and AI analytics have assisted the establishment of the virus chain by the Chinese government.

Secondly, the COVID-19 pandemic has also shown how important it is to have a substantial R&D capacity and proven skills deployed in the short term on new and unforeseen issues. These skills can be called upon from where they are located in various industries, universities, etc. Hence, basic research is necessary to answer society's fundamental problems, regardless of the level of economic development [24]. Innovation will also have a vital role in postpandemic recovery [52]. Innovation will be essential to take advantage of the opportunities that will emerge from the COVID-19 crisis: new business models, new client expectations, new market realities, etc. [53]. Moreover, scientific co-operation in developing vaccines and other medical treatments increased and expanded. International R&D developed practical knowledge rapidly to produce innovative medicines that address urgent needs. However, the epidemic also exposes significant disparities throughout the world. Researchers and companies in high-income nations with the strongest R&D capabilities dominated R&D networks for generating vaccines and cures [54].

Thirdly, education was another component of the knowledge economy mobilized to combat and defend against COVID-19. The education system must mobilize young people of all ages to develop attitudes relating to hygiene in individual and group behavior in disasters. It also provides the foundation for pupils and students to feel comfortable and fully operational in the digital economy and the knowledge society. Education will teach how to be creative and inventive in finding solutions to protect, communicate, create solutions, and lay the foundations for future operators and researchers capable of launching start-ups and discovering original solutions [24].

Finally, the pandemic has shown the crucial role of institutions in organizing the battle against COVID-19 and, especially, mobilizing all the knowledge sources [24]. Furthermore, the knowledge-based economy may reduce the COVID-19 pandemic's long-term economic effects. These changes in consumer behavior and business structure will continue in industrialized countries after the epidemic, although not with the same intensity as during the crisis. Higher productivity, efficiency, and innovation offer substantial advantages [45].

3. The Current Qatari Economic Context and the State of the Economic Diversification Policies

Before the advent of oil, Qatar's economy relied almost exclusively on fishing, pearling, and commerce. The exploitation of Qatar's oil fields began in 1949 after discovering the

Dukhan Field. During the 1950s and 1960s, several new offshore and onshore oil fields were discovered [55]. Since then, revenues from oil exports have increased exponentially and have largely underpinned Qatar's economy [56]. Since the early 1990s, Qatar has invested heavily to raise hydrocarbon production, especially in liquefied natural gas (LNG) [57]. Qatar pioneered LNG-production technology and is considered the global leader in LNG exports, with a 30% global market share in 2016 [58]. While Qatar has the lowest fiscal break-even oil price among the GCC nations at \$45.40 per barrel, it is not entirely invulnerable to the possibly lasting low oil prices, which ranged around \$38–39 in 2020 [13]. Qatar, which relies heavily on oil-linked contracts, has suffered a significant drop in gas export profits. Thus, the current economic state is not sustainable.

The recent collapse in oil prices presents a significant threat to the economy of Qatar, especially for oil-linked LNG contracts. After a 12% rise, the world's fastest growth rate between 2008 and 2012, growth plunged from 4.4% in 2013 to 2.6% in 2019 [17]. Qatar has moved from a fiscal surplus of 10.3% in 2015 to a deficit of 4.07% of GDP in 2016, the first in 17 years, and government debt has grown from 35.8% to 47.6% of GDP in the same years [59]. In 2020, with the sharp drop in hydrocarbon revenues due to the COVID-19 pandemic, Qatar experienced its first contraction in a generation in 2019, albeit by only -0.2% , and the fiscal balance is expected to swing sharply into deficit. The impact of COVID-19 is set to see the demand for natural gas fall by 4% during 2020. National lockdowns and social distancing measures applied worldwide have led to a dramatic decline in natural gas consumption [60]. Due to a strong reliance on oil-linked gas contracts, Qatar has witnessed a significant effect on export revenues. The country's overall exports decreased by 42.8% in June 2020 compared to 2019. Hence, Qatar's government ran a 100 million \$ budget deficit in the first quarter of 2020 [17]. There is also uncertainty in the LNG market, with fears of oversupply with new reserves coming from Australia and the USA, challenging Qatar's position [61] (Figure 1).

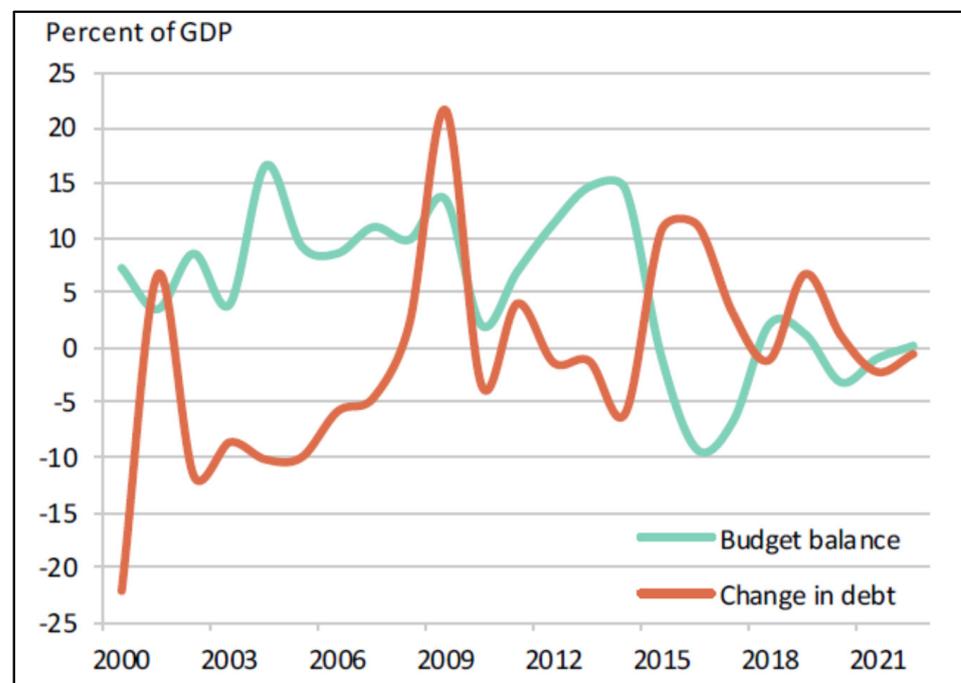


Figure 1. Public finances and debt in Qatar (2000–2021). Source: World Bank [17].

