

# FACTORY DIGITIZATION IN SAUDI ARABIA

## A TRANSFORMATIVE JOURNEY BEGINS



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# THE RISE OF DIGITAL ECONOMY

Technology-driven transformations are altering business and society as networks, devices, and applications increasingly connect people and organizations around the world. The rise of the digital economy is rapidly transforming the global landscape, with digitally enhanced offerings, operations, and relationships driving growth in every industry. IDC predicts that more than 60% of global gross domestic product (GDP) will be digitized by 2022. Businesses across industries are racing to innovate as rapid service delivery and operations separate leaders from laggards. Organizations are now striving to become 'digitally native' by integrating technology into every aspect of their business, from products and services to customer/partner interactions and operations. Such enterprises — that is, those with integrated digital strategies, singular road maps, and integrated technology architectures — will rise to prominence over the next few years.

# MANUFACTURING AN INDUSTRY UNDER TRANSFORMATION

Manufacturers are at the forefront of this digital transformation (DX); in fact, DX is at the center of their business strategies today. The proliferation of digital technologies affects the entire manufacturing value chain, from design, supply, production, and delivery to customer services. At the same time, the shift from products to services and the need to bypass traditional sales channels via ecommerce are influencing the adoption of digital strategies. Organizations are looking at solutions that can enhance supply chain visibility, asset utilization, manufacturing efficiency and responsiveness, accountability, and customer retention. Because the stakes are high, manufacturers have made concerted efforts to undertake DX initiatives. These efforts are boosting investments in digital technologies that empower employees and enable better decision making.





In the manufacturing space, the above trend, which is characterized by cyber-physical systems, is better known by the terms “Industry 4.0” or the “Fourth Industrial Revolution.” Industry 4.0 is a strategy of operational transformation that brings together technologies, processes, and organizations to improve efficiency and performance, all while considering the needs of people and the planet at large. The strategy further accelerates product development, business transformation, and development of new business models by integrating data into upstream and downstream production methods and incorporating smart technologies into factories and mines. At a plant or shop floor, a constant stream of process data — captured through connected and smart automation processes — can be analyzed and used to improve product design, increase the pace of engineering and research and development, and facilitate reliable and quality automation. Industry 4.0 delivers digital innovation through autonomous, data-rich, and insight-based operations that improve production performance, optimize the condition of people, products, and processes, and drive customer engagement to achieve extreme efficiency, quality, and performance.

The figure below describes the benefits of DX in the manufacturing domain:

**FIGURE 1: Benefits of Digital Transformation in Manufacturing**



Source: IDC, 2019

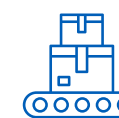
The rise of digital economies and societies presents great opportunities and challenges to manufacturers, which can be summarized under four key strategic priorities:



**Smart Manufacturing:**

Manufacturers are now competing at a global level; as such, product quality is increasingly important.

Organizations are also striving to achieve more with less by focusing on boosting productivity and lowering costs; however, fluctuating global demand is a key risk in the manufacturing industry. Digital technologies are thereby helping manufacturers address these challenges by enabling greater automation on the shop floor. The combination of Industrial Internet of Things (IIoT) platforms with cloud and analytics technologies is turning the shop floor into the focal point of transformation within the broader organization. A major area of transformation is asset management, which is going beyond machine monitoring to evaluating the health of an entire system through sensors and connectivity. When combined with predictive analytics, revamped processes can significantly reduce unplanned downtime.



**Digital Supply Chain Optimization:**

The lack of visibility across the complete value chain is a major issue that affects the overall efficiency of manufacturing organizations.

Digital supply chain optimization is about enabling the seamless flow of information throughout the supply chain while deriving value from business processes. Technologies such as IIoT can create <digital twins> of the supply chain, improving visibility into the entire chain and enabling better decision making based on near real-time data.



**Connected Customer Engagement:**

IDC predicts that 90% of the industry growth over the next decade will be captured by those companies that successfully engage with consumers directly.

Older consumers are being supplanted by millennials who connect anywhere, crave personalization, and are intolerant of latency. Customer service innovation is therefore becoming essential in this shifting landscape characterized by changing service concepts, service delivery systems, and customer support channels. Consequently, new business models are emerging that leverage value-added services such as remote product monitoring.



**Digital Innovation:**

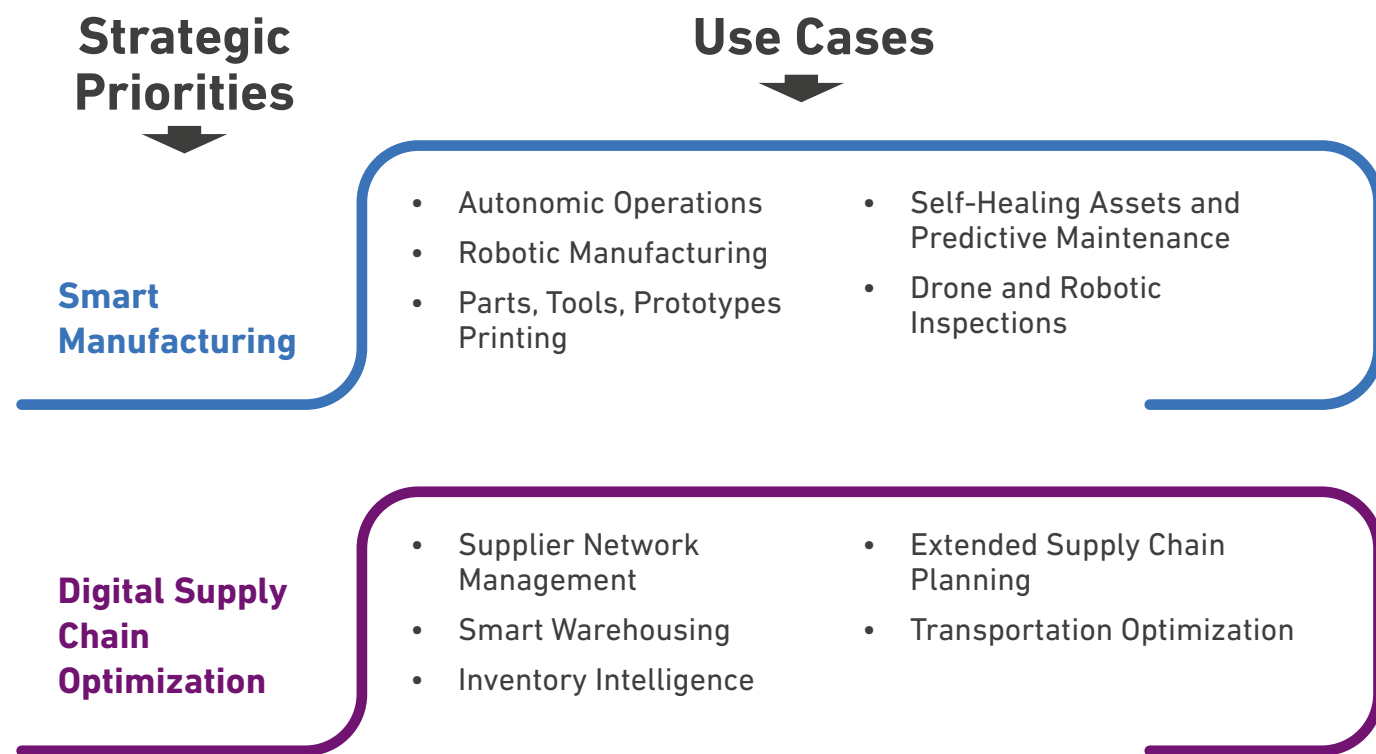
Innovation is one of the most important areas for manufacturers, as it is essential for ensuring competitiveness in an increasingly dynamic environment.

