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**A survey of the innovation ecosystem  
in the United Arab Emirates**

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**Abstract.** The UAE has long set itself apart from other members of the Organization of Petroleum Exporting Countries (OPEC) by successfully reducing its dependence on oil exports and diversifying its economy to focus on industries such as tourism, media, technology, and real estate. The economy's innovation capacity expanded when businesses and properties were allowed to be 100pc owned by non-nationals. However, the UAE must learn from its own experiences and those of other nations to further improve its innovation ecosystem, such as by tackling legacy rentier institutions and laws that prevent it from transforming into a fully modern sustainable economy.

**Keywords.** Innovation; Ecosystem; United Arab Emirates.

**JEL.** A10; B10; E10.

## **1. Introduction**

Innovation in the UAE was given a world stage during the six-month Dubai Expo 2020, which ran from October 2021 to March 2022, having been postponed due to the Covid-19 pandemic. The world expo, which coincided with the 50th anniversary of the UAE's foundation, focused on innovations in line with the United Nations's 17 sustainable development goals for 2030.

The UAE's drive for the next 50 years is to become a global player across different industries as it prepares for a sustainable post-oil future. In September, the UAE's Vision 2021 plan -- which incorporated ambitious targets for the state's economy, society and government -- moved closer to fruition with the launch of 50 economic initiatives aimed at making the country more competitive. The UAE's Projects of the 50 program to mark the country's golden jubilee included goals to attract \$150 billion in overseas investment within nine years, as well as measures such as new visa categories for freelancers and entrepreneurs, allowing skilled workers greater flexibility to sponsor family members, and more time for expatriates who lose their jobs to find a new role before being required to leave the country. Last year, the UAE also allowed foreigners to own businesses outright by removing the requirement for onshore companies to be majority-owned by an Emirati. In 2020, it introduced a golden visa that allows for ten-year residency periods for skilled expats and investors.

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Despite all these advances, the UAE's innovation ecosystem still faces some challenges, including the need for more legislative reform to create a more competitive landscape. This paper outlines the main challenges, compares the nation's current innovation efficiency with that of other countries, emphasizes the need for further investment in knowledge capital to create a sustainable learning society, and suggests ways in which the UAE can create a culture of innovation.

### 2. The path of economic diversification

Within just five decades, the UAE's economy has been transformed from a collection of trading posts and a reliance on fishing and pearling into a bustling cosmopolitan state that is now the second-biggest Arab economy after Saudi Arabia. This transformation is epitomized by its luxurious hotels, skyscrapers, private villas, its designer retail stores and its vast highway infrastructure.

Diversification away from the oil and gas production that fueled the UAE's economic growth has long been at the heart of the country's development strategy. Indeed, the non-hydrocarbon sector now accounts for about two-thirds of GDP.

Over the past decade, the nation's economic development has been guided by Vision 2021, which was launched in 2010 with the aim of being completed by the golden jubilee. This policy document proposed legislative reforms as well as investments in further diversification to create a more sustainable, socially cohesive, and more competitive knowledge-based economy. This strategy helped the UAE recover from the global financial crisis of 2007/2008.

In 2014, the UAE introduced the National Innovation Strategy to promote investments in renewable energy, transportation, education, healthcare, technology, water, and the space sciences. The following year, the National Innovation Committee organized 214 conferences and produced 865 initiatives during Innovation Week, of which 30 were shortlisted. These 30 initiatives encouraged investments in incubators, worker skillsets, public-private partnerships (PPPs), as well as bureaucratic and legislative reforms. To fund these initiatives, the Emirates Science, Technology and Innovation Higher Policy was established in 2016 and allocated a budget of AED 300 billion (\$81.7 billion).

The UAE certainly has the ambition for more innovation to aid further economic diversification. A sequel to that 2010 policy document -- called Vision 2021-2030 -- encouraged the development of space technologies and new sources of renewable energy, such as solar power, to enable the UAE to meet its goal of net zero emissions by 2050.

In February 2021, the UAE became the first Arab nation to successfully reach Mars, creating another giant step towards a knowledge-based economy. Much of the technology aboard its Hope robotic probe in the Martian orbit is homegrown and is sharing the data from Mars with the

international scientific community. The Emirati government believes the mission will inspire a new generation of local scientists and technologists.