Given the classic oil-based economy limits, Qatari leaders believe that the country needs a long-term strategy to diversify its economy and minimize its dependence on hydrocarbons [62]. The economic diversification process accelerated with Qatar National Vision, Qatar 2030, followed by two National Development Strategy five-year plans by the General Secretariat for Development Planning (GSDP) (GSDP, 2011, 2018). Qatar 2030, the

long-term national strategy, was released in July 2008. It aims “at transforming Qatar into an advanced country by 2030, capable of sustaining its own development and providing a high standard of living for all of its people for generations to come” [63] (p. 2). Qatar 2030 identifies the country’s long-term priorities and offers a context through which policies and action plans can be established. The strategy rests on four inter-related and mutually reinforcing pillars of development: environmental, economic, human, and social (Table 1).

Table 1. Qatar 2030 Pillars.

Economic Development	Social Development
<ul style="list-style-type: none"> • This pillar seeks to build a sustainable and diversified economy capable of addressing the demands of and maintaining a high quality of life for its people now and in the future. • The national vision will manage the Qatari economy, establish a compromise between a knowledge-based and oil-based economy, draw further investors, increase competitiveness, and promote development. 	<ul style="list-style-type: none"> • This pillar aims to create a fair and supportive society founded on strong moral principles and to be willing to play a significant role in the partnership for sustainable development. • It requires a social welfare and protection system and women’s empowerment by offering equal opportunities for all people in different fields such as education and employment.
Human Development	Environmental Development
<ul style="list-style-type: none"> • Qatar 2030 aims at educating all Qatari citizens so that they can sustain a prosperous society. • This involves a high-standard educational system and a modern healthcare system. 	<ul style="list-style-type: none"> • To ensure a compromise between developmental needs and environmental preservation for future generations. • It involves managing the environment based on harmony between social development, economic growth, and environmental protection.

Source: GSDP [63].

Qatar’s National Vision (Qatar 2030) calls for programs and initiatives to support sustainable development for future generations. Following Qatar 2030, the government established a large phase of cross-sectoral consultations, analyses, and discussions. In March 2011, Qatar’s National Development Strategy 2011–2016 was introduced. The aims and projects outlined in this plan are congruent with the Qatar 2030 objectives, and they seek to (1) identify the essential development goals and obstacles; (2) define strategic initiatives linked with Qatar 2030 priorities; and (3) promote strategic coherence in national development planning and budgeting by transitioning from ad hoc development programs to long-term, result-based planning [64].

A key focus has been to create a highly participatory and inclusive mechanism to facilitate a national-development-planning culture across all government agencies and other development stakeholders. The strategy was prepared to define concrete steps and results to resolve obstacles and advance Qatar 2030 objectives [25]. The second National Development Strategy (2018–2022) (NDS-2) [65] objectives complement the first strategy. It aims at “Sustaining economic prosperity through economic infrastructure development, economic diversification, and private sector development, and management of natural resources; promoting human development through a comprehensive and integrated healthcare system, quality education and training, efficient and committed workforce; and a sound social development through social protection, public security and safety, cultural enrichment and sports excellence. It also seeks to achieve a sustainable development that preserves the environment” [65].

Furthermore, plans for diversifying the Qatari economy were given a sharp boost after the Blockade of 2017. On 5 June 2017, Egypt, the United Arab Emirates, Saudi Arabia, and Bahrain declared the cut of diplomatic ties with Qatar and announced a land, air, and sea embargo against it. The four countries accused Qatar of supporting terrorist movements,

maintaining close relations with Iran, and interfering in their internal affairs [66]. Since a large portion of Qatar's food and other necessities of daily life are imported from or through Saudi Arabia and the UAE, the sudden suspension of trade revealed Qatar's high dependence on imports and shocked the economy [67]. In 2019, the IMF reported that Qatar had effectively dealt with the economic effects of declining oil prices in 2014–2016 and the continuing blockade in 2017. Qatar's domestic production and diversified supply chains have been improved effectively since 2017, thus growing resistance to external shocks [68]. As a result, the transition to a knowledge-based economy is driven by a desire to diversify the economy to minimize Qatar's reliance on hydrocarbons, as stated in Qatar 2030 and Qatar's National Development Strategies [64,65].

4. The Key Strengths and Drawbacks of Qatar's Knowledge-Based Economy

Qatar's transition to a knowledge-based economy is primarily the result of consolidated top-down economic policies by advancing ICT infrastructures; promoting entrepreneurship, R&D, and innovation; and modernizing the education system [25,69]. Indeed, government actions have influenced a variety of facets of the knowledge-based economy. As mentioned by Rubin [70] "Qatar has set the bar high with its goal of becoming a knowledge-producing economy at record speed. However, the country holds some strong cards: a clear vision, highly committed leadership, and abundant resources to devote to the cause". Nonetheless, the advancement of Qatar's knowledge-based economy is hampered by several constraints, including a lack of qualified human resources due to the education system's meager performance, a fear of failure that hampers entrepreneurial activities, and poor performance of the innovation system. In the next section, we will examine the key strengths and drawbacks of Qatar's knowledge-based economy.

4.1. ICT

ICT is considered a significant sector in Qatar (Ben Hassen, 2020a). Starting in 2004, Qatar's government has implemented various ICT policies and measures to enhance the sector and develop its governance (Table 2). Qatar has made significant investments in state-of-the-art ICT technology, skills growth, ICT products and services, and e-government, which has benefited all fields.

