National Experts Program
برنامج خبراء الإمارات

AI Report

Leveraging Artificial Intelligence to Enhance Labor Productivity in the United Arab Emirates

By changing its approach to economic development and leveraging AI, the United Arab Emirates can maximize its innate potential and catalyze growth for generations to come.

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Mohamed Tarmoom joined Mubadala in 2015 after starting his career in the Boeing Company, where he supported the commercial flight services division. Today, he is a Senior Associate working as part of the UAE Investments platform at Mubadala. Throughout his journey, he supported various asset management and business development activities in multiple sectors.

Currently, Tarmoom is responsible for the management of assets in both the Aerospace and Technology sectors. He also plays a key role in business development activities in the Australia-UAE business council. His experience included a secondment to Cognit Technology Solutions where he played a pivotal role in delivering projects to high profile clients, including the Prime Minister's office.

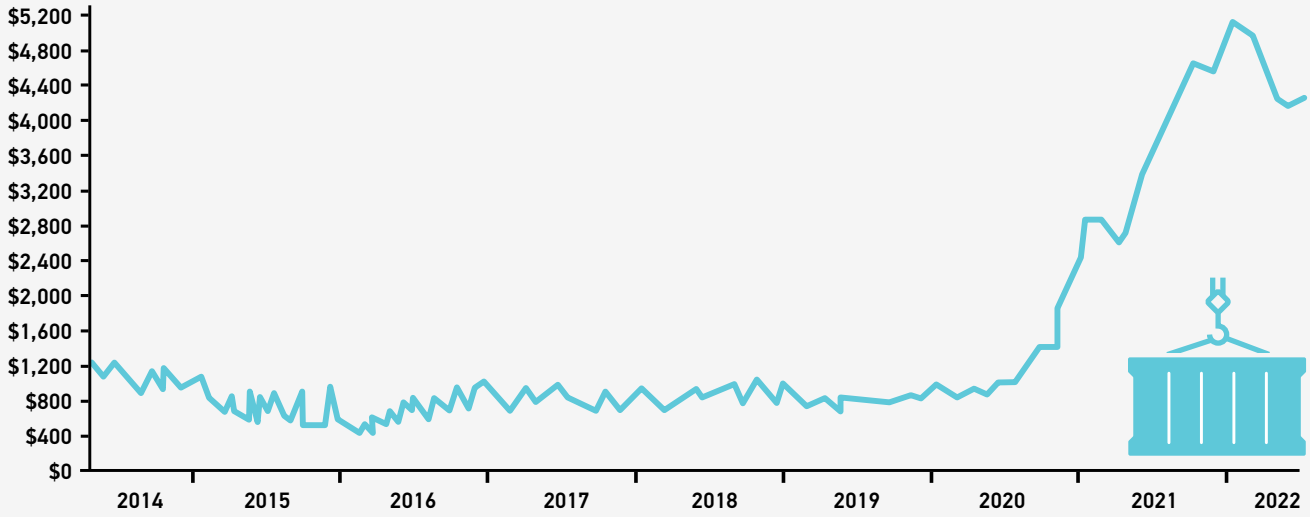
The world is facing a rapidly changing economic, geopolitical, and technological landscape. For the United Arab Emirates (UAE), this is creating a unique opportunity to integrate artificial intelligence (AI) as pivotal to the success of its economic development strategy.

The world is undergoing three major structural shifts:

Economic shifts. The breakdown of global supply chains during the COVID-19 crisis alerted the world to the fragility of the global economic order. In one fell swoop the interconnectedness of the global supply chain went from being a great strength to a massive vulnerability. At the same time, shipping and labor restrictions caused outsourcing costs to increase for the first time since the new economic order was established.

Container spot rates appear to be ticking up again as we enter peak season

China Containerized Freight Index (CCFI), Spot Rate (USD per Box)



In this new world, companies and countries are increasingly focused on building more resilient supply chains with two main objectives:

Friendshoring. While a shift to entirely domestic supply lines is neither economically nor logistically feasible, countries and companies are focusing on identifying places in the world where they have closer geopolitical ties. By moving input processing to these nations, countries and companies are reducing the risk of tariff enactment (as seen in the trade relationship between the US and China in recent years) or outright cessation or nationalization of input production.