By 2031, the UAE aims to become a global leader in artificial intelligence (AI), which it deems to be key in advancing innovation. In 2017, it created its own ministry for AI in a bid to become an early adopter of the technology and eventually become a net exporter of AI capabilities. Investments in incubators and accelerators are promoting AI, machine learning, internet of things and block-chain applications, and small and medium-sized enterprises (SMEs) are being encouraged to take risks in this sphere.

These technologies will be a central focus of an innovation-driven business ecosystem at District 2020, a new urban sustainable business and living hub designed to emerge from the redevelopment of the Dubai Expo site. District 2020, which will curate businesses believed to be key to the UAE's future -- such as smart logistics, smart mobility, digital healthcare and smart cities -- aims to bring together global minds and to use technology and digital innovation to support cross-collaboration.

Indeed, the word 'innovation' has become a buzzword throughout the UAE economy. But a healthy innovation ecosystem needs investment in research and development (R&D), human capital, and technology that entrepreneurs can tap into to develop and commercialize innovations. It requires an environment that is receptive to risk taking and it needs learning institutions.

This paper examines the foundations of the UAE's innovation ecosystem, the country's innovation strategies, how its modern ecosystem compares with that of other countries and analyzes the constraints on the evolution of the innovation ecosystem.

### 3. A survey of UAE innovations

The year 1971 saw an explosion of new technology in the Global North, from the first email and first commercially available floppy disk to the first programmable microprocessor and the introduction of the Nasdaq, the world's first electronic stock market. The same year, six Trucial sheikhdoms forged the UAE federation (the seventh joined in early 1972), creating a nation free from a British protectorate that could create its own future and capitalize on recent oil discoveries. Since then, the UAE's population has surged from 277,463 to almost 10 million, while nominal GDP soared from \$1.77 billion to \$421 billion in 2019.

Abu Dhabi discovered crude oil in 1958, with exports commencing in 1962, followed by an oil discovery in Dubai in 1966. By 1959, the Dubai emirate had spotted an opportunity to invest in a port that could accommodate modern ships, but its ability to competitively raise funds was hampered by a monopoly granted in 1946 to the forerunner of the British Bank of the Middle East (now HSBC Bank Middle East). In 1963, Dubai breached the monopoly agreement with the British Bank and created the National Bank of Dubai. The emirate's first domestic bank introduced competition to the banking sector, thereby boosting liquidity and making

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funds available at cheaper rates. Construction of the port went ahead and the first ship docked in 1972.

However, insufficient domestic absorptive capacity bloated the UAE's trade and current account surplus, risking faster inflation and currency appreciation. Curtailing oil exports was not an option because other producers stood to increase market share and there was concern total revenue would fall should oil prices decline in the future. In 1976, Abu Dhabi established the Abu Dhabi Investment Authority (ADIA) ~~and~~ a sovereign wealth fund (SWF) to convert a potentially depleting asset class -- the oil reserves -- into a perpetually growing asset class, namely global stocks and bonds. By doing so, not only did the ADIA optimize the oil reserves' net present value, but its investments in global securities propped up the currency's security and hedged the economy against inflation.

A commodity-based SWF was not a new concept: 23 years earlier, the Kuwait Investment Authority had set one up. Nevertheless, emulating this innovation served the UAE well as it boosted investor confidence and promoted economic growth, and the ADIA's success has since been replicated in other countries. By 1974, the Shaikh Rashid Tower (now the Dubai World Trade Centre) had broken ground, signaling to the world that the UAE was open to the world as a free and open market.

The first Islamic bank in the world, the Dubai Islamic Bank, was established in 1975, offering Sharia-compliant contracts. Its introduction increased liquidity in the banking sector because religious individuals and businesses who had been hoarding cash began to invest in wakalas deposits and borrow through new instruments such as murabaha, mudarabah, and ijara. Today, the Dubai International Financial Center is the regional hub for Islamic financial products.

The 1979 Iranian revolution destabilized the UAE, which responded by promoting tourism. New public-private initiatives transformed the country into a destination for sport, shopping, business and healthcare tourism, thereby helping to diversify the economy and reduce its dependency on crude oil exports.