Table 2. Qatar's ICT major initiatives.

2002	Creation of the Information Technology and Communications Committee
2004	Creation of the Supreme Council for Information Technology (ictQATAR)
2005	Adoption of the National ICT Masterplan 2005–2008
2006	Promulgation of the Telecommunications Law
2007	Vodafone Consortium has been chosen as the second network operator in Qatar
2013	Establishment of the National Cyber Security Committee (NCSC)
2014	Adoption of the National Cyber Security Strategy
2014	ictQATAR was replaced by the Communications Regulatory Authority (CRA)
2016	Launch of the Ministry of Transport and Communications

Source: Author's elaboration based on information from organizations web sites.

The first significant move was establishing the ICT Supreme Council (ictQATAR) in 2004 as a regulator and enabler of the ICT sector in Qatar. The National ICT Master Plan 2005–2008 was implemented in 2005 to develop a catalyst for a healthy economy, universalize access to social services, and establish a knowledge-based online society [71]. The plan includes: developing state-of-the-art infrastructure in education, health, government, and business; developing appropriate legal framework; and ensuring information safety and security [71]. With this program in place and to achieve its broad goals, ictQATAR has implemented a series of initiatives: policy reforms; security-related steps; ICT interventions in health care, education, e-government, infrastructure; and deregulation of the telecommunications sector [71]. In 2013, The National Cyber Security Committee (NCSC) was formed to provide a governance mechanism to work collaboratively to resolve cybersecurity issues at the government's highest level. In May 2014, the National Cyber Security Strategy, a

roadmap toward enhancing Qatar's cybersecurity, was adopted [72]. In 2014, ictQATAR was replaced by the Communications Regulatory Authority (CRA). The CRA has two main missions: to promote the development of a digital society through an open and coherent regulatory framework; and to stimulate sustainable competition to foster a fair marketplace and enhance consumer experience [73].

In 2016, the Ministry of Transport and Communications was created to perform several mandates such as (1) supervising and developing the ICT sector to serve the national development requirements; (2) securing and enhancing the quality of ICT technology and building the next generation; (3) raising awareness of the value of ICT and how it can be used safely to improve the living conditions of people and support the digital economy.

These ambitious programs and policies have resulted in Qatar reaching top positions in various indices that depict ICT development. In 2017, Qatar ranked 39th globally on the ICT Development Index (IDI), according to the International Telecommunication Union [74]. In the Global Cyber Security Index (GCI), Qatar ranked third in the Arab world and had advanced eight positions between 2017 and 2018 to reach the 17th position globally [75].

The World Economic Forum's Networked Readiness Index 2020, which examines the impact of information and communications technology on nations' development and international competitiveness, ranks Qatar 38th of 148 developed and developing countries. This ranking recognizes Qatar as the second most networked society in the Arab world [76]. Moreover, as the Ministry of Transport and Communication of Qatar [71] outlined, ICT has increased the quality of products and services, offered access to new geographic markets, enabled better customer relationship management, and offered access to higher-quality raw materials and services.

4.2. Entrepreneurship

As Mehrez [77] highlighted, as Qatar attempts to meet the objectives outlined in the 2030 National Vision and transition from a carbon-export-based economy to a knowledge-based one, the private sector, particularly entrepreneurs, is expected to play a crucial role in this process. Therefore, the development of SMEs has become a priority. Accordingly, since 1997, Qatar has established numerous institutions, incubators, organizations, and funding structures to aid entrepreneurs and create an effervescent entrepreneurship ecosystem, such as the Qatar Development Bank, QBIC, Social Development Center, Silatech, Center for Entrepreneurship (Qatar University), QSTP, Enterprise Qatar, and Qatar Foundation [25,78] (Table 3).

Furthermore, Qatar's hosting of the 2022 World Cup and plans to spend \$16.4 billion on infrastructure and real estate over the next four years are an excellent chance for the government to encourage local innovation and the business sector, and promote the knowledge economy [17]. This gives the private sector a more significant opportunity to participate in the government's projects [79].

Further, the Qatari government is making significant efforts to improve the legal and economic environment to decrease business risk and encourage start-ups [80]. Consequently, start-ups and small- and medium-sized enterprises (SMEs) in Qatar already have access to a robust ecosystem of public assistance from various government departments and organizations. As a result of careful planning, Qatar has identified high-potential industries such as smart manufacturing, fintech, sports-tech, and fashion and design as areas where the private sector can use its capabilities to build global competitiveness and produce new revenue streams [81].

More recently, the COVID-19 pandemic prompted a significant reaction from the Qatari government, which has made efforts to prevent the loss of new and developing businesses while also aiding entrepreneurs in adapting to the new economic reality. Government action to safeguard employees and consumers of new and developing businesses has also been taken, as well as a significant increase in the digital and online delivery of regulations for entrepreneurs [82].

Table 3. The leading entrepreneurship support organizations in Qatar.

Organization	Est. Date	Mission and Goals
Social development Center (Nama Center)	1996	Nama Center helps broaden the opportunities available to young people, develop their capacity, and empower them.
Qatar Development Bank (QDB)	1997	Supporting Qatari entrepreneurs to help contribute to the diversification of the local economy by successful small- and medium-sized businesses able to participate in international markets.
Qatar Science and Technology Park (QSTP)	2005	Enabling an open innovation, research, and entrepreneurship ecosystem.
Injaz Qatar	2007	Creating an SME environment conducive to a creative entrepreneurial spirit and business development helps SMEs achieve business excellence.
Enterprise Qatar	2008	Being the focus of SMEs and the locomotive of Qatar's economic diversification process.
Silatech	2008	Silatech is a global development organization that links young people to economic opportunities and jobs through creative business development and employment programs.
Digital Incubation Center (DIC)	2011	Promoting ICT innovation in Qatar, especially among millennials at early stages.
Bedaya Center	2011	The Bedaya Center gives Qatari young people access to several programs, including career advice, developing employment skills, and entrepreneurship.
Qatar Business Incubation Centre (QBIC)	2013	The QBIC is a special incubation center offering support resources for entrepreneurs that have an idea of starting a new company or are willing to expand an established business.
Center for Entrepreneurship (QU)	2013	Help students and the QU community grow and turn business ideas into successful start-ups.