Diversification. Although economies of scale and centralized production create economic advantages, the concentration of supply lines became a massive economic concern—and in some cases even a national security concern. As the world moves away from large individual manufacturing bases, companies will look to have multiple production centers located strategically across the globe to best supply their customers.

Geopolitical shifts. The world is the most fragmented it has been since the rise of the British Empire. Countries now choose to work with each other on individual initiatives, without having to necessarily agree on every policy outlook. Nowhere is this more evident than India, which continues to buy Russian energy (despite discouragement from the US and the broader Western world), facilitate the movement of key supply chains out of China (despite the discouragement of China), and simultaneously work with China selectively on areas of mutual agreement, such as the Cross-Border Interbank Payment System.

This new world has led to a massive reshaping of global supply lines, with an estimated **40-70%** of China's productive capacity being moved out of the country. Given China's roughly **$2 trillion** manufacturing asset base, this shift represents an **$800 billion** to **$1.4 trillion** opportunity.

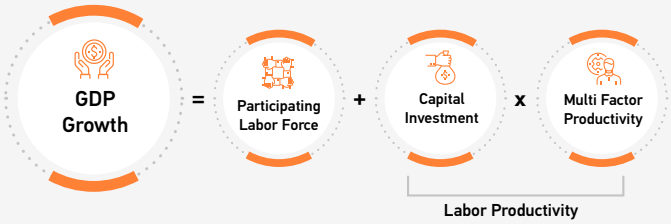
Technological shifts. We are living in a time when digital technologies are driving transformative change. Economic paradigms are shifting as new technologies reshape product and factor markets and profoundly alter business and work.

> **The latest advances in AI and related innovations are expanding the frontiers of the digital revolution. Digital transformation accelerated in the wake of COVID-19 and the future is now arriving faster than expected.**

The UAE is perfectly positioned to take advantage of this structural shift by putting increased focus on labor productivity and the integration of AI.

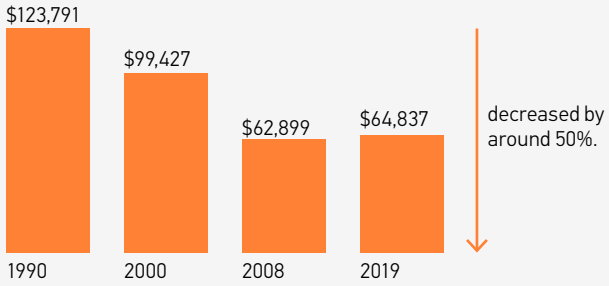
The relevance of labor productivity

While today's global shifts are creating incredible economic opportunities, Arab nations face a growing internal concern that is embodied in a single statistic—labor productivity (herein defined as GDP per laborer).



There are many data points that can help identify, both retrospectively and prospectively, the overall health and well-being of a nation, but there is no individual data points that is more meaningful than labor productivity. In fact, we are witnessing potential signs of civil unrest in the Western world that can be linked to the decline in the growth rate of labor productivity over the last 50 years. When an economy increasingly becomes a financial economy—with companies allocating capital abroad—rather than a productivity economy, it tends to lead to increased inequality (those with capital benefit more as the balance of financial returns shift away from labor) and increased dissatisfaction (middle- and lower-class workers lose working opportunities).

According to the World Bank database, the UAE's labor productivity is experiencing major headwinds. Over the last 30 years, real GDP (measured in 2015 $) per laborer in the UAE has lagged the trend seen in the rest of the world. From 1990 through 2019, real GDP per workforce participant in the UAE decreased by around **50%**. In other words, the average UAE workforce participant of 1990 was twice as productive as they were in 2019.



