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National Transformations Institute

4IR Future of Production in KSA: Where Is the Value?

Learnings from the
Riyadh Leadership Summit

Part 2



Context

On Thursday, December 14, 2017, A.T. Kearney and Al-Aghar Group co-hosted a gathering of Saudi Arabia's most prominent industrial and technology leaders, policymakers, and academics. Together we discussed the impact of the Fourth Industrial Revolution (4IR) and, specifically, the Future of Production on the Kingdom of Saudi Arabia. Participants also defined a crucial set of initiatives that will most enable the Kingdom to capture the benefits from the resulting technological advancements, including further diversifying and strengthening the economy. The gathering was highly interactive, featuring presentations, face-to-face discussions, and solution-oriented collaborative thinking on the most crucial issues and opportunities the country faces as it seeks to harness the economic potential of the synthesis of physical, biological, and digital technologies of the Fourth Industrial Revolution. This paper summarizes the main discussion points from the summit and identifies a foundation for building a strong Saudi community of government and business leaders working together to shape a growing, sustainable, and inclusive 4IR production system in the Kingdom.

The Riyadh Leadership Summit was hosted by A.T. Kearney, its National Transformations Institute, and the Al-Aghar Group. A.T. Kearney is a leading global management consulting firm active in more than 40 countries worldwide. Since 2015, the firm has been a knowledge partner to the World Economic Forum focused on understanding the Fourth Industrial Revolution—specifically, the Future of Production and its implications on individuals, companies, countries, and the world. The National Transformations Institute, which is the Middle East platform of A.T. Kearney's Global Business Policy Council, provides insights into regional leadership and views on navigating the increasingly complex dynamics shaping the Middle East, including the Fourth Industrial Revolution.

Al-Aghar Group is an independent Saudi think tank and contributor to the transformation of the Kingdom into a knowledge-based society. The Group provides strategic options to decision-makers in the areas of social, cultural, and economic development, and engages stakeholders in dialogue throughout the process.

The authors would like to thank the following for their contributions:

- Zuhair Maghrabi, Al-Aghar Group
- Madeline Sanderford, associate, National Transformations Institute
- Alessandro Massa, partner, A.T. Kearney
- Rob van Dale, partner, A.T. Kearney
- Lays Badra, consultant, A.T. Kearney
- Sachidanand Sahoo, consultant, A.T. Kearney
- Daria Shevchenko, marketing, A.T. Kearney

This brief provides the executive summary of the main outcomes from the event.

Detailed insights and findings from the event and the associated study are published in a four-part series:

- Part 1: Realizing the Benefits of 4IR Future of Production in KSA
- Part 3: KSA Country Readiness: Capturing the Value at Stake

Speakers and Panelists



Prince Turki bin Saud bin Mohammed Al Saud

President of King Abdulaziz City for Science and Technology

He also holds the following positions: Chairman of the Supervisory Committee for the National Science, Technology and Innovations Plan; Member of the Board of Trustees for Al Faisal University; Chairman of the Administrative Committee of the Saudi Energy Efficiency Center; and Chairman of the Board of Directors of TAQNA.



Mauricio Zuazua

Partner, A.T. Kearney, and Lead Partner, World Economic Forum Future of Production

Mr. Zuazua has 18+ years of experience advising business and government leaders in more than 20 countries with policy, strategy, and transformation to enhance competitiveness, growth, innovation, industrial diversification, and national capability development.



Dr. Ibrahim M. Babelli

Acting President of Center for Strategic Development

Dr. Babelli oversees integrated planning of GDP contributing (for example, manufacturing) and enabling (for example, logistics) sectors of the economy. Prior to that he served as Renewable Energy Team Leader and Chief Strategist of King Abdullah City for Atomic and Renewable Energy and as Executive Director of the National Industrial Development Program.



Rudolph Lohmeyer

Vice President, A.T. Kearney Global Business Policy Council – National Transformations Institute

Mr. Lohmeyer is a recognized expert on scenario-based strategic planning and the institutional requirements of 21st-century statecraft and whole-of-government strategic planning. He leads the Middle East-based National Transformations Institute helping business and government leaders around the globe anticipate and plan for the future.



Dr. Lama Sulaiman

Vice Chair, Jeddah Chamber of Commerce

Dr. Sulaiman is the first female elected as deputy chairman of the Jeddah Chamber of Commerce & Industry. She is also a board member of the Jeddah-based Rolaco Trading & Contracting, the National Institute of Health Services, the National Home Health Care Foundation, and the Economic and Social Circle of the Mecca Region.



Dr. Mohammed Almajed

Advisor to the Chairman, Taqnia

Dr. Almajed has served as an advisor to HH KACST President, has advised BIAAC on advanced manufacturing, worked as an advisor to HE TVTC Governor, and served as COE Chairman of the Board, Chief Operating Officer at College of Excellence & Innovation, Commercialization Coordinator, and National Satellite Technology Program Director.