The 1984 UAE Commercial Companies Law (CCL) facilitated the establishment of US-style limited liability companies (LLCs), allowing the formation of business structures that protect its owners and operators from being personally pursued for debts or liabilities. These legal structures can encourage startup entrepreneurs to commercialize new innovations without exposing themselves to unacceptable personal risks. But in the UAE, credit institutions required LLC owners to use their personal assets as collateral, which both defeated the purpose of the business structure and led LLCs in the UAE to adopt a more conservative approach to risk-taking when it came to commercializing innovations.

### 3.1. The Jebel Ali Free Zone

The 1984 UAE CCL required that all LLCs and trading and manufacturing entities be at least 51% owned by UAE nationals in bid to increase citizen

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participation in private commercial entities. But this did not augur well with the UAE's free market doctrine, so the country set up the Jebel Ali Free Zone Authority (JAFZA) in 1985. This enabled foreign investors who registered with JAFZA and operated out of the Jebel Ali Free Zone (JAFZ) to own up to 100% of their businesses.

The JAFZA gambit paid off. A strong logistics cluster with warehousing, cross-docking, packaging, marshalling and central distributing facilities emerged within the free zone and the foreign direct investment (FDI) created as a result of the measure attracted a new pool of specialized talent. Today, more than 7,500 businesses employed a combined 135,000 people operate in the free zone. Furthermore, the Jebel Ali Port itself developed into the largest container port between Singapore and Rotterdam and is the ninth-busiest port in the world.

JAFZA introduced a slew of measures aimed at reducing red tape on companies, such as the introduction of one-stop shops for licensing, leasing, work visas and work permits. The authority did not impose standard plot sizes on investors and allowed creditors to mortgage fixed assets built on leased plots, as-which was not the case further inland. It also made membership of the chamber of commerce optional and did not require goods to be cleared of customs before being stored inside the zone, which freed up cash that investors could deploy more productively elsewhere. All these innovations made businesses within the free zone more efficient and productive and heightened demand for JAFZA registrations.

The popularity of the free zone led to the 1984 CCL amendment and free zones became legitimate entities. Subsequently, several new free zones emerged and there are now 60,000 businesses at more than 50 trade and non-trade free zones. These businesses boosted overall competition in the UAE and encouraged private-sector innovation, and the free zone administrative solutions have been adopted by other government authorities seeking to become more business friendly.

Indeed, free zones are now used as policy tools for promoting industry clusters and creating well-paid jobs for citizens. These clusters are attracting a diversity of talent, new technologies, and FDI, and many creative startups have found these free zone clusters to be a fertile ground for collaboration and synergy. For instance, the merger of the operations of real-estate portal Bayut with those of classified ads portal Dubizzle – both of which originated at Dubai Internet City -- enabled the tech firms to cross-sell into each other's markets, expand their combined footprint, and become the dominant portal for their range of products and services. Meanwhile, free zone startups Souk.com and Careem were acquired by Amazon and Uber, respectively. In 2020, the Yalla Group, a social networking and entertainment platform set up at Dubai Internet City, became the first UAE-based tech company to list on the New York Stock Exchange. Zeta, a financial app platform, and Kitopi, a cloud-based kitchen platform, raised hundreds of millions of dollars through Japan's SoftBank.

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The free zones also pioneered co-working spaces in the UAE, thereby encouraging the creation of micro-enterprises. Many of these co-working spaces evolved into incubators or accelerators that incentivize entrepreneurs to start a business without incurring high costs.

July 2021 ushered in a paradigm shift in UAE company law, when the 1984 CCL was amended to allow 100% foreign ownership of entities. This meant overseas investors were no longer required to partner up with an Emirati citizen to own companies, a move that should further encourage competition and incentivize innovation.

### 3.2. Emirates

Between 1980 and 1985, the UAE's tourism industry began to take off in earnest, thanks to initiatives such as the region's first shopping mall, the Dubai World Trade Centre becoming a preferred venue for regional events and exhibitions, the first professional off-road four-wheel drive Masafi Rally enticing international enthusiasts, and the first cricket stadium to host international cricket tournaments opening up in Sharjah.