Workforce participant in the UAE

GDP Per laborer

		United Arab Emirates	United States	European Union	OECD	World	Singapore
GDP per Laborer (Real US$)	1990	123,791	76,548	47,289	54,220	15,484	46,274
	2000	99,427	93,866	56,469	64,232	17,521	65,341
	2008	62,899	103,863	62,563	70,262	20,294	11,578
	2019	64,837	120,072	67,766	75,967	24,419	98,718
Absolute Growth	1990 - 2019	-48%	57%	43%	40%	58%	113%
	2000 - 2019	-35%	28%	20%	18%	39%	51%
	2008 - 2019	3%	16%	8%	8%	20%	27%
Annual Growth	**1990 -2019**	**-2.2%**	**1.6%**	**1.2%**	**1.2%**	**1.6%**	**2.6%**
	2000 - 2019	-2.2%	1.3%	1.0%	0.9%	1.8%	2.2%
	2008 - 2019	0.3%	1.3%	0.7%	0.7%	1.7%	2.2%

Despite meaningful GDP growth in the UAE (106% in the past 20 years, or an average of 4.1% annually), this growth has entirely been driven by an increase in labor force participation. Over the past 20 years, the UAE has increased its labor force by around 220%, or 6.3% annually, far outpacing almost every other country. Adding a focus on productivity to that growth can unlock sustainable economic growth and prosperity for the UAE.

What drives GDP growth and why is this relevant to the UAE?

The basic growth accounting formula developed by Robert Solow and Trevor Swan in 1956 (for which Solow was awarded the Nobel Prize in 1987) makes abundantly obvious the potential risks of this steep decline in labor force productivity.

Firstly, at its logical extreme, at some point an economy will run out of additional workers to pump into the system. At the same time, these workers will become increasingly expensive in the long run as increased demand pushes up wages globally.

In the UAE, this effect is especially evident. In a country where 90% of the population is non-local, there is extreme elasticity of supply. In other words, given that most of the population has no permanent tie to the UAE, they are more than willing to identify opportunities elsewhere (although this is currently being addressed by programs such as the Golden Visa).

For an increasingly acute example, take Indian workers. Roughly 40% of the UAE's population is of Indian origin. As India becomes an increasingly attractive destination for labor, the UAE risks losing a huge portion of its human capital base, because of either migration back to India or because laborers will choose not to come to the UAE in the first place. Were the UAE to lose even a small percentage of its population, real estate values would crater, service industries would contract sharply and the knock-on effects to the economy would be disastrous.

What has driven this decline in productivity?

Labor productivity in the UAE has declined rapidly because of both constituent components. Capital investment refers to the physical capital that workers use to enable them to be more productive.

While the rest of the world has seen slowdowns in the growth of both fixed capital investment and productivity the rate of change remains positive.

Fixed Capital Investment

		United Arab Emirates	United States	European Union	OECD	World	Singapore
Capital Efficiency	2000	0.18	0.21	0.22	0.22	0.29	0.31
	2008	0.26	0.20	0.22	0.22	0.29	0.26
	2019	0.19	0.21	0.22	0.22	0.25	0.24
GFCF per Laborer Index (2000 +1.00)	2005	1.04	1.10	1.04	1.06	1.07	0.87
	2008	0.99	1.04	1.14	1.07	1.15	1.01
	2015	0.82	1.16	1.04	1.09	1.12	1.20
	2019	0.75	1.27	1.21	1.17	1.21	1.19
GFCF Per Laborer Absolute Growth	2000 - 2019	-25%	27%	21%	17%	21%	19%
	2005 - 2019	-28%	15%	16%	10%	13%	38%
	2008 - 2019	-24%	22%	6%	9%	5%	18%
	2015 - 2019	-8%	10%	10%	7%	7%	-1%
CFCF per Laborer Annual Growth	**2000 - 2019**	**-15%**	**1.3%**	**1.0%**	**0.8%**	**1.0%**	**0.9%**
	2005 - 2019	-2.3%	1.0%	1.1%	0.7%	0.9%	2.3%
	2008 - 2019	-2.5%	1.8%	0.6%	0.7%	0.4%	1.5%
	2015 - 2019	-2.1%	2.3%	3.9%	1.8%	1.8%	-0.1%