Source: Author's elaboration based on information from the websites of the mentioned organizations.

These measures and policies contributed to the expansion of entrepreneurial activity in Qatar and the facilitation of the process. From 2016 to 2020, the Global Entrepreneurship Monitor (GEM) data collection provides a comprehensive yet brief assessment of Qatar's entrepreneurial development. There was a noticeable rise in the number of people in Qatar launching or operating new firms [83]. Further, the number of persons in Qatar engaged in early-stage entrepreneurship has consistently climbed since 2017, and the percentage of established firm ownership has hit an all-time high since the benchmark survey was conducted in 2016. Furthermore, the rate of Entrepreneurial Employee Activity has almost doubled since 2019. As the rate of company discontinuation in Qatar decreases, so does the rate of entrepreneurial activity [84].

Consequently, in 2020, Qatar was ranked third in the GCC member states and the MENA region, and eighth globally, according to the National Entrepreneurship Context Index (NECI). GEM launched the National Entrepreneurial Context Index (NECI) in 2018, which measures an economy's entrepreneurship environment. The NECI informs policymakers, practitioners, and other important stakeholders on the overall strength of the entrepreneurial ecosystem [82]. It scored slightly lower than the United Arab Emirates and Saudi Arabia, which ranked fourth and seventh globally, respectively [82]. Moreover, in 2021, start-ups in Qatar received record-level funding, and venture investment in Qatar

reached a new high, with QAR 69 million invested in start-ups, a 92% increase over the previous year's amount [84,85].

Nevertheless, entrepreneurs face numerous obstacles and difficulties in Qatar despite positive regard [76,77,85,86]. New entrepreneurs face high costs in Qatar. Renting, salaries, and the expense of the initial investment in capital and facilities are very high [86]. Firstly, access to finance is a significant barrier for many Qatari entrepreneurs. Indeed, according to the IMF [87], in 2019, SMEs got just 2% of total credit in Qatar, indicating that there is still room for improvement in inclusion and fostering entrepreneurial activity in the country. Indeed, in 2020, financing options for new and expanding businesses via private lenders such as crowdsourcing (3.6) and initial public offerings (IPOs) got the lowest scores from experts [82]. The same year, Qatar ranked 101st worldwide for the ease of getting credit [88]. In fact, business owners are often unable to receive appropriate financing. In Qatar, most new businesses are backed by informal financing channels (e.g., family, relatives, friends, work colleagues, neighbors, strangers, etc.) [86]. In 2020, 74.4% of early-stage entrepreneurs utilized personal funds to fund their business, 28.8% used personal loans, and 14.8% used commercial loans [82].

Qatar's banking culture could explain this problem since most Qatari banks tend to finance more stable projects such as real estate. As clarified by the senior regional economist at HSBC: "Debt and equity capital markets are small and limited to create an obstacle to raising funds for SMEs. At the same time, it is hard to obtain bank loans, given that most banks in GCC states are traditionally unwilling to lend to small, little-known firms, preferring instead the security and predictability of lending to large firms, such as those with state connections" [89].

Indeed, as Khalid Abujassoum, a prominent Qatari businessman, puts forward, there is a fear of investing in start-ups in Qatar and the MENA area in general: "There is, fear, and I think it's natural due to the history of business in this region and how the economy has evolved. In the Gulf, the major business contributors to the economy were traders and merchants, so the whole technology entrepreneurship realm is new. Such fear is natural and understood [90]". Indeed, the most problematic factor for doing business in Qatar is access to financing [59].

Another major obstacle is that of social values and culture. As stated above, business ownership is regarded favorably by Qatari society; however, only as an extra income. Ben Hassen [78] states: "The most common model of an entrepreneur in Qatar is the passive entrepreneur. The entrepreneur has a secured full-time job most of the time in the public sector and has a business to earn extra money. Quitting his job and start his own business as a full-time entrepreneur is risky". This might be explained by the fear of failure, which seems to be a barrier that inhibits many people from establishing their businesses, even though the adult population in Qatar is positive about entrepreneurship. There is a significant disparity between people who aspire to establish a company and those who do so [91].

Additionally, this could be explained by the preference for a career in the public sector. Because of Qatar's economic structure and its public-state ties, the unemployment rate among Qataris is low. Qatar's social contract is founded on a rentier model like other GCC countries [92]. This social contract ensures public-sector jobs. These lifelong jobs are more lucrative than private ones, and they come with a host of privileges, such as shorter workdays and more extended vacations [93]. As a result, Qatari nationals generally do not seek jobs in the private sector. This also diminishes Qataris' desire to become entrepreneurs, especially in full-time businesses, affecting the growth rate of start-ups.

As a result, most entrepreneurs in Qatar are driven by opportunity. They keep their jobs in the public sector but launch a new firm to capitalize on market opportunities [91]. The rentier model prioritizes high-return, low-risk, quick-payback real estate investments and financial speculation above productive investment in high-value-added sectors [94]. Furthermore, Qatari society's sociocultural features influence entrepreneurship. Indeed, conformity defines the culture of Qatar, as for the other GCC countries. Based on con-

sideration of seniority and values, it is a collectivist society. However, entrepreneurship does not tolerate these characteristics because it relies on new concepts and products that continuously contradict old and individualistic attempts to alter certain pre-existing factors [77].

4.3. Education and Human Capital

Education and human capital development have been identified as primary vehicles for addressing national development challenges and essential pillars of Qatar's transition toward a knowledge-based economy [95]. As mentioned in the Qatar National Development Strategy (2011–2016): "As Qatar's economy diversifies more from its reliance on gas and oil, success will increasingly depend on the ability to compete in a global knowledge economy. Educating and training Qataris to their full potential will be critical to continuing progress" [64] (p. 122).