In response, Dubai upgraded its airport by adding a second runway and modernizing the arrival and departure lounges. But, in the early 1980s, ~~by~~ Gulf Air, a carrier owned by Abu Dhabi, Bahrain, Oman, and Qatar, enjoyed a virtual monopoly over regional travel. The airline was in a unique position to collaborate with Dubai but chose not to. This led Dubai to launch its own airline, Emirates, in 1985 in pursuit of its diversification strategy into tourism.

While airlines are not new innovations, the speed at which Emirates scaled up to become the world's third-largest airline is attributed to its innovative marketing and high level of customer service. That innovation continues today: instead of depending on imported produce for passenger meals, Emirates recently invested in ~~a~~-vertical farms~~s~~ next to its kitchens so it could grow its own fresh fruit, berries, and vegetables. This tackled the difficulties posed by UAE's climate and limited water resources, which mean the country cannot usually produce good quality fruit and vegetables by traditional means.

Emirates became a platform for many domestic and international innovators targeting the airline and travel industry. This eco-system comprises more than 200,000 people working at the core and an additional 400,000 in the peripheries.

The creation of Emirates also led to many other successful initiatives that promoted tourism in the country, such as:

1. Gulf News Fun Drive (outdoor family entertainment – 1986)
2. Victory Team (power-boat race – 1988)
3. Desert Classic (world-class golf tournament – 1989)
4. Dubai Air Show (defense and aeronautics exhibition – 1989)
5. Dubai Shopping Festival (family entertainment and discount shopping – 1996)

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6. Gulf Information Technology Exhibition (GITEX) (ICT exhibition – 1996)
7. Dubai World Cup (horse racing – 1996)
8. Global Village (family entertainment and merchandizing – 1997)

### 3.3. Emaar

Established in 1997, the real-estate developer sought and received special rights to sell land, homes and commercial property in multistory buildings to non-Gulf Cooperation Council (GCC) nationals in designated freehold-zones. By doing so, Emaar – the company behind the Burj Khalifa, the world’s tallest building – had tackled a failure by the market to meet pent-up demand for property from non-GCC nationals.

The profits generated because of the measure attracted several state-owned enterprises (SOEs) to satisfy the demand. Swaths of undeveloped land were designated as freehold zones and the subsequent construction activity triggered a domestic economic boom. And it was only a matter of time before some free hold zones began to offer free zone services and vice versa.

Early SOEs duplicated Emaar’s model: they prepared the masterplan, negotiated with utility and transportation link providers, invested in a central hub, and sold land or off-plan properties to fund construction of the infrastructure required for the developments. The model evolved to master developers taking on partner developers and, in some cases, the work was divided among contractors, financiers, real estate agents and developers.

The SOEs competed against each other and against Emaar by offering property lifestyles that would suit different budgets, building developments on themes ranging from golf, lakes, and theme parks to high-rises, beachfronts and artificial islands. Today, the Palm-shaped artificial peninsulas and The World archipelago developed by Nakheel are engineering marvels that can be seen from the International Space Station.

### 3.4. Masdar City

As far back as 2006, when the World Wildlife Fund rated the UAE as having the world’s largest ecological footprint per capita, Abu Dhabi launched Masdar City, billed as the world’s first carbon-neutral city to be built under the One Planet Living [\[Retrieved from\]](#) framework. Designed by British architectural firm Foster + Partners, the futuristic city on a 2.5-sq mile patch of desert was intended to house 50,000 people and 40,000 workers. Though progress on the project has been slower than initially projected, the innovation is an example of what a post-petroleum city could look like.

Masdar City, which relies on solar power and other forms of renewable energy, is being developed by renewable energy company Masdar, a subsidiary of Mubadala Investment Company, the Abu Dhabi government’s strategic investment company. In December, Abu Dhabi announced that three of the UAE’s energy giants – Adnoc, Taqa and Mubadala – would

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partner under the Masdar brand and combine their renewables and green hydrogen portfolios to form a clean energy powerhouse.

#### 4. The UAE's innovation engine

Fast-tracking innovation became possible with clusters of free zones, which incentivized anchor tenants to move in, thereby becoming network nodes for a range of supporting and competing businesses. These businesses developed and offered innovative solutions.