New product requirements continue to emerge as manufacturers focus on driving revenue gains while reducing costs. Therefore, manufacturers must improve their innovation processes to bring new products to market faster and cheaper.

These strategic DX priorities are, in turn, composed of several use cases. To achieve a desired priority, an organization needs to leverage relevant use cases. Since use cases can vary by the nature of the industry and size of the organization (among other factors), organizations must first identify a suitable use case, and then launch an appropriate transformation program. Balancing short-term and long-term goals will be important when identifying use cases. Moreover, organizations will need to target 'high value' use cases first, and then map complementary use cases after studying the various interdependencies and relationships between them.

The use cases pertaining to these priorities are outlined in the figure below.

**FIGURE 2: Digital Transformation in Manufacturing: Strategic Priorities and Use Cases**



**Connected Customer Engagement**

- Specification Management
- Service Model Innovation
- 360 Degree Customer and Client Management
- Remote Management
- Omni-Experience Coordination
- Adverse Event, Brand Sentiment

**Digital Innovation**

- Advanced Digital Simulation
- Quality & Compliance
- Formula Management
- Product Innovation Platform
- Networked R&D

Source: IDC, 2019

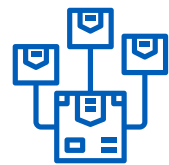
IDC believes that these use cases collectively represent \$4.5 trillion in annual economic value addition to the global manufacturing industry. Of this amount, about one quarter (\$1.13 trillion) will be directly generated by smart manufacturing activities that improve asset utilization, increase throughput and efficiency, and safeguard quality. Data will thus permeate every step of the manufacturing process. Inputs (such as raw materials) and manufacturing components will be increasingly embedded with information about their origins, suppliers, and assembly instructions. This embedding process will be supported by a continuous transfer of information by workers, machines, and business applications. In terms of output, numerous factories will also produce data-centric smart products that can report their status to the plant while in operation, request the production of spare parts for a maintenance activity, or report a quality issue that can potentially be addressed by fine-tuning the product line or manufacturing facility.

Visionary companies see the plant as a technology-driven enabler of business success. For the first time, manufacturers realize that their plants can generate much more data than they currently process. Mastery of factory floor processes will enable firms to proactively disrupt their market segments by not only delivering fantastic products but also leveraging transformative business models that make use of agile, demand-driven manufacturing processes, lot-size-one methods, and mass customization. However, to achieve such mastery, firms will have to reconsider their factory visions to the point of turning them upside down in a data-centric revolution.



According to IDC's Worldwide Smart Manufacturing 2019 predictions, 80% of manufacturers will need to extensively restructure their operations. They will need to place data at the center of their processes to increase speed, agility, efficiency, and innovation. This transformation will be based on infusing smart data across the board and creating information-intensive processes that have far-reaching implications on the ways manufacturing processes are run (in terms of how people work in the production process).

However, factory workers cannot be considered as commodities in today's economies. Indeed, IDC's vision of the factory of the future is centered on the capability of decision makers to provide the necessary levels of flexibility and agility to the process owners through their decision-making capability. According to IDC, the solution to this apparent dichotomy (between data and resources) is to understand that both contribute to data-centric transformation. The three principles below detail the core aspects of this transformation:



The first principle is about efficiency and repeatability. Every process is describable, repeatable, and able to be standardized. All processes can also be eventually automated (this principle is thus automation-intensive).