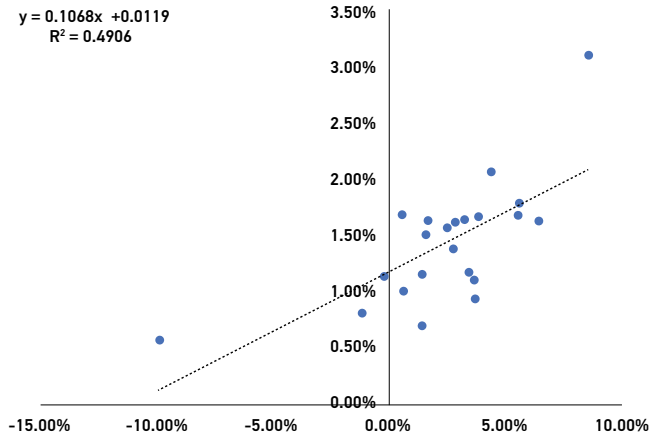
Multi Factor Productivity

		United Arab Emirates	United States	European Union	OECD	World	Singapore
MEP Index (2000 = 1.00)	2005	0.98	1.07	1.05	1.05	1.06	1.22
	2008	0.56	1.10	1.08	1.08	1.11	1.19
	2015	0.67	1.17	1.11	1.11	1.25	1.31
	2019	0.73	1.21	1.15	1.14	1.32	1.44
MEP Absolute Growth	2000 - 2019	-27%	21%	13%	14%	32%	44%
	2005 - 2019	-26	14%	10%	9%	25%	13%
	2008 - 2019	10%	11%	7%	6%	19%	22%
	2015 - 2019	8%	3%	4%	3%	6%	10%
MEP Annual Growth	**2000 - 2019**	**-1.7%**	**1.0%**	**0.7%**	**0.7%**	**1.5%**	**2.0%**
	2005 - 2019	2.1%	0.9%	0.7%	0.6%	1.6%	1.2%
	2008 - 2019	0.8%	0.9%	0.6%	0.5%	1.6%	1.8%
	2015 - 2019	2.0%	0.8%	0.9%	0.7%	1.5%	2.5%

How to increase labor productivity

There has been a marked slowdown in the growth rate of labor productivity over the past 50 years, coinciding with the arrival of the digital age. Annual output has dropped by an average of 1.54% over the past half-century. This is in contrast to labor productivity growth from 1870 to 1970.

World Multi Factor Productivity v. Manufacturing Output



Singapore, United States, European Union, OECD

Regression Statistics	
Multiple R	0.7578
R Square	0.5743
Adjusted R Square	0.5700
Standard Error	1.4047
Observation	101

ANOVA	df	SS	MS	F	Significance F
Regression	1	263.51	263.51	133.54	0.00
Residual	99	195.35	1.97		
Total	100	458.86			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	0.4006	0.1585	2.5275	0.0131	0.0861	0.7150	0.0861	0.7150
Value Added Manufachuring	0.2871	0.0248	11.5560	0.0000	0.2378	0.3364	0.2378	0.3364

By regressing MFP against value-added manufacturing output (both globally and among a basket of developed nations) the picture becomes even clearer. Roughly half of the change in MFP can be explained by changes in manufacturing output, with a single percentage point in manufacturing output increasing MFP by around **0.30%** on average.

In analyzing over **1.6 million** data points across time and geography, no other variable consistently showed statistically significant explanatory power for this change.

Value-added manufacturing also makes sense as a driver for growth in productivity because it requires the creation of outputs that are more valuable than the sum of its inputs. Firms are forced to adopt best practices around technological innovation, managerial expertise, and efficiency maximization. Furthermore, having a solid manufacturing base creates innumerable knock-on effects throughout the economy, ranging from the ecosystem required to provide necessities to employees through to the various capital providers that will help finance existing and expanding operations.
If we take a furniture manufacturing plant as an example, hundreds of employees will be required, both blue-collar and white-collar staff. Each of these employees will require food, housing, education, and other necessities. Additional enterprises will be required to service this demand, which will in turn create a positive ripple effect.

In contrast to technological innovation (which in general acts as an overlay or enabler, rather than as a productive output) and financial engineering (which only creates productive value when used to finance the actual output more efficiently), value added manufacturing has driven economies forward since the one true Industrial Revolution that began in 1870.