The free zones further fast-tracked innovation by establishing co-working spaces and investing in incubators, innovation centers, and accelerators. They actively promoted start-up entrepreneurs by guiding them on legal and commercial matters, introducing them to industry leaders and angel investors, and preparing them for fundraising, mergers and acquisitions, or a stock market listing.

The UAE is home to more than 30 incubators, innovation centers, accelerators, ecosystem builders, and venture studios. Several businesses have graduated from these platforms and some have been acquired by international brands, such as Wrappup, an AI-powered voice-to-text note-taking platform that was purchased by Voicea, which in turn was acquired by tech giant Cisco. Its features were then embedded into Cisco's Webex video-conferencing application. Others like Anghami became the first Arab tech company to successfully list on the Nasdaq. Both Wrappup and Anghami were founded at the in5 technology incubator at Knowledge Village. However, while free zones such as Knowledge Village, Internet City, the Dubai International Financial Center, Twofour 54, and Masdar City have sparked many innovations, others have languished.

The UAE is now a regional hub for incubators and is attracting start-ups from across the globe (Nagraj, 2021). Some universities have also introduced innovation-promoting programs and the local and federal government agencies, SWFs, and chambers of commerce are investing in R&D and financing innovative start-ups. By focusing on promoting cutting-edge technologies and digitalization, the UAE is seeking to bypass the traditional economic growth stages (Rostow, 1971).

##### 4.1. Global rankings

Between 2012 and 2020, the UAE moved up the rankings on the Global Innovation Index (GII), [Retrieved from] which is jointly published by Cornell University, INSEAD and the World Intellectual Property Organization, from 37th place to 34<sup>th</sup> place. However, the GII said the UAE could become even more innovative if it increased production of creative intangibles and online creativity, expanded knowledge creation, improved its overall business environment, enhanced R&D capacity, and increased promotion of trade and competition and of innovation links with businesses.

4.2. What can the UAE learn from other countries?

In 2020, the top three GII countries were Switzerland, Sweden, and the US, where investments in efficient open-data systems, R&D and education propelled innovation. In 2018, when the global average of R&D expenditures was 2.3% of GDP, these countries spent 3% or more. By contrast, the UAE spent 1.3% of its GDP on R&D. In education, the average global spend was 4.5% of GDP, but Sweden spent 7.6%, the US 6.2%, and Switzerland 5.1%, whereas the UAE spent just 1.1% of its GDP [Retrieved from]the average global expenditure on R&D and education was 2.4% and 3.7% of GDP, respectively, but the top three GII countries spent between 2.8% and 3.4% of their GDP on R&D and between 4.9% to 7.6% of their GDP on education. By contrast, the UAE spent just 1.3% of its GDP on R&D and 3.1% on education. Given that education is an essential prerequisite for basic and applied research, and that research leads to innovations that are developed and commercialized, increasing the percentage of GDP spend on education and R&D would build the UAE's knowledge capital and improve its innovation capacity.

In addition, Switzerland, Sweden and the US leveraged also leverage their well-developed institutions for basic and applied research, specialized R&D, brokerage services that bring universities and the private sector together to develop and commercialize innovations, and for to disseminating research findings. Some of the leading national institutions promoting innovation in these countries include the following:

The US: The Defense Advanced Research Projects Agency, the National Aeronautics and Space Administration (Nasa), the Health & Human Services Laboratories, the National Science Foundation

Switzerland: The Swiss National Science Foundation, ETH Zurich, Swiss Innovation Park, European Organization for Nuclear Research (CERN), and pharmaceutical giants such as Roche and Novartis

Sweden: The Swedish Research Council, the Swedish Research Council for Sustainable Development (Formas), Forte, Vinnova, the Swedish Foundation for Strategic Research, the Foundation for Strategic Environmental Research, and the Knowledge Foundation

The These countries understand that the private sector typically shies away from the risks that can be posed by investments in basic and applied research. The US, Switzerland and Sweden, however, use Accordingly, they have been channeling public funds into such research, and they then share their findings with the private sector through PPP programs. In addition to allowing access to the research findings, the PPPs also extend technical, financial and occasionally commercial assistance to the private sector for developing and commercializing the innovations. Companies such as Tesla and Apple Computer have benefited from such programs (Mazzucato, 2015).