Eng. Tarek Noureldin

Senior Operations Director, KSA, Philips Lighting

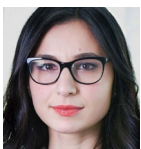
Tarek has 19 years of operations and supply chain experience in multiple industries, including lighting, telecommunications, and FMCG. He leads the industrial transformational vision for Philips Lighting in KSA to set the standards and competitive edge for an industrial hub serving the region from KSA.



Ihab Foudeh

Public Sector General Manager, Microsoft Middle East

Mr. Foudeh has held several positions within Microsoft in the past 17 years. He is an avid technology supporter and is a strong advocate for developers in the MEA region and for the adaptation of technology in various industries. Prior to Microsoft, Ihab held multiple R&D leadership roles working for US multinationals.



Andreea Zugravu

Principal, A.T. Kearney, and World Economic Forum Seconded 4IR Future of Production

Mrs. Zugravu has managed high-profile strategic initiatives for the World Economic Forum, leading government and private sector organizations across the world. She advises on public policies and strategies, technology and innovation ecosystems, economic development, and organizational transformation—many with focus on 4IR.



“In NEOM, everything will have a link to artificial intelligence, to the Internet of Things—everything.”

— **Crown Prince Mohammed bin Salman**



“KACST is leading Industry 4.0 localization... by establishing the foundational elements [of] the Industry 4.0 ecosystem and providing catalysts to increase adoption of Industry 4.0 technologies. In collaboration with relevant stakeholders and public and private entities, it plans on increasing the competitive advantage of existing industries, extending existing value chains, and developing new ones.”

— **HH Dr. Turki bin Saud**



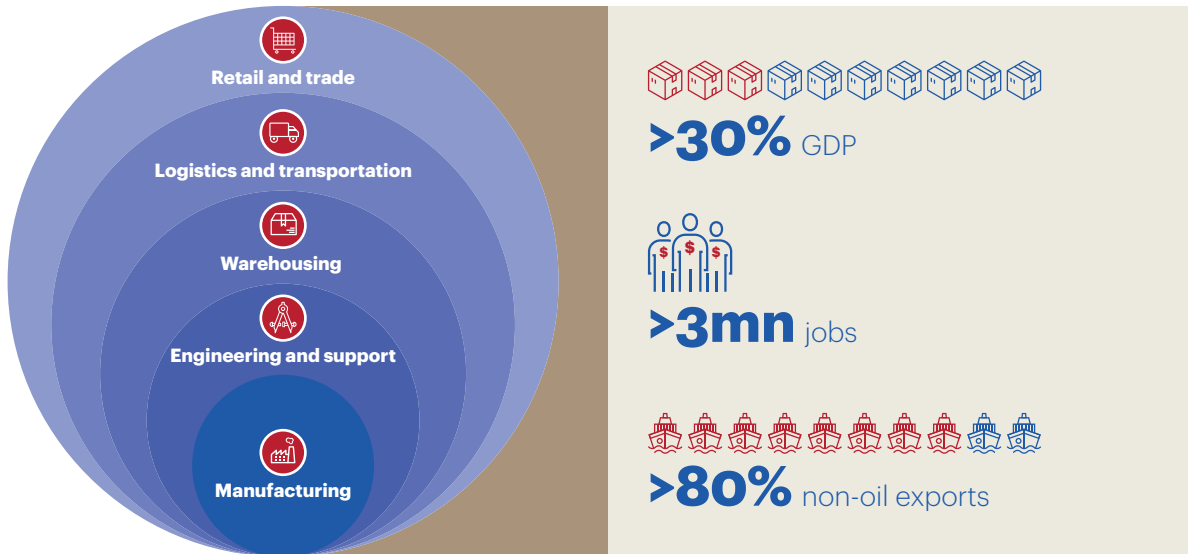
“We stand on the brink of a technological revolution... the transformation will be unlike anything humankind has experienced before.”