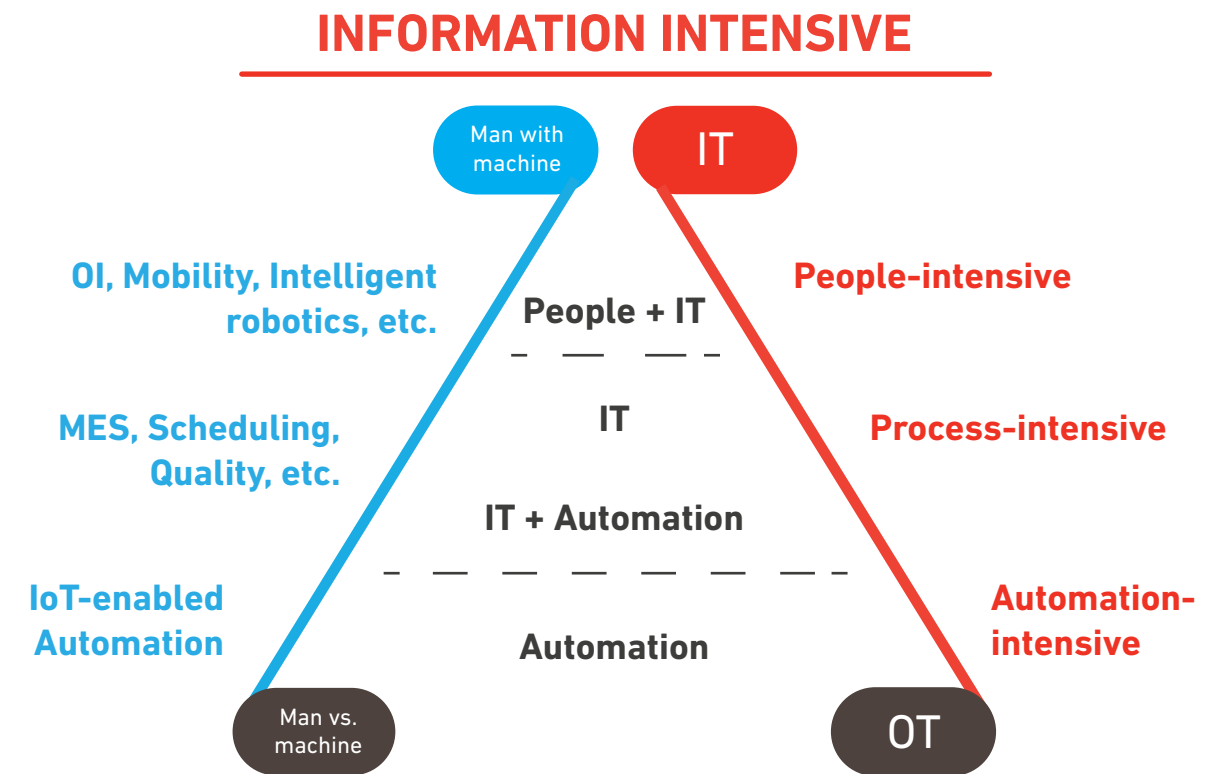


The second principle is about continuity plus quality. It is based on the notion of using IT applications such as production scheduling, manufacturing execution systems, quality management, and enterprise asset management to enable process execution and consistency (IT-intensive).



The third principle is about people. People will be at the centre of the factory of the future as they provide the flexibility and decision-making capabilities that are required to deal with increasing business and operational complexity.

**FIGURE 3: IDC Factory of the Future Principles**



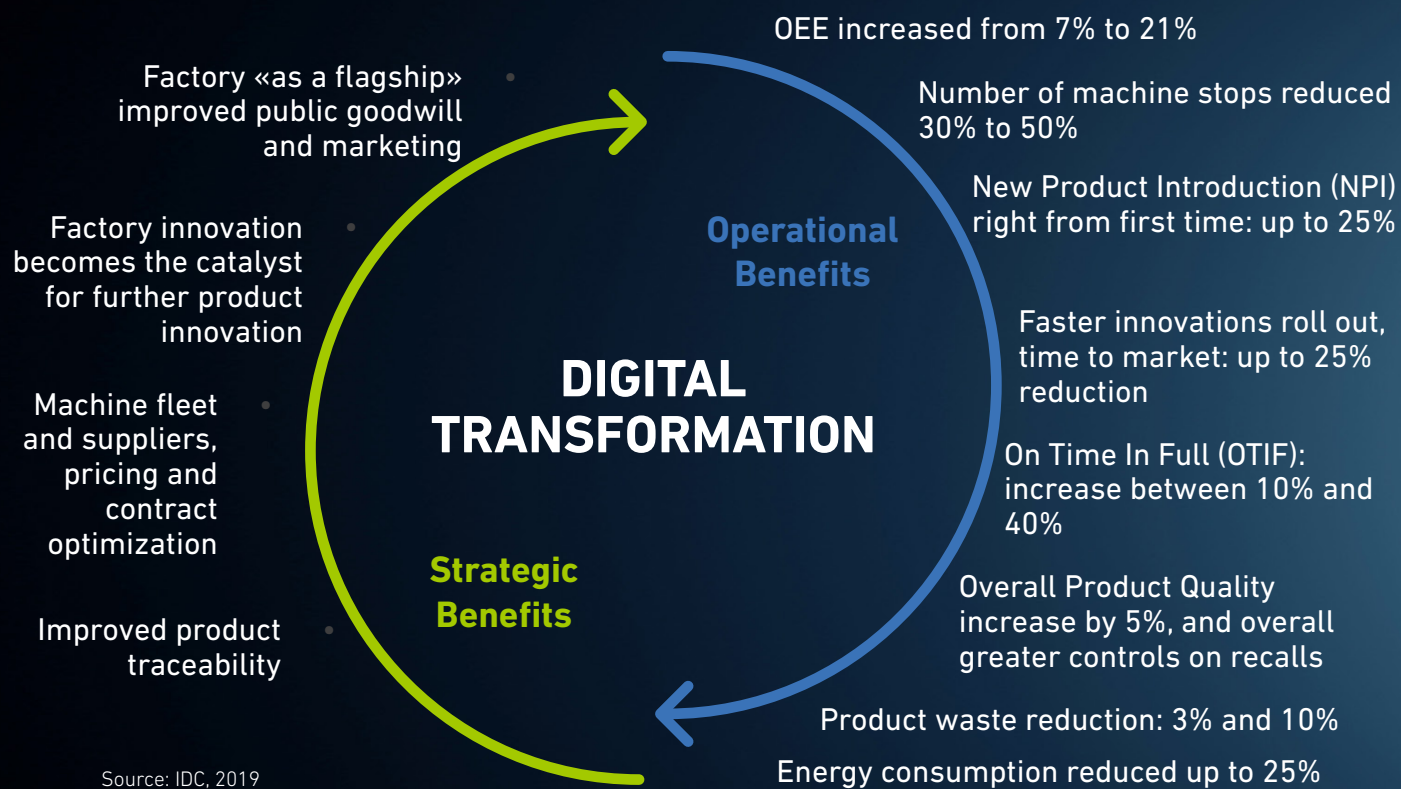
Source: IDC, 2019

The key is to make workers more adept at handling complex activities. In other words, augmenting worker capabilities with technology (and thereby putting people at the center of manufacturing) provides firms with an opportunity to significantly transform production processes. Several companies that IDC has monitored have understood that the greatest opportunity in DX is to change the way people manage processes and interact with IT tools. These organizations understand the need for empowered decision makers to run self-managed, decentralized processes based on real-time notifications and granular information from different levels of employees, down to the operator/mechanic level. For example, these organizations have enabled operators to run root-cause analyses focused on key metrics such as energy management, uptime, mean time between failures (MTBF), and run-to-target.