Through an elaborate social safety net that can protect citizens from inflation and higher medical costs in their old age, these countries encourage people to risk their savings instead of hoarding wealth such as gold, real-estate and or art for a rainy day in their old age. Making Meanwhile,

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increased national savings make cheap funds available for commercializing innovations and investing in production facilities. Cheap funds is important because it makes businesses more receptive towards taking risks with new innovations and production capacity.

The These countries also tend to have effective of a country's bankruptcy laws also determines that increase investors' willingness to take on risk. The bankruptcy laws in the US, Switzerland and Sweden allow for an efficient transfer of the assets and liabilities of bankrupt entities into more capable hands, thereby reducing the amount of time that an asset remains unproductive and allowing and inga more effective owner to extract greater value from that assets.

Strong property ownership laws, especially for intellectual property (IP), are also crucial for ensuring ownership rights are not expropriated. In fact, these countries work through multilateral organizations and bilateral trade agreements -- and even threaten export restrictions, boycotts and sanctions - - to ensure that the property rights of their businesses are not infringed upon.

The key takeaways for the UAE, therefore, are:

1. increase investments in R&D and education as a percentage of GDP
2. invest public funds in basic and applied research
3. create an effective and productive open-data mechanism that reduces the cost of gaining information
4. assist the private sector in developing and commercializing innovations through tailored PPP programs
5. invest in specialized research institutions to design, research, develop, and commercialize innovations
6. broker between academia and the private sector to research, develop, and finance innovation
7. protect property rights against expropriation, especially IP rights
8. ensure a well-functioning and efficient bankruptcy regime is in place

### 4.3. What can the UAE learn from its own experiences?

Eliminating monopolies in the UAE opened up new markets in areas such as banking, air travel, property ownership and business ownership and encouraged entrepreneurs to innovate and invest in new capacities to compete against each other. This led to job creation, an increase in market size, economic growth and an improvement in citizen welfare.

Free zones provided the platform for increasing diversity and competition. They fast-tracked economic growth and became the main development policy tool for creating business clusters, diversifying the economy, and advancing innovations.

Co-working and co-sharing spaces nursed startups. By unburdening startups from a need for upfront capital investment -- which can prompt entrepreneurs to take up paid jobs rather than incur the cost of starting their

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own company -- these entrepreneurs were instead nudged into taking risks with their time and limited financial resources to promote their ideas and innovate.

Businesses were enabled to mortgage properties on leased lands, thereby allowing them to generate cashflow by converting bricks and mortar into liquid assets. This cashflow provided valuable capital for productive investments, such as business improvements, R&D, marketing, and capacity increases.

The freehold zones unclogged the property market and attracted new investments. Instead of ~~sending remitting~~ their ~~incomesavings home~~, expats invested in property. Meanwhile, financial institutions increased domestic liquidity by tapping into international savings to finance the construction work. The scale and scope of property development triggered a boom that benefited developers, building contractors, property owners, traders, manufacturers, households, and service providers.

The country's security and currency stability attracted FDI and helped drive up domestic savings. Indeed, the UAE attracted the highest FDI flows of any Arab country last year, according to the UNCTAD 2021 World Investment Report [[Retrieved from](#)]. FDI attracts talent, managerial skills, technology, and boosts expertise and a country's capacity for innovation.

Public investments in major development projects in the UAE increased entrepreneurial confidence and encouraged the private sector to take more risks and innovate. Meanwhile, the leadership's long-term vision and guidance cultivated trust.

#### 4.4. Restraining factors

Even though the UAE federation is a common market, it is not necessarily a unified market. Competition, investment, ownership and market accessibility rules can differ in each emirate. The differences between free zone, freehold zone and the mainland markets extend different privileges, which occasionally lead to costly and cumbersome barriers. Instead of investing their resources in innovation, entrepreneurs have to preoccupy themselves with circumventing these barriers to benefit from the privileges extended. As a result, productivity, efficiency, and the capacity to compete suffers, hindering productive innovation.