— **Klaus Schwab, Founder and Executive Chairman of the WEF**

Preparing for the Fourth Industrial Revolution Future of Production

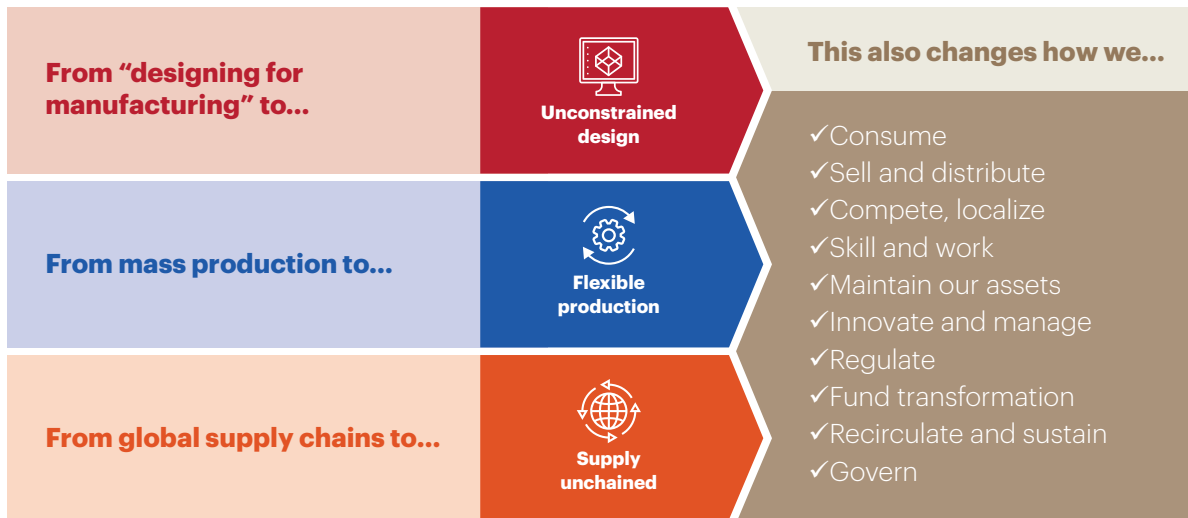
KSA Leadership Summit

What is “production” and why does it matter to KSA?



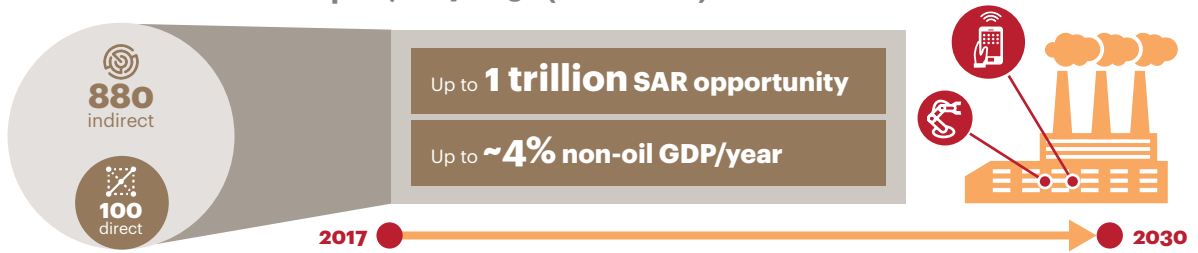
Source: A.T. Kearney/WEF Country Readiness for the Future of Production

A change in production changes a vast ecosystem in unprecedented ways

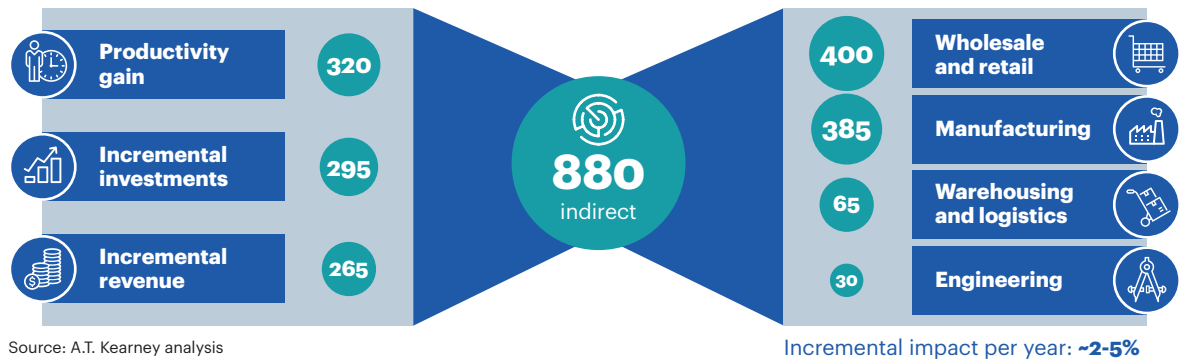


Source: A.T. Kearney analysis

4IR Future of Production offers a potential ~1 trillion SAR opportunity in KSA by 2030
Cumulative economic impact, 2017-2030 (billion SAR)

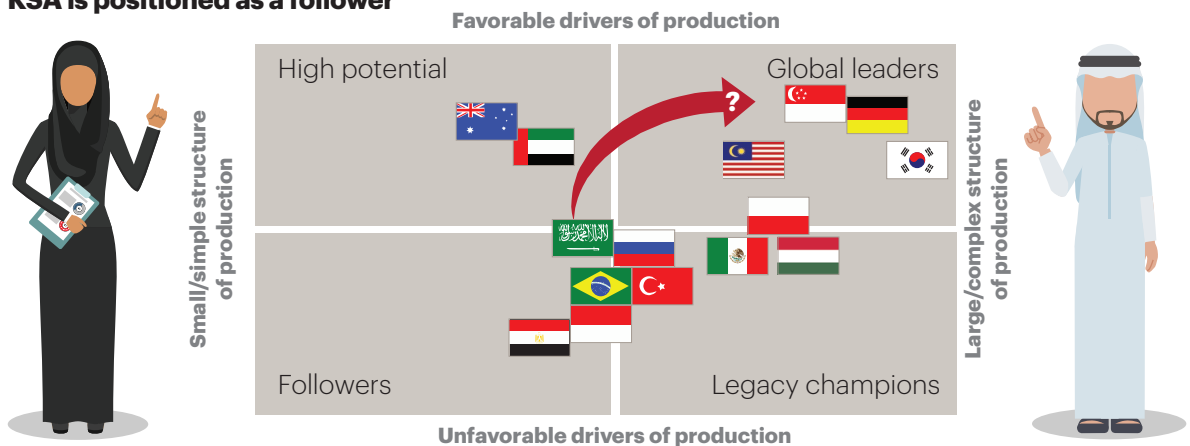


Indirect impact mostly driven by productivity; retail and manufacturing to play a key role
Cumulative economic impact, 2017-2030 (billion SAR)