These efforts have provided organizations with several hard (operational) and soft (strategic) benefits:

**FIGURE 4: DX: Operational and Strategic Benefits**





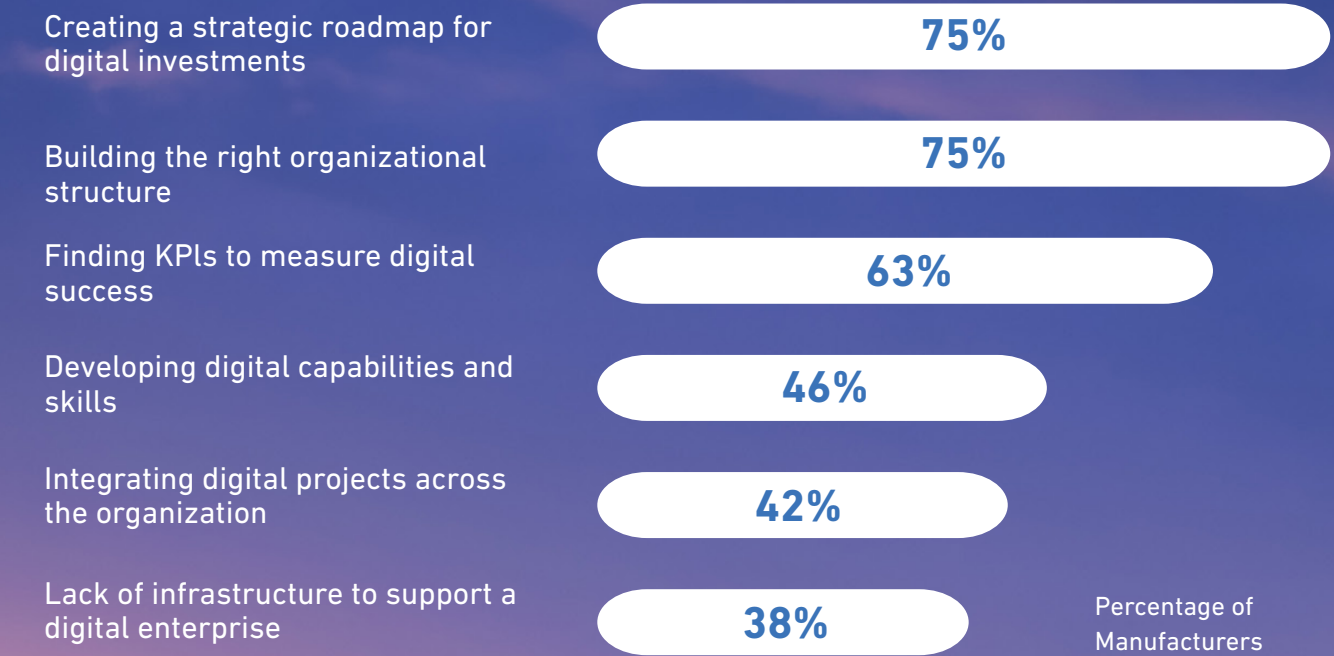
# SAUDI ARABIA'S INDUSTRIAL TRANSFORMATION

Saudi Arabia's manufacturing sector has come a long way from its early days. The first industrial wave quadrupled the sector's size, and the country is now home to several world-renowned manufacturers. However, economic development has been skewed toward some sectors, mostly basic industries such as petrochemicals, metals, and minerals. The productivity of Saudi Arabia's industrial sector is thus lower than the productivity in corresponding sectors around the globe. The sector is also straddled with limited value addition, high costs of production, and inadequate innovation.

Manufacturers in Saudi Arabia have been embracing Industry 4.0 to address the challenges they face, and many have already embarked on DX journeys. A 2019 IDC survey revealed that 75% of large manufacturers in Saudi Arabia are currently undertaking a formal DX effort. However, these transformation efforts have encountered various challenges. Manufacturers chiefly struggle with creating a strategic road map for their DX journeys. They also struggle with defining the key performance indicators (KPIs) that would measure the success and track the progress of their DX initiatives. Since DX is an enterprise-wide initiative that cuts across business lines and departments, building the right DX organization structure was also highlighted as a key challenge by manufacturers in Saudi Arabia.

**FIGURE 5:** Key Digital Transformation Challenges Faced by Manufacturers in Saudi Arabia

Q. What are your organization's top digital transformation challenges?



Source: IDC Survey, 2019. N=24

While the above challenges are complicated, manufacturers have put in place long-term plans to address them. Moreover, the Saudi government has established the National Industrial Development and Logistics Program to realize the objectives of Vision 2030. This program focuses on diversifying and increasing the competitiveness and productivity of the industrial sector.



# MODON SPEARHEADING MANUFACTURING DIGITIZATION IN SAUDI ARABIA

Manufacturing digitization is one of the key pillars of Saudi Arabia's industrial development plan. The Saudi Industrial Property Authority (MODON), which has been driving the kingdom's industrial sector development for the last two decades, is playing a critical role in facilitating digitization and achieving the transformation and modernization vision of the industrial sector.

“ Industry 4.0 will open up new employment opportunities to citizens, and it will require transformation of existing skill sets.

Eng. **Khaled Al-Salem**,  
*Director General MODON*

”

Since 2001, MODON has worked to modernize the kingdom's industrial economy by fusing private sector investments with public sector projects. MODON is presently involved in developing, operating, and maintaining industrial facilities throughout the vast country. The organization oversees more than 3,400 factories across 35 industrial cities, which employ more than 435,000 workers. It also supervises two technological zones and is seeking to establish additional zones enhanced with the latest technological investments.