The Qatari government has consistently supported education with significant efforts and investments to build "a modern world-class educational system that provides students with a first-rate education, comparable to that offered anywhere in the world" [63] (p. 13). As a result, from 2016 to 2019, spending on education ranged from QAR 19 bn to 20.6 bn (USD 5.2 bn–5.7 bn) and climbed to QAR 22.1 bn (\$6.1 bn) in 2020 when it was equivalent to 10.5% of total spending [96]. Experts estimated that Qatar had spent about 50 billion dollars on the education sector in the past fifteen years, which has improved the quality of education.

Until the late 1990s, Qatar's education system was outdated and conservative, with no global benchmarking to measure its competitiveness [97]. A rigorous examination of K–12 education in 2001 revealed that the system was unchallenging, heavily relying on rote memory, making many children bored, and giving little chance for student–teacher interaction [98], with little place given to the development of critical thinking or problem-solving skills. Notably, the system was run top-down and lacked collaboration and a cohesive educational goal. In addition, schools were in disrepair, and classrooms were crowded [98].

Qatar has introduced significant education reforms to improve education quality, learning strategies, and skills to fulfill global education standards and its future human resource objectives [98,99]. The program Education for a New Era, designed by RAND in 2001 to revamp the existing educational system at the primary, preparatory, and secondary levels, was the starting point for education reform. RAND proposed three options for the reform: (1) changing the current education system; (2) establishing an autonomous school system; or (3) privatization of education. The Qatari leadership embraced the second alternative when considering the long-term privatization of education [100]. Independent schools were mainly public institutions that had been converted to independent status. This makeover started in 2004 and finished by 2011 [101,102]. It included a major restructure starting at primary school levels, with new curriculum standards, particularly in mathematics, science, English, Arabic, and training programs for teachers. The new act initiated the Supreme Education Council's establishment in 2002 and significant reforms for Qatar University [103].

The reform succeeded in establishing a decentralized education system that gave schools more autonomy with the independent school model [104], and marked improvements in leadership, teaching, and learning [105]. However, the new reform surged several challenges and disadvantages [105]. Ennis (2013) mentioned that the RAND reform was engulfed by uncertainty, culminating in considerable policy incongruity and reversals. Due to an influx of expat teachers, students faced significant social and cultural changes with the reform. Consequently, adaptation to modifications in the curriculum has become more difficult for students. Learning diverse subjects and acquiring social and technological knowledge via non-native languages has been challenging and resulted in a loss of inspiration and success [97]. Alkhatir [102] summarizes the reform process by claiming that

the reform was genuine and creative, but unstable, nonaccumulative, and the cause of unprecedented social controversy.

Further, Qatar's tertiary education sector was expanded quite rapidly and is seen as crucial to national growth on the road to a "knowledge society", according to Crist [95] (p. 104). In Qatar, as with most small states, the higher education system was thought from the beginning to be the principal hope for overcoming—or at least balancing—the high dependence on foreign workers and for encouraging the diversification of the economy to include sectors other than those directly related to the production of the principal national resource: liquefied natural gas (LNG). Qatar University (QU), founded in 1973 as a national College of Education, was Qatar's first university. The Government of Qatar has invested heavily in Qatar University to improve entry, expand its educational programs, adjust them to the needs of Qatar's economy and workforce, and increase its research potential. Consequently, higher education became more accessible to Qataris [95].

Another higher education institution is Qatar Foundation (QF), established in 1995. In 1998, it launched the Education City as "an assemblage of 8 international branch campuses of U.S. and European universities combined into a single hub" [95] (p. 94), with think tanks and research centers that allow local students to have access to top-class academic resources and educational experiences [97,98]. However, Education City poses problems correlated with the inadequacy of the current K–12 education structure. According to Khodr and Reiche [106], the City's creation is premature since more work has to be conducted on the educational system to meet the challenge of finding competent students. There are still a small number of qualified students to attend these elite institutions. Indeed, the elitist character of Education City's universities renders them inaccessible to most Qataris and creates an unequal, two-tiered educational system that unavoidably disadvantages individuals who attend other universities in Qatar [95].

Further, the knowledge-based economy's main limitation is the shortage of technology-related human capital, especially for engineers and other specific STEM fields (Science, Technology, Engineering, and Mathematics) in general. STEM fields are the most important sciences to help Qatar's transition to the knowledge economy [107]. In 2017, Qatar ranked 37th for higher education quality, as illustrated by Schwab [59]. However, Qatar ranked 73rd for the enrollment rate for secondary education and 105th for the enrollment rate for tertiary education. Several studies have established a substantial shortage of educated Qatari citizens in vital STEM fields [108–110]. Qatar's demographic structure reveals that the country depends significantly on the expatriate labor force with a substantial national–foreign ratio. Indeed, the overall workforce comprises 11.6%, or nearly 310,000, Qataris and 88.4% non-Qatari, primarily male foreign workers [111].

Moreover, Sellami et al. (2017) indicate that only a small proportion of Qatari students are interested in science, technology, engineering, and mathematics (STEM) professions, while many students appear to be interested in public sector jobs. There has been a sharp decrease in science-program enrollment at Qatar University in the last fifteen years, leading to the suspension of three science programs. Currently, students are not joining STEM professions at the stage that will contribute to the economic self-sufficiency intended for the future of Qatar [112]. According to Kayan–Fadlelmula, Sellami, and Abdelkader [113], this is a general issue in the GCC countries, where youth still lack interest in STEM careers and represent low enrollment rates in STEM fields. Further, the most acceptable professions for women are determined by local traditions and cultural norms, which exclude most women from STEM careers [113]. Additionally, as outlined by Abdulwahed [114] (p. 17), "Most of engineering schools in the GCC and the Middle East follow a traditional disciplinary department's structure, with curriculum mainly focused on engineering sciences and theories". Qatar's engineering education should shift to a greater focus on innovation and entrepreneurship to play a crucial role in socioeconomic development. The 20th-century engineering curriculum is no longer sufficient to address the challenges of the 21st century [114].