Source: A.T. Kearney analysis

KSA is positioned as a follower



Source: A.T. Kearney/WEF Country Readiness for the Future of Production

Emerging global insights

- 1** **Technology and innovation** are shifting and recreating value chains
 - 2** **Opportunity for localization leapfrogging** for those “ready”
 - 3** **Inclusive growth**—bringing SMEs and women into the supply chain—must be driven
 - 4** **Institutional framework, education, and other systems** must adapt
 - 5** **Rapid human capital up-skilling and re-skilling** is urgent
-

Source: A.T. Kearney analysis

4IR Future of Production in KSA

The Fourth Industrial Revolution (4IR) is the current wave of accelerated, historic change that is transforming the global economic landscape. This revolution is not only reshaping the way we do things but is also radically blurring the lines between the physical, biological, and digital worlds. It is being driven by a rapidly evolving and interconnected set of transformative technologies, some of which are still in the early design stages while others, such as the Internet of Things, are beginning to flourish across all aspects of society.

Production demonstrates globally one of the most important areas of transformation in the context of 4IR. Production refers to the manufacturing, engineering and support, warehousing, logistics and transportation, and retail and trade of goods. Collectively, these sectors are a foundational source of economic growth for developed and developing nations alike, accounting for roughly 30 percent of global GDP (see figure 1). They generate nearly 1 billion well-paid jobs for an increasingly skilled workforce and contribute disproportionately to innovation and exports.

Figure 1
Economic value of production

	Globally	Saudi Arabia
GDP	~30%	>30%
Exports	>80%	>80% (non-oil)
Jobs	>850 mn	>3 mn

Sources: WEF; A.T. Kearney analysis

In Saudi Arabia, production is an equally important engine of economic value, generating more than 30 percent of total GDP in 2016. The production sectors are responsible for more than 3 million jobs within the Kingdom (with nearly 1 million filled by nationals) and more than 80 percent of the Kingdom’s non-oil exports.

Today, the production sectors are evolving rapidly and with them the ways in which we consume, sell and distribute, compete, localize, innovate, regulate, manage, and work. While design was once constrained by the manufacturing process, today it is becoming ever more limitless as artificial intelligence, IoT, and enterprise wearables enable algorithmic design optimization, customer co-creation, and voxel level control. Manufacturers historically favored mass production but today these technologies, combined with 3D printing and robotics, enable flexible production involving fewer processing steps, shorter lead times, lower capital requirements, and even batch sizes of one. In addition, the historic trend toward global supply chains is shifting as 3D printing allows producers to rethink this integration and enable small-scale, on-location production. We refer to this new emerging landscape as the Future of Production—a future that holds tremendous potential in realizing Saudi’s ambitious Vision 2030. But capturing this potential requires significant, targeted, and rapid efforts of Saudi leadership.

The Value at Stake from 4IR Future of Production in KSA

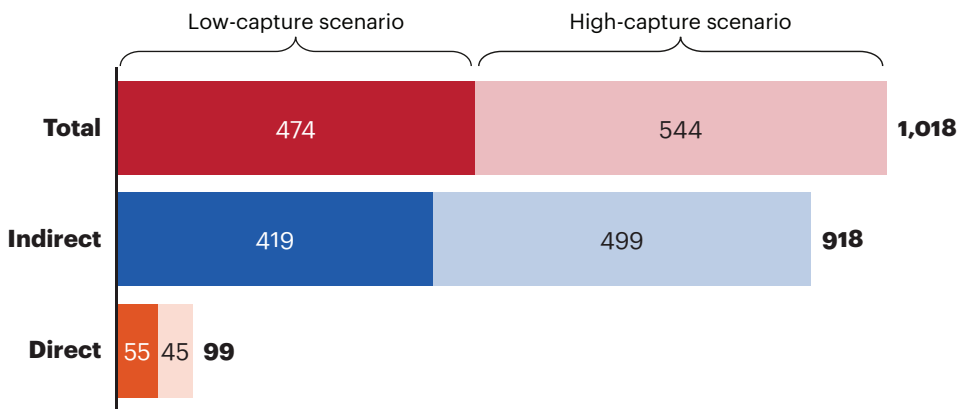
4IR Future of Production offers tremendous promise for the Kingdom of Saudi Arabia, both as an accelerant and an enabler of a broad transformation already under way. It will contribute directly to economic growth and diversification through expansion of key technology markets, and indirectly through technology-driven expansion of key production sectors. The combination of these direct and indirect contributions represents the primary value at stake of the 4IR Future of Production for Saudi Arabia (see figure 2). A.T. Kearney estimates this value to be as much as 1 trillion SAR by 2030, or roughly 3 percent of GDP per year.¹

Figure 2

The 4IR Future of Production value at stake for Saudi Arabia could reach 3 percent of GDP by 2030

4IR Future of Production contributions to economic growth

(Billion SAR, 2016–2030)



Note: Numbers may not resolve due to rounding.