MODON aims to spur significant innovation in the Saudi manufacturing sector and raise its regional and international competitiveness during the coming years. MODON has initiated the digital transformation of the services and products that it provides to its partners within the 35 industrial cities it supervises in order to enable the industry to turn its product ideas into reality, increase local content, and create added value for industries in the country. By doing so, MODON has been instrumental in attracting significant investments into the manufacturing and technology domains within Saudi Arabia.



# NATIONAL PRODUCTIVITY PROGRAM

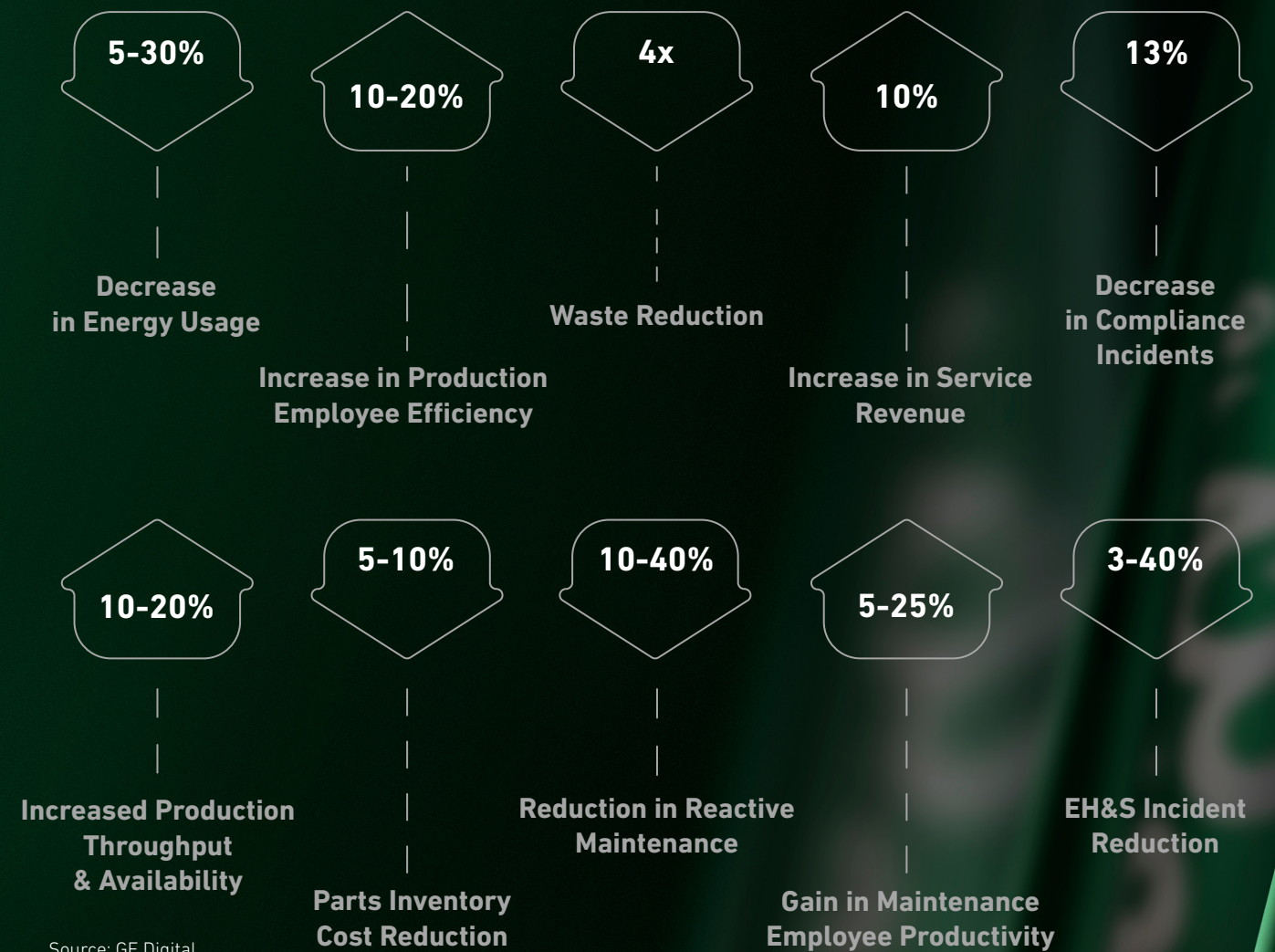
In early 2019, MODON and GE Digital launched the National Productivity Program (NPP). The NPP aims to help 100 selected factories located in MODON industrial cities with their DX journeys. The NPP is a game changing initiative under the aforementioned National Industrial Development and Logistics Program. Through this program, MODON wants to increase the productivity of the private industrial sector by applying Industry 4.0 technologies, enhancing workforce capabilities, and helping partner factories compete at a global level. The Saudi Industrial Development Fund and the King Abdulaziz City for Science and Technology are the other key stakeholders of this program.

GE Digital is MODON's strategic technical partner with respect to the NPP. General Electric (GE) is a company with a long history of manufacturing excellence; it also has the unique distinction of being a driving force behind all four industrial revolutions. The company's digital transformation arm, GE Digital, is driving the digital transformation of factories around the world by applying leading-edge technology solutions such as industrial software, IIoT platforms, machine learning systems, predictive analytics, and cloud-based data applications such as manufacturing execution systems (MES), asset performance management (APM), and field service management (FSM).

At the global level, the operating climate for industrial companies has never been more challenging. Manufacturers are faced with cost volatilities, increased price pressures, shrinking profit margins, constantly changing buyer preferences, compressed cycle times, knowledge attrition, and growing environmental scrutiny. In response, GE Digital is reimagining how industrial companies operate factories and deliver products using data as a fuel and advanced analytics as a growth engine. By bringing together the digital world and the physical world of manufacturing, GE Digital's solutions are facilitating holistic performance management for today's connected enterprises.

GE Digital's solutions can maximize overall equipment effectiveness (OEE), improve production scheduling, ensure product quality (by leveraging real-time production data), reduce work-in-progress (WIP), provide a tighter control over quality, and streamline the overall supply chain. In turn, these benefits reduce time to market, enhance just-in-sequence performance, deliver broader visibility to all plant personnel, and quickly improve operational processes by coordinating isolated activities. In addition, GE Digital solutions can improve operator engagement and motivation, ultimately resulting in a marked improvement in labor utilization. Through these outcomes, GE Digital has successfully provided tangible operational and business benefits to its global manufacturing clients, as highlighted in the figure next page.

