

Industry 4.0 Market by Technology (Industrial Robots, Blockchain, Industrial Sensors, Industrial 3D Printing, Machine Vision, HMI, AI in Manufacturing, Digital Twin, AGV's, Machine Condition Monitoring) and Geography - Global Forecast to 2026

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Abstracts

The industry 4.0 market is projected to grow from USD 64.9 billion in 2021 to USD 165.5 billion by 2026; it is expected to grow at a CAGR of 20.6% from 2021 to 2026.

The growth of the industry 4.0 market is driven by rapid adoption of Artificial Intelligence (AI) and Internet of Things (IoT) in manufacturing sector, increasing demand for industrial robots in pharmaceutical and medical device manufacturing sector, rising government investments in 3D printing and additive manufacturing, and growing adoption of blockchain technology in manufacturing industry

“The industrial sensors segment is projected to account for the largest share of the industry 4.0 market during the forecast period.”

Industrial sensors are used to track, monitor, and maintain various equipment within a smart factory. These sensors form the basis of industry 4.0 ecosystem enabling connectivity throughout manufacturing operations.

“The market for digital twin is expected to grow at the highest CAGR during the forecast period”

Using a digital twin, a factory engineer can monitor the condition of various electrical and mechanical parts of a system; gauge equipment life-cycles and ascertain the need for spare parts. This helps eliminate unnecessary downtime, thereby increasing

efficiency and cutting maintenance costs. Digital twin is used across various process and discrete industry verticals.

“APAC held the largest share of the industry 4.0 market during the forecast period.”

The increasing adoption of robotics in the manufacturing sector in China, Japan, and India is among the major factors leading to the growth of the Industry 4.0 market in APAC. Low production cost in APAC countries enables market players to set up manufacturing facilities in this region. APAC is also one of the fastest-growing regions in this market due to the continuous technological advancements, financial support from governments in the region, and extensive industrial base, with Japan and China being the major contributors.

Break-up of the profiles of primary participants:

By Company Type – Tier 1 – 40%, Tier 2 – 35%, and Tier 3 – 25%

By Designation – C-level – 48%, Director-level – 33%, and Manager-level – 19%

By Region – North America - 35%, Europe – 18%, APAC – 40%, and RoW – 7%

The key players operating in the industry 4.0 market include General Electric (US), Siemens (Germany), Honeywell International (US), ABB (Switzerland), and Emerson Electric (US).

The industry 4.0 market has been segmented into the technology and region.

Based on technology, the market has been segmented into industrial robots, blockchain, industrial sensors, industrial 3D printing, machine vision, HMI, AI in manufacturing, digital twin, AGV's, and machine condition monitoring. The industry 4.0 market has been studied for North America, Europe, Asia Pacific (APAC), and the Rest of the World (RoW).

Reasons to buy the report:

Illustrative segmentation, analysis, and forecast of the market based on technology, and region have been conducted to give an overall view of the industry 4.0 market.

A value chain analysis has been performed to provide in-depth insights into the industry 4.0 market.

The key drivers, restraints, opportunities, and challenges pertaining to the industry 4.0 market have been detailed in this report.

Detailed information regarding the COVID-19 impact on the industry 4.0 market has been provided in the report.

The report includes a detailed competitive landscape of the market, along with key players, as well as in-depth analysis of their revenues

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TABLE 89 INDUSTRY 4.0 MARKET FOR AI IN MANUFACTURING, BY TECHNOLOGY, 2017–2020 (USD MILLION)

TABLE 90 INDUSTRY 4.0 MARKET FOR AI IN MANUFACTURING, BY TECHNOLOGY, 2021–2026 (USD MILLION)

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6.7.2.1 Machine learning

TABLE 91 INDUSTRY 4.0 MARKET FOR AI IN MANUFACTURING, FOR MACHINE LEARNING, BY TYPE, 2017–2020 (USD MILLION)

TABLE 92 INDUSTRY 4.0 MARKET FOR AI IN MANUFACTURING, FOR MACHINE LEARNING, BY TYPE, 2021–2026 (USD MILLION)