Sources: WEF; A.T. Kearney analysis

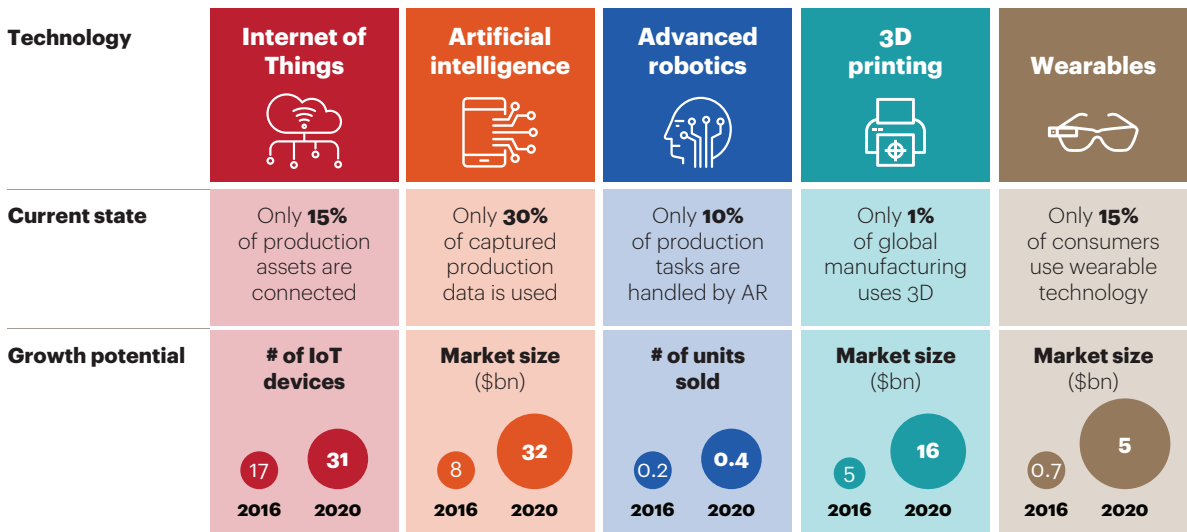
Direct value at stake

The direct value at stake refers to the economic contribution in terms of addressable market size of the five main technologies that will continue to shape the future of production: The Internet of Things (IoT), artificial intelligence (AI), advanced robotics, 3D printing, and enterprise wearables (see figure 3 on page 8).

- IoT** is the term for the growing interconnectivity of devices through the Internet, enabled by rapidly increasing access to the Internet globally and the integration of increasingly cost-effective sensors on an ever-expanding range of devices. Although a phenomenon with broad economic consequences, IoT has significance for production by enabling smart enterprise control, a broader portfolio of connected products and services, and real-time asset performance management. According to the latest estimates by IHS Markit, the number of connected devices will grow from almost 27 billion in 2017 to 125 billion in 2030,

¹ Assumes CAGR of the economic impact from 4IR Future of Production is proportional to overall growth of the Saudi economy.

Figure 3
Key technologies shaping the Future of Production



Source: A.T. Kearney analysis

growing at 12 percent per year on average.² These statistics suggest the massive scale of the opportunity at stake from IoT alone.

- **AI** represents another significant opportunity for the Future of Production. Artificial intelligence allows for rapid processing of vast amounts of data and translation of that data into useful information for application by decision-makers. In the context of production, and in combination with IoT, this enables more effective quality management, predictive maintenance, and supply chain optimization.
- **Advanced robotics** builds on the developments in AI technology by playing an increasingly important role in production through automation. Estimates suggest that between 25 percent and 45 percent of production tasks could be automated by 2030, and that this process of automation, in combination with AI, could boost productivity by 30 percent by 2025.³
- **3D printing** is already revolutionizing production and deeply altering our ideas of its future. Capable of rapidly producing high-value, custom components, 3D printing has until now only achieved broad use in highly specialized, time-sensitive industries, including aerospace and healthcare. However, as the technology becomes more economically attractive, 3D printing will penetrate an expanding range of industries enabling mass localization and disrupting global production value chains.
- **Enterprise wearables**, the smallest of the five Future of Production technology markets, are quickly becoming an important force of change in global production. Enterprise wearables, which include augmented and virtual reality devices that extend the capabilities of human operators, improve worker productivity, increase the efficiency of training and development programs, and advance on-the-job health and safety. Expected to grow nearly 65 percent year-on-year between now and 2020, the influence of this nascent market on the future of production will be significant.