Despite significant efforts, Qatar continues to underperform in educational accomplishments [115]. Qatari students continue to perform somewhat behind the international average in the Trends in International Mathematics and Science Study (TIMSS) and the Program for International Student Assessment (PISA) [112]. In 2012, PISA results showed that 70% of students in Qatar performed below average in math, reading, and science [99]. With restricted soft skills, leadership qualities, or knowledge matching the market needs of graduates in Qatar, as outlined by public and private sector employers, the economy has few benefits from increasing education [116]. This underperformance has to do with “the shortage of skilled teachers, and the widespread prevalence of rote learning in classrooms, which hinders creativity and creates an environment that eliminates flexibility in learning” [115] (p. 13). Finally, as highlighted by Abu-Shawish et al. [117], Qatar and the GCC countries in general are facing a dilemma. Can the growth of a knowledge economy and human capital coexist with local culture and traditions that are deeply embedded in national identity?

4.4. Innovation

During the last 25 years, Qatar has invested extensively in developing an adequate innovation infrastructure. This involves the establishment of the Qatar Foundation (QF) in 1995; the implementation of the Qatar National Development Strategy (QNRS 2012); and the launch of several R&D centers and institutions in various fields, such as the Qatar Science and Technology Park (QSTP), the Qatar Environment and Energy Research Institute (QEERI), the Qatar Computer Research Institute (QCRI), etc. QF sees research as critical to national and regional development, as a method of diversifying the nation’s economy, improving educational offerings, and developing sectors that impact the nation, including health and the environment [118]. Moreover, in 2006, QF created the sole research-funding agency in Qatar: the Qatar National Research Fund (QNRF) “as part of its ongoing commitment to establishing Qatar as a knowledge-based economy” [118]. The primary mission of the QNRF is to fund and promote R&D in Qatar and scientific co-operation internationally to achieve a knowledge-based economy. Via its diverse funding programs, the goal of QNRF is to promote original and competitive selected research in different areas: engineering and technology, physical and life sciences, medicine, humanities, and social sciences [118]. As a national agency responsible for applied research, innovation, and entrepreneurship, the Qatar Science and Technology Park (QSTP) was launched in 2005, offering commercialized technology for the energy, environment, and health sectors.

World indices and rankings that measure innovation performance and knowledge-based economies’ strengths provide a comparative evaluation of Qatar’s position. The Global Innovation Index (GII), which is considered one of the leading indices that assesses innovation systems [115], offers detailed indices of the innovation performance of 127 countries and economies around the world. Its 81 metrics discuss a large vision for innovation, covering the political landscape, education, technology and market maturity [88]. The Global Innovation Index (GII) ranked Qatar at 70 of 128 countries in 2020 [88] (Table 4).

Table 4. Qatar’s ranking in the Global Innovation Index and subindex.

	Pillar	Rank
	Institutions	58
The Innovation Input Sub-Index	Human capital & research	83
	Infrastructure	28
	Market sophistication	94
The Innovation Output Sub-Index	Business sophistication	77
	Knowledge & technology outputs	85
	Creative outputs	58

Source: Cornell University et al. [88].

Nevertheless, Qatar's innovation system suffers from some limitations despite substantial efforts. Qatar was listed by the Global Innovation Index of 2020 as one of the countries where innovation output is below its projected level, meaning that it produces fewer outputs than the inputs invested in innovation [88]. In other words, Qatar is suffering from low performance in innovation output indicators (patents, publications, and share of high technology exports).

For patents by origin/bn PPP\$ GDP, Qatar is ranked 129, 88 for scientific & technical articles/bn PPP\$ GDPs and 125 for trademarks by origin/bn PPP\$ GDP [88]. The GII report states that "resource-rich Arab countries could rank higher. They exhibit relative shortcomings in important areas, such as institutions, market sophistication, and business sophistication. This phenomenon is reminiscent of what has been called the resource curse or the paradox of plenty" [119].

There is very little co-operation between R&D centers, universities, and businesses. For example, companies' investments in R&D are low in the ICT sector, inhibiting innovation. In 2014, only 10% of ICT companies in Qatar reported investing in R&D activities. Most (63%) spent less than 5% of their annual revenues on R&D [120]. There is no interest in local ICT R&D and innovation in Qatar, as most innovations are imported [42]. Furthermore, the tools available to entrepreneurs are not enough to initiate innovation. Innovations that are fortunate enough to start cannot be completed due to low internal capital. Insufficient internal capital and management skills hinder a firm's initiation and growth [77].

5. Discussion: What Is Needed to Enable Innovation, Entrepreneurship, and Education in Qatar?

The shift toward a knowledge-based economy is not an easy task. This transformation impacts all areas of society, big and small, public and private. In addition, the knowledge-based economy is seen as a long-term transformation process that will last decades, if not centuries. The shift to a knowledge-based economy is challenging since it is built on a delicate interplay between entrepreneurship, motivation, and supportive economic and institutional regimes. The lessons learned from international experiences confirm the importance of institutions, human capital, research, knowledge, and ICT infrastructure to transform into a prosperous knowledge-based economy. International experiences also show that this transformation is a complex process that can easily be derailed by factors pulling in the opposite direction.

Like the other GCC countries, Qatar is seen as a transformative state, suggesting that, although oil and gas provide its primary export revenue, the government has also pushed to diversify its economy toward a knowledge-based one [18]. Qatar is a prominent exporter of gas and oil, and the past 50 years of rent coming from these sources have turned the country into a rentier economy, implying that the state has held a primary focus on the distribution of rent money into society and little emphasis on building industries outside the oil and gas sectors. Therefore, the country finds itself in a path-dependent situation, which will take substantial effort to bend away. Qatar is conscious that a transformation into a knowledge-based economy is necessary to succeed in the global economy.