FIGURE 6: GE Benefits



Source: GE Digital

In Saudi Arabia, the NPP will help manufacturers adapt and adopt the diversification strategy set by the Saudi government by lowering the cost of doing business, identifying inefficiencies, and unearthing cost-saving measures. MODON's vision is to provide end-to-end seamless services to factories, supported by technological innovations. Accordingly, the program aims to digitally transform 100 factories chosen from high-priority industrial sectors in various geographical regions within Saudi Arabia.

The program is being deployed in a phased approach, with 20 factories covered in phase one and 40 factories each in two subsequent phases. Going forward, the program is expected to be extended to all factories in the industrial cities managed by MODON and all sub-sectors within manufacturing. Scalability, repeatability, and sustainability are the key focus areas of the NPP. The exercises undertaken in phase one are expected to form a baseline that will be used to guide future development of the program. There is also a clear focus on providing on-the-job training and helping MODON and factories develop their own capabilities for the future.



# THE METHODOLOGY

“ There is a sense of leapfrogging in Saudi Arabia. It has very ambitious plans and in future it wants to be an exporter of technology through buildup of advanced technology capability.

**Patrick Byrne,**  
*Global Chief Executive Office, GE Digital*

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The MODON and GE Digital teams are analyzing the current state of transformation and developing road maps based on Industrial Transformation Readiness Maturity Model, in sync with set business outcomes. Through these road maps, GE Digital will be able to build and transfer capabilities to MODON and ensure the sustainability of the NPP.

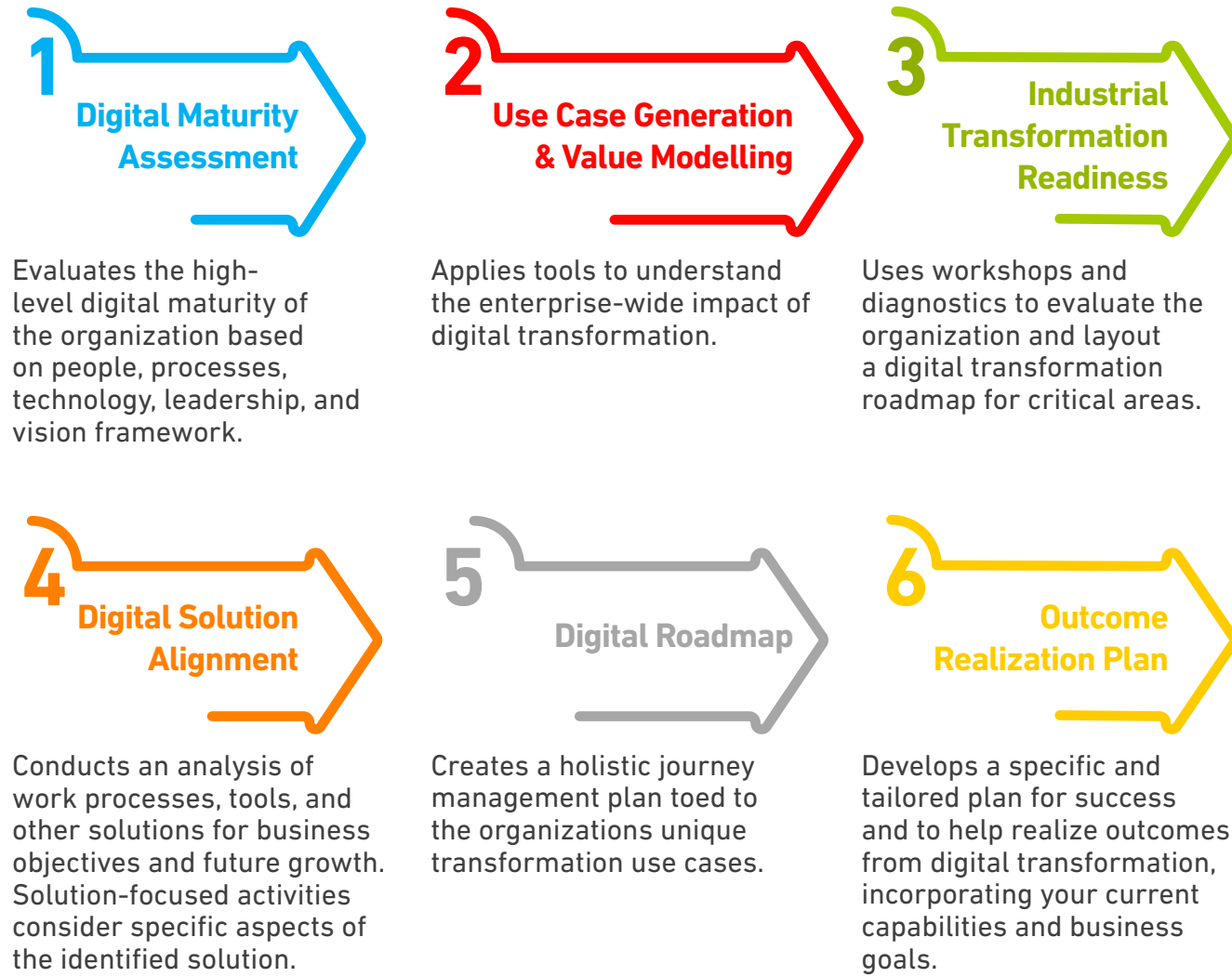
The NPP takes a phased approach — based on GE Digital’s global digital transformation framework — to helping factories build, implement, and sustain their transformation blueprints. Teams from MODON and GE Digital worked together for twelve months to clearly and collectively understand the goals, needs, and operations of 20 factories. This immersion period allowed GE Digital to research and plan for the buildout of unique road maps that would help businesses assess their digital capabilities and identify their next steps.