² "Number of Connected IoT Devices Will Surge to 125 Billion by 2030, IHS Markit Says," IHS Markit, 24 October, 2017

³ *Technology and Innovation for the Future of Production: Accelerating Value Creation*, World Economic Forum, March 2017

Estimating the value of key Future of Production technology markets in KSA

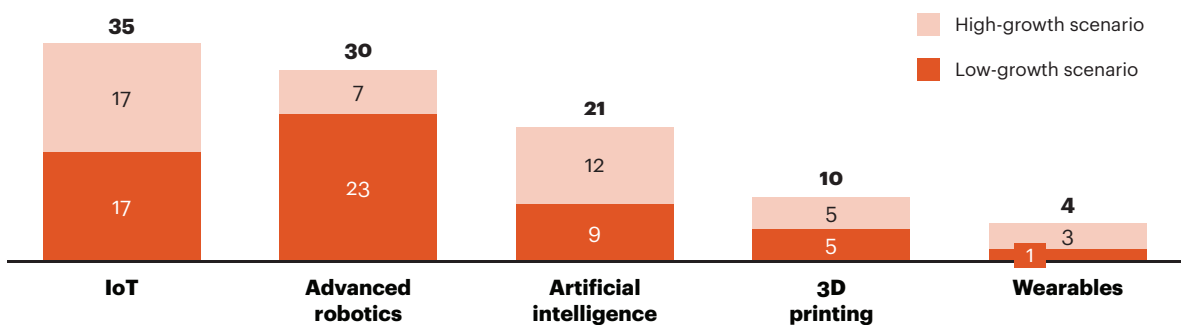
While these technology markets are expected to continue their rapid global growth—between 13 percent and 64 percent year-on-year through 2020—the markets are largely concentrated in North America, Europe, and select countries in Asia. In Saudi Arabia, as with much of the world, progress has been limited. That said, there is increasing attention and investment in these nascent markets. For example, the TAQNIA-Similarity partnership announced in 2017 involves the use of AI for satellite imagery in Saudi Arabia, and Saudi Arabia hosted its first International IoT Exhibition and Conference in January of this year.^{4,5} Through 2030, sustained investment from both the public and private sectors, broader adoption across industries, and local and global innovation related to each technology could rapidly expand their economic contribution in Saudi Arabia and allow the Kingdom to capture a share of the global market value of each technology—a share more consistent with the overall global economy. Assuming a steady tapering off in growth of each technology as it matures, this translates to an additional contribution of between 4 billion and 7 billion SAR per year, in low- and high-growth scenarios respectively, or between 55 billion and 100 billion SAR cumulatively by 2030 (see figure 4).

Figure 4

The value of key Future of Production technology markets is expected to grow

Direct value at stake by technology

(Billion SAR, 2016–2030)



Note: Numbers may not resolve due to rounding.

Sources: WEF; A.T. Kearney analysis

Capturing market share in these intensely competitive areas requires significant effort and investment. Many of these technologies are heavily concentrated in geographic hubs that can attract the funding and the talent necessary to succeed. Strategic investments by large industrial firms have increased barriers to entry for others, particularly SMEs. However, Saudi Arabia has many underutilized levers, which if deployed could result in a successful technology strategy to compete in this space. A successful strategy will balance short-term initiatives to foster the adoption of existing technologies and long-term investments in resources in the early stages to develop and commercialize new technologies. IoT, advanced robotics, and enterprise wearables can be quickly adopted in the Kingdom on the backbone of large infrastructure investments (NEOM and other cities will require digital enablement), government efficiency

⁴ "TAQNIA and Similarity Launch Breakthrough Artificial Intelligence for Satellite Image Analysis in Saudi Arabia," CISION, 23 January 2017

⁵ "First IoT exhibition opens to explore what lies ahead for information technology in KSA," Arab News, 29 January 2018

overhauls (digitization of government processes), and new government programs (Factory of the Future technology adoption programs at Saudi’s 7,000+ factories).

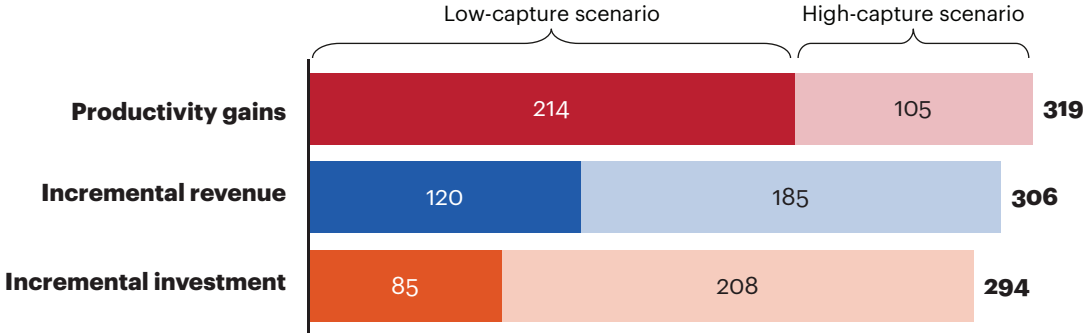
Other technologies, such as 3D printing, accelerate the potential for Saudi Arabia to become a global exporter of technology through printers, materials, and the software space. Vision 2030 mandates localization of defense procurement, which covers areas perfectly suitable for 3D printing, such as maintenance and repair operations and manufacturing of aerospace components. Benefiting from large natural reserves, Saudi Arabia can further increase its role in new materials developed for 3D printers. With the help of SMEs, Saudi can foster local capabilities within the software ecosystem to develop a complete end-to-end 3D printing capability.