Certain barriers ~~can beare~~ designed to protect or provide an advantage to some citizens or to protect, promote or sponsor monopolies. Other barriers repel private investment in designated industries. Even though free zones and freehold zones have opened up new markets by unclogging pent-up demand, these zones have also created enclaves ~~that can act aswith~~ barriers.

Capital mostly flows freely in the UAE. But this is not always the case with labor -- when an expat is changing jobs, the new employer must apply for a fresh visa and work permit, the administrative cost of which is mostly borne by the business taking on the new hire. Recent liberalization of the rules means that, for the first time, expats can take up part-time jobs or switch from one employer to another more easily even if the previous employer

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objects. ~~Nevertheless, these liberalizations have not taken away the~~ ~~Administrative costs that are also~~ imposed on employers seeking to relocate an expat worker from their business in one emirate to their business in another ~~emirate. Such because the~~ ~~moves~~ requires the employer to change the ~~employee's~~ visa and work permit. ~~Accordingly, S~~such restrictions shrink the labor pool, increase recruitment costs, encourage businesses to hoard labor, and prevent the free movement of ideas, skills and knowledge.

A lurking undercurrent that is ~~also~~ undermining innovation is the rent-seeking institution. Rent-seeking stymies competition and hampers the country's capacity to innovate. Such institutions result from policies promoting or tolerating rent generation, extraction, or distribution practices, which benefit a few at the cost of the overall economy's efficiency and productivity. When such institutions are embedded in a society's culture, it creates cognitive dissonance and clouds any decisions intended on promoting innovation.

One example of a rent-extracting institution is the ~~red tape that businesses must navigate when~~ ~~UAE's fee-based system for getting issuing or renewing~~ a commercial license ~~issued or renewed~~. In his book *The Miracle*, Michael Schuman identified India's "license Raj" as the main culprit behind the country's economic divergence from other emerging economies (Schuman, 2009). It was not until India reformed this system that businesses started to become more competitive and innovative. ~~That's because a~~ ~~An alternative to a fee-based system is a~~ price-based system for generating public revenue, ~~— rather than a fee based system — is which tends to be~~ less damaging to innovation.

While the UAE's free zones and freehold zones encouraged foreign and domestic investments and promoted innovation, market liberalization was partial and restricted to these zones (Mogielnicki, 2021). This has created opportunities for the ~~extracting~~ ~~generating~~ and ~~distributing~~ of ~~on of~~ rent, which ~~is~~ ~~hamstringing~~ growth, competition, and innovation.

Some laws and practices that protect or promote monopolies, such as the Commercial Agency Law and the Federal Telecommunication Law, ~~are~~ ~~institutionalizing~~ ~~encourage~~ rent extraction, thereby leading to an adverse effect on competition and innovation. ~~However~~ ~~It~~ remains ~~to be seen whether~~ ~~the~~ ~~—~~ recent government considerations on abolishing the Commercial Agency Law ~~should lead to greater~~ ~~will~~ progress [Retrieved from].

Even though significant information is available over the internet, up-to-date and accurate domestic information is not ~~also~~ available to investors and enterprises. This means businesses ~~can~~ rely on obsolete or speculative information, which restrains their appetite for risk and constrains innovation. ~~Therefore, to~~ ~~To~~ stimulate the emergence of a healthy innovation ecosystem, it is vital that timely and accurate information is available to entrepreneurs. Indeed, the government is in a strong position to collect, compile, and disseminate such information in order to facilitate good business decisions.

### 4.5. The race against time

The global economic landscape is changing rapidly ~~as, with advances and innovations in economic-digital~~ neural systems ~~takeing over from~~ muscular and machine-powered systems (Arthur, 2011). Since Steward Brand declared at a 1984 conference that "Information wants to be free," [Retrieved from] the world has experienced the rapid rise of the internet and the decline in the power of government to control and monopolize information. Governments that seek to do so stunt economic prosperity, while countries that free information -- by releasing accurate, comprehensive, and timely information to the public -- accelerate innovation.