GE Digital’s delivery included a comprehensive Digital Roadmapping Report as well as a Governance Model, Digital Maturity, Transformation Readiness, and Multi-Generational Plan Summary, and Outcome Realization Plan. GE Digital is leveraging GE’s industrial DNA and expertise — as well as its 80 years of operating experience in Saudi Arabia — to incorporate essential best practices into the NPP. The digital road map building exercise helps factories achieve their business objectives by decreasing project execution risks and improving ROI through clear value modeling and tracking. The approach goes through various steps, starting with a digital maturity assessment and ending with an outcome realization plan, as depicted in the figure below.

The GE Digital solution is not only restricted to software or technology implementations; the application of a robust and methodical approach wherein the GE Digital team assesses opportunities, creates actionable use cases, undertakes use case digitization, puts the use cases into practice, and provides services enablement for the same is an essential component.



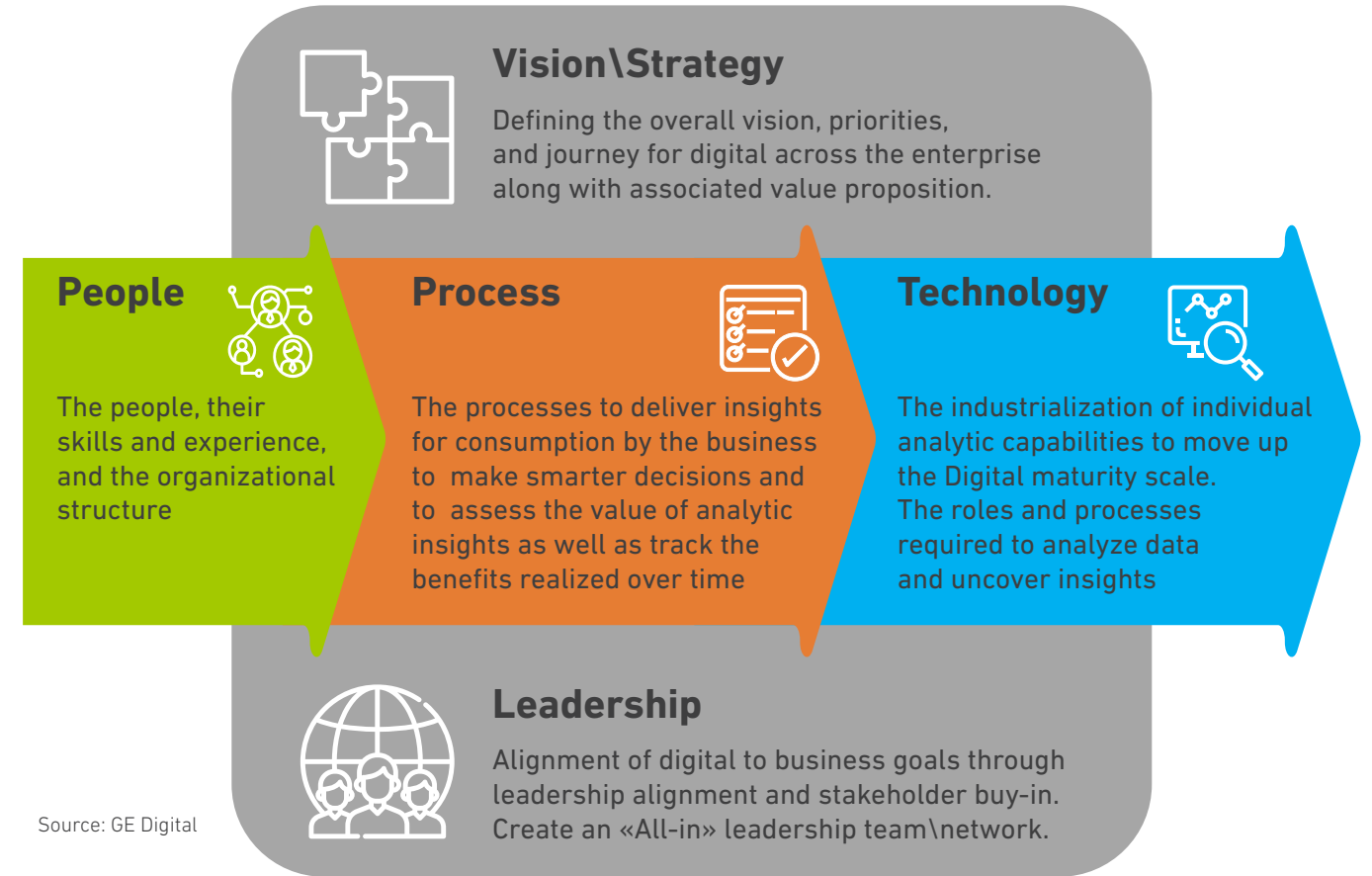
**FIGURE 7: National Transformation Program: Key Steps**



Source: GE Digital

An assessment of the current situation is a critical step in understanding where an organization unit stands today; it also forms a baseline for the future transformation. Accordingly, the 'digital maturity assessment' is a critical step in the NPP process. Business objectives and challenges, as well as processes, tools, and skills, can vary with the type and size of a factory. Moreover, the focus areas of a manufacturer in the food processing industry differ from those of an automotive component manufacturer. Similarly, a factory with 50 employees faces different challenges than a facility with 3,000 employees. The digital maturity assessment takes these nuances into account by covering various aspects such as people, processes, technology, leadership, and vision. It also ensures that the whole road mapping process is aligned to the specifics of the factory.

**FIGURE 8: Digital Maturity Assessment: Key Coverage Areas**



Source: GE Digital

A set of use cases is thereafter identified based on the results of the assessment. A use case is a specific area in which a digital technology can be applied to bring about specific business value. Many such use cases are generated and, through a value-modeling exercise, these use cases are then prioritized for implementation based on criteria such as opportunity to create value for the business and effort required to implement. This exercise results in the identification of a set of technology implementations, which are then categorized (as high impact, quick wins, etc.) to prioritize their deployment.

DX is more than a mere implementation of technology; it is an enterprise-wide transformation covering all aspects of the business. Many DX efforts have failed because of siloed approaches as well as failures in change management. A key aspect of GE Digital's methodology is the Industrial Transformation Readiness assessment. This assessment analyzes an organization's readiness to adapt to change, and largely mitigates the risk of implementation failure. The right solutions for the use cases are identified in subsequent steps. These various steps finally lead to the creation of a comprehensive road map and outcome realization plan, which become a detailed blueprint for organizations to achieve their vision.