The path forward

By focusing on increasing manufacturing capacity in the UAE, the country can stem the decline in labor productivity while taking advantage of today's multiple global opportunities.

However, rather than focusing on industries that the biggest global powers are fiercely pursuing, the UAE should take a closer look at the demand side of the economic equation. It is important to focus on advanced manufacturing (vaccines, energy transition, food security, and other "clusters") while simultaneously acknowledging that the other larger economies have decades of advanced experience, an entrenched demand base, and developed ecosystems. Going head-to-head with these countries may not yield the necessary results in the desired timeframe.

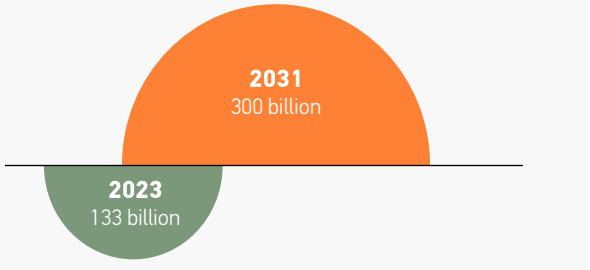
On the other hand, reversing the equation by identifying points of demand mitigates demand risk and increases the likelihood of successful investment.

> **"The UAE should therefore first focus on its imports. It should identify which inputs in the production of those imports can be made domestically in higher quantities"**

Then expand the analysis to neighboring nations. In 2021, the UAE imported over **$293** billion of goods (excluding items that are ultimately re-exported), a significant portion of which could be produced domestically.

By focusing on just the 10 industries highlighted in red (see table above), the UAE could domesticate over **$113** billion of annual imports. Assuming, extremely conservatively, 10% net margins with **20%** required yield, these industries could generate an additional **$56.8** billion of productive asset base. Additionally, assuming **50%** gross margins, the additional **40%** of costs will result in around **$45.5** billion going back into the UAE economy per annum. This analysis only considers the direct impact of these 10 import groups and does not include the knock-on effects discussed above. Even getting a percentage of this industrial capacity established will begin to establish the UAE as an industrial superpower and reverse the decline in labor productivity.

This will also be in line with the UAE's industrial strategy, Operation **300bn**, which aims to raise the industrial sector's contribution to GDP from



The strategy aligns with national goals and international commitments relating to advancing sustainable economic growth, deploying clean energy solutions, driving industrial innovation, and promoting responsible consumption and production.

United Arab Emirates - Imports// Trading Partner - World

	2021			10Ys.P	
Product Name	**$**	**%**	**10YsCAGR**	**$**	**%**
Mfg. of Basic metals	61,214	20.87%	0.71%	45,719	19.73%
Mfg. of Coke, Refined Petroleum Products	33,930	11.57%	17.69%	12,048	5.20%
Mfg. of Radio, Television and Communication	32,181	10.97%	5.56%	20,187	8.71%
Mfg. of Chemicals and Chemical Products	22,496	7.67%	3.41%	16,446	7.10%
Mfg. of Furniture	19,345	6.59%	-0.15%	18,386	7.94%
Mfg. of Motor Vehicles and Trailers	18,647	6.36%	-0.44%	18,810	8.12%
Mfg. of Machinery and Equipment	16,630	5.67%	-2.66%	15,893	6.86%
Mfg. of Food Products and Beverages	11,334	3.86%	1.38%	10,607	4.58%
Other Mining and Quarrying	10,191	3.47%	6.63%	6,821	2.94%
Mfg. of Office Machinery	9,263	3.16%	1.31%	5,831	2.52%
Mfg. of Electrical Machinery and Apparatus	8,153	2.78%	-1.38%	7,577	3.27%
Mfg. of Other Transport Equipment	7,569	2.58%	-6.81%	12,510	5.40%
Agriculture., Hunting and Related	6,495	2.21%	4.96%	5,509	2.38%
Mfg. of Medical and Optical Instruments	5,829	1.99%	0.86%	4,694	2.03%
Mfg. of Wearing Apparel	4,566	1.56%	-0.57%	4,103	1.77%
Mfg. of Rubber and Rubber Products	3,982	1.36%	-0.65%	3,544	1.53%
Mfg. of Fabricated Metal Products	3,777	1.29%	-3.73%	4,381	1.89%
Mfg. of Leather	3,236	1.10%	2.41%	2,683	1.16%
Mfg. of Textiles	3,158	1.08%	-0.63%	3,005	1.30%
Extraction of Crude Petroleum and Natural Gas	2,237	0.76%	101.64%	5,407	2.33%
Mfg. of Other Non-Metallic Mineral Products	2,148	0.73%	-0.81%	2,070	0.89%
Mfg. of Paper and Paper Products	2,084	0.71%	4.48%	1,608	0.69%
Mining of Metal Ores	1,556	0.53%	9.28%	813	0.35%
Mfg. of Wood and Wood Products	1,022	0.35%	-1.47%	993	0.43%
Mfg. of Tobacco Products	832	0.28%	-6.02%	848	0.37%
Publishing of Recorded Media	717	0.24%	-0.03%	618	0.27%
Mining of Coal and Lignite	427	0.15%	4.32%	272	0.12%
Fishing, Hatcheries, Fish Farms	195	0.07%	14.06%	217	0.09%
Recycling	121	0.04%	0.40%	71	0.03%
Forestry, Logging and Related	37	0.01%	0.08%	32	0.01%
Electricity, Gas, and Steam	0	0.00%	-34/69%	0	0.00%
Mining of Uranium		0.00%	-	0	0.00%
Total	**293,373**		**1.90%**	**231,703**	