Moreover, the current COVID-19 pandemic has undeniably acted as the most significant test of Qatar's digital technology. In this regard, Qatar and the whole GCC area have demonstrated considerable digital resilience [121]. The pandemic and social distancing initiatives have intensified the ongoing trend of digitization in Qatar. The country has witnessed the increasing usage of digital technology in various industries, such as health, banking, education, shopping, etc. [122], and online food shopping (Ben Hassen et al., 2020). Further, to comply with social-distancing measures and preserve business continuity, Qatari-based companies quickly embraced digital solutions and agile work processes [68]. This transition was driven by various government policies and measures, such as the generalization of online payment and online medical diagnosis, etc. Besides, leading telecommunications providers (e.g., Ooredoo, Vodafone, Qatar) have strengthened the current networks' capabilities to provide greater access by doubling the internet's

pace without additional costs [123]. However, transforming Qatar into a knowledge-based economy faces many challenges that need to be resolved by applying systemic reforms regarding the different pillars of a knowledge-based economy.

At the ICT level, Qatar must continue to untie some of the constraints, such as high ICT costs, security concerns, and the need for more advanced ICT expertise and skills among all demographic groups. Additionally, Qatar's ICT industry is still primarily reliant on imports, with all leading ICT goods and services currently available in Qatar, primarily through resellers and service providers. Few ICT companies in Qatar are engaged in manufacturing ICT products [120,124].

At the educational level, schools and universities in Qatar should promote a culture of business development and risk-taking by guaranteeing that these skills are an essential part of the university curriculum [125]. This, in turn, should encourage more students to engage in entrepreneurial activities and contribute. Adding these skills to the university curriculum likely implies that a new generation of Qataris is entering the private sector and contributing to the knowledge-based economy. Additionally, from the primary stage to the university level, Qatar's education system has to support and meet the economy's needs to ensure stability and growth in the long term. Comprehensive reforms should be conducted in Qatar's schools and universities to fulfill the government's knowledge-based economy objectives, as illustrated in Qatar 2030 [125]. Encouraging a culture of innovation and creativity in schools by introducing nonconventional learning approaches emphasizes cognitive problem solving, creative and critical thinking, and professional and technical skills. Additionally, to minimize the mismatch between the skills needed by the market and those offered by the education system, we suggest further collaboration between the private sector and higher education institutions. Indeed, it is necessary to induct an evolution in academia's understanding and application–industry linkage from operational activities to a more strategic relationship (in many cases facilitated by government programs) for producing collective knowledge and economic outcomes [126]. Further, since only a small percentage of Qatari students are interested in a STEM (Science, Technology, Engineering, and Mathematics) profession, we suggest implementing a clear strategy to draw more students to these fields.

At the entrepreneurship level, we suggest implementing a policy that facilitates access to funding, new markets, and relevant networks to promote new and established start-ups. We also propose reforming the legal and regulatory framework to make it more encouraging for start-ups, allow more foreigners to become entrepreneurs, and simplify sponsorship regulations [78]. Finally, the interventions have to focus on developing an interconnected chain of resources and stakeholders to promote and develop an entrepreneurial spirit among the youth in a sustainable way.

At the innovation level, Qatar needs to adopt a systematic approach, taking into account all the components of the innovation system, their interconnections, and related effects. In the knowledge-based economy, innovating and offering new products and services is critical for firms' survival and growth. It demands a high level of technological expertise, which requires constant innovation. This task calls for the continuous deployment of human capital and investment in R&D. R&D is an essential component—but not necessarily a central element—of innovation. Innovation is not only about the introduction of new technologies; it also needs new methods and forms of organizing. Therefore, innovation concerns various fields that affect both the technical and comprehensive institutional, marketing, and operational areas (process improvement, new modes of co-ordination, etc.) [127].

Furthermore, to innovate, firms start by using their knowledge, but innovation also depends on their capacity to utilize their environment to absorb external knowledge, which refers to the sector and market dimensions and the geographical and institutional environment. Especially in small- and medium-sized businesses with small R&D capabilities and specialized skills shortages, attention has been given to the importance of

absorption capacity: the company's ability to recognize, assimilate, and leverage external knowledge [128].

At the R&D level, Qatar needs to increase investment in education and R&D programs by raising public spending, reaching the minimum standard of developed countries, and promoting further private sector investments. Additionally, Qatar needs to set up a technology transfer structure to organize technology transfer, initiate successful co-operation between universities and industries, and provide legal guidance on regulatory mechanisms for research collaboration between universities and industries.

Finally, as demonstrated by the Second National Development Strategy (2018–2022) [65], in Qatar, there is a lack of “planning culture” and “teamwork” and low sectoral collaboration and integration. This allows for a so-called silo mindset, a substantial obstacle to implementing progress. This problem illustrates the lack of consistency in the overall sectoral direction of specific government sectors, which has slowed down the execution of some programs and projects [65]. Furthermore, many researchers have highlighted that promoting knowledge, entrepreneurship, or innovation in isolation does not automatically increase economic growth [129]. Joint action and co-ordination of efforts are required to develop a knowledge-based economy. In order to foster an efficient national innovation ecosystem, the transition to a knowledge-based economy necessitates collective and innovative thinking outside the silo, sector-wide and cross-sector co-ordination (ICT, education, innovation, R&D, and government), and synergy between central authorities and implementing administrations (NIE). Qatar needs to encourage more collaboration and inter- and intraorganizational learning among all the knowledge-based economy's constituents and stakeholders.

6. Conclusions

This paper has three objectives. Firstly, it aims to present the pillars of the knowledge-based economy and their link to the COVID-19 pandemic. Secondly, the paper aims to analyze the current state of the knowledge-based economy in Qatar, including its strengths, drawbacks, and its prospect for the future. Finally, the paper presents some structural reform recommendations to enable innovation, entrepreneurship, and education in Qatar.