Indirect value at stake

The indirect value of 4IR Future of Production represents the combined contribution of three interrelated value generators: productivity gains, incremental revenues, and incremental investments (see figure 5).

Figure 5
The indirect value of the 4IR Future of Production is the combined contributions of three value generators

Future of Production indirect benefits for KSA
 (Billion SAR, 2016–2030)



Note: Numbers may not resolve due to rounding.
 Source: A.T. Kearney analysis

Productivity gains: creating more with less. Productivity enhancement as it relates to production refers to the ability to create more with less. In the context of the Fourth Industrial Revolution, this includes the ability to rapidly create prototypes and accelerate production times through 3D printing, circumvent traditional logistics challenges through new delivery capabilities, reduce investment in both human and capital expenditures through broader reliance on e-commerce, and expand human capabilities through a wearables-augmented workforce. Each enhancement translates into time and cost savings, thereby increasing profitability. Informed by global developed-market estimates, and accounting for the additional potential in Saudi Arabia given the historically low labor productivity compared to developed markets, A.T. Kearney estimates these cost savings to be worth between 214 and 319 billion SAR cumulatively through 2030.

Incremental revenues: disruptively driving top-line growth. Incremental revenue gains represent the other half of the profit equation. Within the context of 4IR Future of Production,

additional revenues are generated in two ways. First, hyper-personalization and the transition toward services and experiences, among other trends, expand and alter a company's product portfolios—thus increasing sales even within an existing customer base. Second, new capabilities allow companies to sell existing products to new customer segments, such as smart supply chains to expand distribution and better data management to increase customization. Analyzing global assessments in the context of the Saudi economy, A.T. Kearney estimates the cumulative incremental revenue gains resulting from the combination of these two factors to be between 120 and 306 billion SAR through 2030.⁶

Multisource investments: fueling the transformation. The third generator is the combined value of multiple incremental investments in overall 4IR Future of Production. First, investments in Saudi Arabia by existing production-related Saudi companies to better adapt to, and embrace, the Fourth Industrial Revolution.⁷ In addition to 4IR technologies, including the five technologies discussed earlier, these investments relate to physical and digital infrastructure and capabilities, such as warehouse expansions, upgrading communications networks, and fleet maintenance. Second are the returns on investments made by Saudi investors in 4IR technologies globally. Already a significant force in global technology M&A, Saudi investors, including the Saudi government, are increasingly investing in 4IR companies abroad, with the returns re-entering Saudi as economic value added. Finally, investments in Saudi Arabia include the additional inflow of foreign direct investment (FDI) related to the Future of Production. For now, these investments are largely limited to entities with an existing presence in Saudi Arabia upgrading their operations in the Kingdom. However, through 2030, these investments could also include local partners bringing 4IR capabilities to Saudi Arabia. Correcting for the share of this investment contributing directly to 4IR technology market growth in KSA, A.T. Kearney estimates the combined indirect value at stake from the incremental increase in investment to be between 85 and 294 billion SAR cumulatively through 2030.⁸

High-value sectors and Future of Production industries

The indirect value at stake is driven primarily by the manufacturing sector contributing nearly 430 billion SAR, followed by wholesale and retail contributing nearly 400 billion SAR through 2030 (see figure 6 on page 12). Within manufacturing, the largest industries—chemicals, rubber, and plastics; food, beverage, and tobacco; coke and refined petroleum; metals and other mineral products—will lead the way in terms of overall value contribution. This value will come from distinct forces shaping the Future of Production. For example, in the chemicals industry, digitization is expected to increase workforce efficiency, productivity, and safety, enable more effective supply chain management, and inspire innovation and ideation. In the food, beverage, and tobacco industry, smart factories and supply chains enable better stock management and price differentiation through customization. The rising interest in health and well-being-related goods and services is fueling demand for wearables, applications, and other technologies. For petroleum manufacturers, IoT is improving supply chain visibility and connecting marketing to customers. Finally, in the metals industry, autonomous stockpile management is reducing manufacturing costs, IoT is enabling real-time sensor tracking, digital platforms are fueling more

⁶ A.T. Kearney analysis is informed by the World Economic Forum's series of "value at stake" analyses for consumer industries, chemicals, metals, automotive, and logistics sectors; analyses include a value estimate for global industry, largely consisting of revenue contributions, informing our analysis of the incremental revenue gains for Saudi Arabia in these and other sectors and industries.