Layering AI into manufacturing

Differences in the cost of capital make the UAE an extremely attractive destination for funding a shift to AI-enabled manufacturing. Risk-adjusted returns have the potential to outpace other global investment opportunities, ensuring adequate capital stock for investment. Additionally, setting up new capabilities will enable the UAE to integrate the latest technologies into manufacturing process and related ancillary processes.

Setting up state-of-the-art AI-enabled facilities will bring the following benefits:

Higher quality. If automation controls the schedules and production lines without human interference, this would optimize activity and reduce defects and inefficiencies, creating higher-quality products.

Reduced costs. Technology can operate with higher efficiency, meaning reduced waste and long-term cost savings.

Lower production time. Manufacturing technology expedites the production process, so more batches can be made more quickly. More products can be created in less time and with a consistent run rate.

Optimized supply chain. The entire supply chain benefits from procurement and production that is more likely to follow delivery schedules.

A safer workplace. Machines can do jobs that are dangerous for workers, preventing injury and risk. Technology can also identify risks and develop safety measures.

These factors will ensure that the business operates efficiently and can gain market share beyond the domestic market.

AI will be essential to manufacturing

The final piece of this puzzle is the use of advanced technologies such as AI. Technologies are, by definition, enablers. Take the case of Amazon. Widely viewed as a technology company, Amazon began with a simply premise—selling books, a practice that has been widespread since the invention of the printing press almost 600 years ago. However, Amazon leveraged technology—initially the internet, and now advanced robotics and AI—to achieve the same goal of selling basic products to consumers.

AI will be an essential overlay in the industrial manufacturing sector as productive capacity is established.

> **“Whether it is used for creative generation, quality controls, robotics, or one of many other goals, AI will be instrumental in the growth of a productive manufacturing base in the UAE.”**

AI can already be used to optimize logistical operations, better manage factory automation, sense opportunities for predictive maintenance, and much more. In the US alone, AI in manufacturing is expected to grow to a **$7.5** billion market by 2027, a growth rate of over **44%** per annum. Globally, the market is expected to reach **$16.7** billion by 2026. This investment will compound the growth and development of technology, which can be overlaid into a productive manufacturing sector.

The UAE is in an enviable position. The world has changed, and the UAE is perfectly positioned to take advantage of the “new normal”. To do so will require a sharp focus on manufacturing capacity that leverages the power of AI and labor productivity, two factors that are mutually reinforcing. Focusing government resources on the establishment of a mezzanine investment fund will be key to driving this evolution. By generating financial returns along with broader economic and political benefits, the UAE can establish itself as one of the few major world leaders.