6.7.2.1.1 Deep learning

6.7.2.1.1.1 In demand for predictive maintenance and quality control purposes

6.7.2.1.2 Supervised learning

6.7.2.1.2.1 Used for facial recognition and other applications

6.7.2.1.3 Reinforcement learning

6.7.2.1.3.1 Allows systems and software to determine ideal behavior to maximize performance

6.7.2.1.4 Unsupervised learning

6.7.2.1.4.1 Uses clustering methods on unlabeled training data

6.7.2.1.5 Others

6.7.2.2 Natural language processing

6.7.2.2.1 Serves wide range of speech recognition applications

6.7.2.3 Context-aware computing

6.7.2.3.1 Accelerated growth due to development of sophisticated hard and soft sensors

TABLE 93 INDUSTRY 4.0 MARKET FOR AI IN MANUFACTURING, FOR CONTEXT-AWARE COMPUTING, BY TYPE, 2017–2020 (USD MILLION)

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6.7.2.4 Computer vision

6.7.2.4.1 Used for predictive maintenance and machinery inspection purposes

6.7.3 ARTIFICIAL INTELLIGENCE IN MANUFACTURING, BY APPLICATION

TABLE 95 INDUSTRY 4.0 MARKET FOR AI IN MANUFACTURING, BY APPLICATION, 2017–2020 (USD MILLION)

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6.7.3.1 Predictive maintenance and machinery inspection

6.7.3.1.1 Provides framework for all planned maintenance activities

6.7.3.2 Material movement

6.7.3.2.1 AI-based technology streamlines in-plant logistics

6.7.3.3 Production planning

6.7.3.3.1 Helps standardize product and process sequence

6.7.3.4 Field services

6.7.3.4.1 Extensively used in heavy metals & machine manufacturing, oil & gas, and energy & power industries

6.7.3.5 Quality control

6.7.3.5.1 Wide use of AI-based quality control systems in pharmaceuticals, food & beverages, and semiconductor industries

6.7.3.6 Cybersecurity

6.7.3.6.1 Growing need for cybersecurity systems due to automation in manufacturing

6.7.3.7 Industrial robots

6.7.3.7.1 Help increase productivity and efficiency

6.7.3.8 Reclamation

6.7.3.8.1 AI-based systems used to detect important components in waste or slag

6.7.4 ARTIFICIAL INTELLIGENCE IN MANUFACTURING, BY INDUSTRY

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TABLE 98 INDUSTRY 4.0 MARKET FOR AI IN MANUFACTURING, BY INDUSTRY,

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FIGURE 39 AUTOMOBILE HELD LARGEST SIZE OF AI IN MANUFACTURING MARKET IN 2020