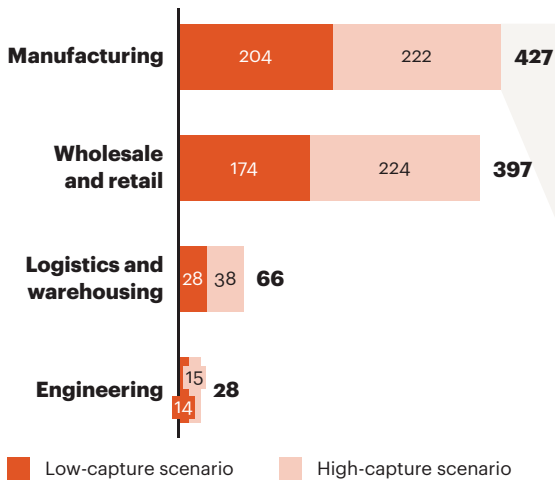
⁷ Investment as a share of revenues

⁸ Saudi companies' investments in 4IR Future of Production include 4IR technologies and the necessary capability and infrastructure upgrades to adapt to these new technologies; because specific investments in 4IR technologies within Saudi Arabia will translate into market growth in each domestic technology market, these investments are already accounted for in the direct impact estimate.

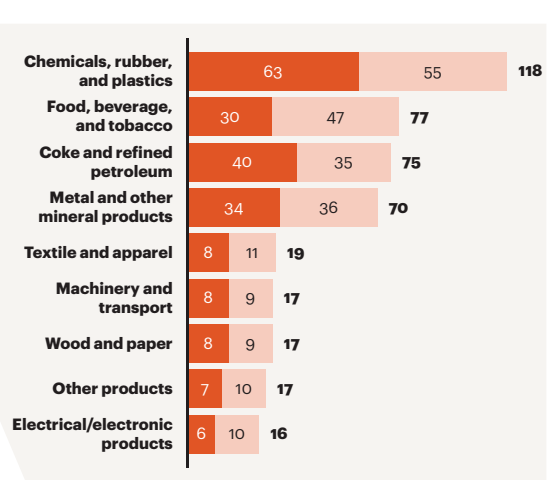
Figure 6

The manufacturing industry will be the greatest contributor to indirect value at stake

Value at stake – sector
(Billion SAR, 2016–2030)



Value at stake – manufacturing industry
(Billion SAR, 2016–2030)



Note: Numbers may not resolve due to rounding.
Source: A.T. Kearney analysis

direct-to-customer marketing, and AI is buttressing demand forecasting.⁹ As the technologies behind these forces of change continue to develop through 2030, the corresponding economic benefit will continue to grow, both globally and within Saudi Arabia.

Additional sources of value

Beyond the direct and indirect impact from 4IR Future of Production, a range of secondary factors are not included in value-at-stake calculations for Saudi Arabia. These include, for example, customer cost savings, time savings, reduced emissions, and lives saved—factors that could increase the estimated 1 trillion SAR impact on society and on the future of production. Also not included in the calculations is the net impact on the job market, which experts suggest could range from largely beneficial and productivity-enhancing to broadly detrimental and labor-polarizing. The reality is likely to be somewhere in the middle and play out uniquely in Saudi Arabia given the distinct structure of its labor force. For example, sectors that rely on expats for low-wage jobs will see the greatest job losses while middle-wage workers will need to meet “up-skilling” requirements to compete, and in other cases job losses will be significant but limited to the non-national labor force. Even excluding these factors, the value at stake represents a significant opportunity for Saudi Arabia. Realizing this value, however, will require a coordinated effort on behalf of public and private sector leaders to overcome historical barriers to innovation and prepare the country for rapid technological advancement. The risks of not doing so are tremendous, including forfeiting the incremental economic value from the Future of Production and also being left behind as global (and even regional) economies embrace 4IR technologies—altering global production value chains, enabling more efficient resource management, and generating new, Future of Production-oriented jobs, all at the expense of the Kingdom. The extent to which Saudi Arabia prepares for and adapts to 4IR Future of Production will determine how well the country can mitigate these risks and capture the value at stake.

⁹ “Introducing value at stake: a new analytical tool for understanding digitalization,” World Economic Forum, 2016

Al-Aghar Group

The Al-Aghar Group is an independent Saudi think tank that is registered as an endowment to ensure transparency and sustainability. The group's core value lies in the active implementation of social, cultural, and economic development programs aimed at addressing national issues and international affairs of interest to Saudi Arabia and transforming the Kingdom into a knowledge-based society and economy. This was a part of our umbrella strategy (knowledge society), which was successfully integrated in the national strategy plan.

Al-Aghar's aim is to contribute to the Kingdom's vision by providing strategic options to policymakers in relevant areas.

The Global Business Policy Council's National Transformations Institute

The Global Business Policy Council's National Transformations Institute is dedicated to helping senior government and business leaders to anticipate and steer the diverse and accelerating transformations that are happening across the globe, based on rigorous strategic foresight.

The Institute specializes in strategic foresight and policy analysis, supporting government institutions and corporations at global, regional, national, and multilateral levels in anticipating, harnessing, and creating change.

Based on deep expertise in the techniques of strategic foresight and with experience at senior levels of government in strategy and policy planning, the National Transformations Institute translates macro-level analysis of the forces of change in practical, innovative courses of action. The Institute develops thought leadership on key emerging topics shaping the future environment faced by institutions across the world. It also convenes world-class regional and global forums that serve as a platform for leaders across the globe to engage with peers and subject matter experts on key strategic issues.