The marginal cost of information declines with scale. Cheaper access to information stimulates algorithmic innovations, which -- in turn -- stimulate innovations in quantum mechanics, robotics, life sciences, nanotechnology, and the management sciences. When innovators can access and use granular data at no cost to crunch and winnow out micro-trends, it stimulates innovation. As AI researcher and computer scientist Pedro Domingos pointed out in his book *The Master Algorithm*, "Data is the new oil [and] refining it is big business" (Domingos, 2015). ~~This is enabling e~~Countries with the fastest information processing capacities tend to rank higher on the innovation ladder than those that lack such capacities.

The UAE is ~~edging up this~~working hard to climb up this innovation ladder, by investing in areas such as smarter cities, vertical farms, Enterprise Command and Control Centers, blockchain applications, and robotic process automations. VAT collections are enabling the government to compile audited balance sheets and income statements and to understand consumption patterns. Cameras and toll gates are generating a deluge of data. Ports and customs are tracking flows of passengers and goods, and the financial authorities are collecting detailed real-time transaction information. But this information will go to waste if it is not be available and shared freely, released quickly, verified for accuracy.? Will it be timely and accurate? At present, the UAE's open-data policy suffers from a lack of detail, quality, reliability, and efficiency in most-many cases. Without free access to up-to-date, quality information, the UAE's investments in knowledge-based capital will remain deficient.

The country's investment in capital infrastructure (hardware) is significant. But more investment is needed in software -- information, data, research, learning, and knowledge. The returns on investments in software differ from those made in physical capital such as machines and buildings. That's because the marginal returns on investments in physical capital keep diminishing with scale, whereas the marginal returns on investments in knowledge accumulate with scale. It is for this reason that many countries are now investing in idea factories to cultivate homegrown ideas and to harvest ideas from other countries. Indeed, idea factories have now become an important tool for countries intent on expanding their innovation capacities (Senor & Singer, 2009).

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The past era promoted industrial policies like tools for shaping markets and enhancing innovation. Nobel Laureate Joseph Stiglitz advocates for industrial policies to promote knowledge and learning at their core (Stiglitz & Greenwald, 2014). Indeed, industrial policies may serve as an effective tool for promoting innovation -- as long as such policies are not used for choosing winners or stamping out competition.

In their book *Whiplash: How to Survive our Faster Future*, authors Joi Ito and Jeff Howe distinguish between learning and education. To them, learning is embedded in a society's culture whereas education mostly focuses on schooling (Ito & Howe, 2016). Ito and Howe see learning as something that people like to do for their own development and advancement, and that by doing so, society progresses, like Adam Smith's invisible hand (Smith, 2012). They note that for learning to exist, a society must have in place the institutions required to protect property rights (especially IP rights), must make information easily accessible to people, reward people for thinking freely, produce quality research, and incentivize people for being innovative.

### 5. Conclusion and recommendations

A country's capacity to innovate cannot depend on a single person, institution, law, or organizational construct. An innovation ecosystem emerges from the combination of competition, leadership, incentives, learning, education, R&D, property rights, ~~the right~~ division of labor, public-private partnerships, population diversity ~~of population~~, and political and economic stability.

In the case of the UAE, the country needs to be wary of the forces that are at work to derail its innovation trajectory. These forces can be found in legacy laws and institutions, which are either inherited from its colonial past or enforced by civil servants brought in from other countries during the early days of UAE's independence.

The UAE is currently at an inflection point: Many countries have learned from the UAE's experiences and are pursuing similar strategies, so it is important not to become complacent about past successes or oblivious to any future threats that may derail growth. To stay at the top and lead by example, the UAE cannot depend on repeating the same things time and again. A cultural refresh is needed at every turn to bring about the required institutional changes and it will be new institutions that will drive future innovations.

The country should consider abolishing fee-based licensing by introducing taxes and subsidies based on the price system to nudge private actors in the desired direction. More competition would definitely open up more new markets and motivate investors and entrepreneurs to innovate. Investments in R&D would enhance knowledge and investing in a learning society would improve the economy's capacity for innovation.

A starting point would be an investment in an independent think-tank to collaborate with leadership, government, and the private sector and to establish a platform for advising on policy decisions. A platform such as the

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National Bureau of Economic Research [Retrieved from] in the US could provide the UAE with a model for debating, formulating, and proposing objective policies for innovation.

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