The paper is based on the premise that the shift to a knowledge-based economy is a dynamic mechanism that could be stimulated or impeded by several structural and positional influences. Some issues have to do with the structural characteristics of the country. Hence, the progress of the knowledge-based economy in Qatar is formed by a variety of opposite factors. The key factor behind the drive to transform Qatar into a knowledge-based economy is the Qatari government's commitment to diversify the economy through centralized, top-down policies by developing ICT infrastructures; fostering entrepreneurship, R&D, and innovation; and reforming the education system. However, while necessary steps have been taken to transform the economy, Qatar's knowledge-based economy has faced several constraints, such as a lack of financing, the lack of qualified human capital attributable to the poor output of the education system, the low performance of the innovation system, and the fear of failure impacting entrepreneurial initiatives.

Our findings made several contributions to the literature. Firstly, our results contributed to the advancement of the rentier state theory (RST). As a matter of fact, since the oil boom of the 1970s, the RST has been used to study the social, political, and economic aspects of the GCC nations. Oil has had a considerable impact on the geopolitics and economics of the region, influencing state-building efforts and creating a rentier economy [130,131]. The notion of the rentier state has been one of the most common and valuable descriptions of the economic dynamics in the GCC region [103]. This theory has been supported by “The Dutch Disease” theory which contends that the expansion of natural resources led to a decrease in other sectors of the economy [132].

The paper's results confirm that Qatar's transition to a knowledge-based economy is facing a critical structural challenge: the rentier system, which is hegemonic within the socioeconomic and political system in Qatar and the GCC region in general, exposes

many limitations [11]. With little private-sector participation, the rentier model makes the government the key player in the knowledge-based economy, which is in line with the government position in the Rentier state [92,133]. For example, according to Ennis [11], the development of Qatar's entrepreneurial activities is entangled between an international capitalist policy agenda and a national economy that is hampered by two inter-related dependencies that are challenging to correct: hydrocarbons and foreign labor addictions. The author also points out that entrepreneurship has perpetuated the rentier state structure, causing a contradiction between economic reform and the existing structural challenges. Tok [134] outlined Qatar as an indication of government entrepreneurship programs' restricted potential to solve a range of institutional challenges. Additionally, he argues that low oil prices, regional dependency on hydrocarbons, and movements in economic diversification signal the GCC countries' preference for strengthening their rental systems with the additional state capital.

Secondly, the paper's results suggest that the Qatari government's intense dedication and willingness to diversify the economy and develop dynamic knowledge-based sectors confirms a new phase in the rentier state theory, with the "late rentierism" as suggested by Gray [135]. Indeed, Gray [135] points out that the rentier state theory has not been sufficiently adjusted to recognize the significant shifts in the GCC countries' political economies throughout the last twenty years. Globalization, new technology, and freer trade coupled with socioeconomic considerations have made economic diversification a cornerstone of the Gulf countries' economic agenda since the 1990s [9,136]. Gray [135] proposed that a new phase of RST, "late rentierism", should be applied to the GCC countries.

Moreover, this study has also highlighted important practical implications. Firstly, the findings demonstrate that transitioning to a knowledge-based economy is a complicated process influenced by a variety of economic, cultural, and institutional factors. These elements go beyond the scope of government or business and are critical for all stakeholders (decision makers, industry, academia, innovation, and interest groups) and all foundations of the knowledge-based economy. The findings reinforce the need for a systemic method to improve our awareness of the possible dynamics of moving towards a knowledge-based economy in the GCC area, considering all of these elements, their interconnections, and consequent effects. In general, the GCC countries score high on the 'economic incentive and institutional regime' and the 'information infrastructures regime' while scoring comparatively low—even compared to global averages on the pillars of 'education' and 'innovation' [27]. Accordingly, the GCC states have to focus on improving the state of innovation and education in order to boost their transition toward a knowledge-based economy. Innovation studies highlight the value of collaboration between various actors (intermediate institutions, universities, R&D centers, etc.) and networks for innovation. Accordingly, a systematic and comprehensive approach of innovation that considers the several aspects of the advancement of knowledge creation, knowledge transfer, and innovation, considering all the elements, their inter-relationships, and associated impacts, is required. A more system-oriented conception of how innovation occurs is key to fostering dynamism and, eventually, improving efficiency. System thinking allows for the understanding of how the different components influence one another [137,138]. More crucially, the transition to a knowledge-based economy must consider the differences in each country's social and cultural context. Indeed, as underlined by Ziafati Bafarasat and Oliveira [139], various studies on the knowledge economy have shown that its success in permitting change is contingent on how well it adapts to sociospatial and institutional settings; countries often seek models that have worked elsewhere.

Secondly, the GCC states, especially Qatar, have a good chance to pursue their diversification aspirations during the post-COVID recovery phase. Consequently, governments may create and execute rigorous, dynamic, and diversified policies, particularly those aimed at increasing entrepreneurial ability, innovation, and competitiveness, as well as the development of other key competencies. Given the current global circumstances, the GCC countries are expected to step up their efforts to diversify their economies. Policymakers

must go outside the box and do something novel and innovative to obtain rapid results. They may lower spending to focus on creating crucial components needed to construct a stable and thriving post-hydrocarbon economy.

Finally, as highlighted by the World Bank [20], “There are different formulations of diversification which are relevant for the GCC countries. First, diversification of fiscal revenues is important to stabilize government revenues over time. Second, diversification of exports matters because it affects macroeconomic volatility via volatility of the terms of trade”. (p. 8). Furthermore, GCC nations must ensure that their crisis response lays the groundwork for long-term recovery that promotes economic diversification and change. Governments should save today’s economy to build the economy of the future rather than rebuild the economy of the past. The success of such development initiatives is dependent on a participatory process including a diverse range of players from government, industry, university, research organizations, and other vital institutions.

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