# CASE STUDY

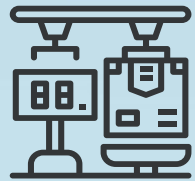
## RAQTAN

Raqtan is a manufacturer with over 40 years of experience in providing solutions to the food service industry in the Middle East. The Raqtan Group employs around 350 employees, and its Miran factory employs around 20% of the Raqtan workforce. Established in 2015, the Miran factory was set up to cover the Raqtan Group's growing need for fabricated stainless-steel equipment for kitchens, refrigerated units, and freezer rooms. Today, the facility also caters to the oil and gas industry, providing electrical enclosures and electrical junction boxes for industrial applications.

The Miran factory, however, faced challenges related to non-standardized processes, operational inefficiencies, and extensive set-up times for production lines. These problems were caused by gaps in information flow and a lack of strong project and manufacturing management systems.

Miran's vision is to become a world class manufacturer by creating smarter products, providing a better customer experience, increasing efficiency, and reducing wastage. Miran thus viewed MODON's NPP as a golden opportunity to accelerate its journey and achieve its vision.

GE Digital and MODON undertook a detailed assessment of the Miran factory, covering various aspects such as process, people, and technology. A detailed DX road map was then created that included specific use cases along with implementation and sustainability plans. The facility started executing the road map based on two key priority areas identified in the assessment:



- Automation of the design process in engineering
- Implementation of offline programming of production machines and establishment of a barcode system for fabrication lines.

Miran utilized solutions such as robotic process automation, artificial intelligence, advanced analytics, cloud, and operational technology to address the road map use cases. In addition, Miran started utilizing lean manufacturing tools in the production floor.

Miran is already reaping the benefits of these implementations by leveraging GE Digital's experience in implementing DX solutions — the design time and errors on standard items were reduced to almost zero, and production output doubled. Additionally, digitization has freed time for more value-added activities, improving productivity in the process. Going forward, Miran wants to become a data-driven factory — that is, a facility that will collect, process, and analyze the crumbs of data spread over the production process to reduce waste, increase efficiency, and design better products.



# THE WAY FORWARD

## Innovate or Perish

Over the past 50 years, the average life span of a company on the S&P 500 — the top 500 companies on the U.S. stock market — has shrunk from around 60 years to 18 years. Not only is this pace of change dramatic; it highlights that transformation is an inevitability, rather than a choice. Organizations thus need to innovate, and must adapt quickly to the changing economic landscape. Top-performing organizations are becoming 'digital-native' by embedding digital technologies in their cultures, tools, and processes.



## THE NEED FOR A HOLISTIC DX APPROACH

DX needs to be an enterprise-wide effort rather than a mere rollout of technologies. Manufacturers need to take a focused, holistic approach to DX.

Some best practices that manufacturers should take with respect to DX are highlighted below:

### Plan your journey:



The first step involves developing a plan for the DX journey — one that looks at the current status, determines what transformation means to the business, and identifies what needs to be done to get there. Building a long-term digital road map by envisioning the strategy and identifying and prioritizing use cases is the next step. DX strategic initiatives should be broken into bite-size chunks when developing road maps, and all stakeholders need to be involved from the outset. The road maps should become guiding documents that ensure successful transformation journeys.

### Create a DX organization:



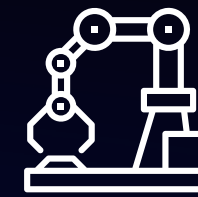
Manufacturers are increasingly establishing teams and budgets dedicated solely to transformation efforts. Such teams are usually comprised of “DX champions” from all business units; some companies go as far as having chief digital officers heading these teams.

### Modernize:



Legacy systems and processes often derail DX initiatives (since an important part of DX is harnessing the power of data). However, most data available within organizations today is siloed and unstructured, a state that poses significant challenges to manufacturers. Process reengineering or restructuring needs to be undertaken to ensure the free flow of data within the entire value chain. Organizations need to invest in a digital platform to create a foundation for business transformation.

### Embrace Automation:



Today, automation is one of the most frequently discussed themes in any sector, and manufacturing automation is at the forefront of these themes. From adding artificial intelligence/machine learning capabilities, automating repetitive tasks, and using industrial robots for specific jobs to having driverless vehicles in warehouses, manufacturers must embrace automation to enhance operational efficiency.

### Manage Change:



The topic of automation needs to be discussed internally to ensure that the workforce understands its implications. Progress needs to be viewed as “technology with people” rather than “technology instead of people.” Even though technology and automation are pervasive across industries, talent will remain one of the most valuable resources of a manufacturer. As such, it needs to be constantly cultivated in the organization. Employees need to be involved — as well as empowered — in DX initiatives. Upskilling or reskilling of employees is thus an integral part of successful DX initiatives. The organization needs to determine major skills gaps and ensure that the workforce is enabled for a data-driven approach to decision making.

### Strengthen Security and Digital Trust:



The issue of cybersecurity has never been more prominent in Saudi Arabia. The threat landscape is increasingly complex, and concepts like technological warfare are becoming a reality. Regulations related to cybersecurity, privacy, and digital trust are also evolving, and compliance is a major pain point for any manufacturer. Security should be, consequently, an underlying theme of DX journeys and an important criterion for all technology implementations. Manufacturers should create a digital trust framework that goes beyond preventing cyberattacks, as this would enable them to resiliently rebound from adverse situations and events.



# BE PART OF THE NPP

Initiatives such as the NPP will catalyze DX journeys. The program addresses key challenges that the manufacturing sector faces with respect to adoption of Industry 4.0; it also brings the best minds in the industry together through its collaborative approach to modernization. Manufacturers in Saudi Arabia are actively pursuing DX, but are simultaneously faced with significant challenges related to creating road maps and measuring the success of their journeys. This is one of the major areas that the NPP covers — it helps manufacturers to assess the status quo and create a DX road map backed by global expertise and benchmarks. For many manufacturers, independent DX initiatives may end up being ineffective due to their limited access to relevant resources and expertise. In the context of “innovate or perish,” manufacturers must utilize such initiatives and be part of the kingdom’s transformation journey.

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