6.7.4.1 Automobile

6.7.4.1.1 Wide use of machine learning and computer vision in automobile industry

6.7.4.1.2 Impact of COVID-19 on AI in manufacturing market for automobile industry

6.7.4.2 Energy & power

6.7.4.2.1 AI-based solutions enhance production output and reduce downtime

6.7.4.2.2 Impact of COVID-19 on AI in manufacturing market for energy & power

industry

6.7.4.3 Pharmaceuticals

6.7.4.3.1 Growing demand for AI solutions from Chinese pharmaceuticals industry

6.7.4.3.2 Impact of COVID-19 on AI in manufacturing market for pharmaceuticals

industry

6.7.4.4 Heavy metals & machine manufacturing

6.7.4.4.1 Heavy demand for AI solutions expected from APAC

6.7.4.4.2 Impact of COVID-19 on AI in manufacturing market for heavy metals &

machine manufacturing industry

6.7.4.5 Semiconductors & electronics

6.7.4.5.1 AI likely to optimize production cost, technology implementation, and integration of components

6.7.4.5.2 Impact of COVID-19 on AI in manufacturing market for semiconductor & electronics industry

6.7.4.6 Food & beverages

6.7.4.6.1 AI-based solutions enhance quality of food production

6.7.4.6.2 Impact of COVID-19 on AI in manufacturing market for food & beverages

industry

6.7.4.7 Others

6.8 INDUSTRY 4.0 MARKET FOR DIGITAL TWIN

6.8.1 INDUSTRY 4.0 MARKET FOR DIGITAL TWIN, BY TECHNOLOGY

FIGURE 40 INDUSTRY 4.0 MARKET FOR DIGITAL TWIN, BY TECHNOLOGY

6.8.1.1 Internet of Things (IOT)

6.8.1.2 Blockchain

6.8.1.3 Artificial intelligence & machine learning

6.8.1.4 Augmented reality, virtual reality & mixed reality

6.8.1.5 Big data analytics

6.8.1.6 5G

6.8.2 INDUSTRY 4.0 MARKET FOR DIGITAL TWIN, BY USAGE TYPE

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TABLE 100 INDUSTRY 4.0 MARKET FOR DIGITAL TWIN, BY USAGE TYPE, 2021–2026 (USD MILLION)

6.8.2.1 Product digital twin

6.8.2.1.1 Expected to witness significant growth during forecast period

6.8.2.2 Process digital twin

6.8.2.2.1 Plays major role in digital twin market

6.8.2.3 System digital twin

6.8.2.3.1 Expected to dominate market during forecast period

6.8.3 INDUSTRY 4.0 MARKET FOR DIGITAL TWIN, BY APPLICATION

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TABLE 102 INDUSTRY 4.0 MARKET FOR DIGITAL TWIN, BY APPLICATION, 2021–2026 (USD MILLION)

6.8.3.1 Product design & development

6.8.3.1.1 Expected to register steady market growth

6.8.3.2 Performance monitoring

6.8.3.2.1 Likely to see rising demand in future

6.8.3.3 Predictive maintenance

6.8.3.3.1 Reduces maintenance costs and operational downtime

6.8.3.4 Inventory management

6.8.3.4.1 High demand in transportation & logistics industry

6.8.3.5 Business optimization

6.8.3.5.1 Expected to dominate market during forecast period

6.8.3.6 Others

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6.8.4.1 Aerospace & defense

6.8.4.1.1 Expected to witness significant market growth

6.8.4.2 Automotive

6.8.4.2.1 Likely to dominate Industry 4.0 market during forecast period

6.8.4.3 Home & commercial

6.8.4.3.1 Stable growth expected in post-COVID-19 period

6.8.4.4 Healthcare

6.8.4.4.1 Least affected segment during COVID-19 crisis

6.8.4.5 Energy & utilities

6.8.4.5.1 Increasing digitalization to boost market

6.8.4.6 Oil & gas

6.8.4.6.1 High demand for system digital twins

6.8.4.7 Agriculture

6.8.4.7.1 Expected to witness significant growth during forecast period

6.8.4.8 Telecommunication

6.8.4.8.1 Expected to boost market growth post 5G commercialization

6.8.4.9 Retail

6.8.4.9.1 Inventory management segment to account for largest share of market

6.8.4.10 Others

6.8.4.10.1 Increasing demand for digital twin in semiconductor manufacturing industry

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6.9.1.1 Tow vehicles

6.9.1.1.1 Expected to hold largest size of market in 2020

TABLE 107 INDUSTRY 4.0 MARKET FOR AGV, FOR TOW VEHICLES, BY NAVIGATION TECHNOLOGY, 2017–2020 (USD MILLION)

TABLE 108 INDUSTRY 4.0 MARKET FOR AGV, FOR TOW VEHICLES, BY NAVIGATION TECHNOLOGY, 2021–2026 (USD MILLION)

6.9.1.2 Unit load carriers

6.9.1.2.1 Major demand from automotive industry

TABLE 109 INDUSTRY 4.0 MARKET FOR AGV, FOR UNIT LOAD CARRIERS, BY NAVIGATION TECHNOLOGY, 2017–2020 (USD MILLION)

TABLE 110 INDUSTRY 4.0 MARKET FOR AGV, FOR UNIT LOAD CARRIERS, BY

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6.9.1.3.1 Vision-guided pallet trucks to register highest growth during forecast period

TABLE 111 INDUSTRY 4.0 MARKET FOR PALLET TRUCKS, BY NAVIGATION TECHNOLOGY, 2017–2020 (USD MILLION)

TABLE 112 INDUSTRY 4.0 MARKET FOR PALLET TRUCKS, BY NAVIGATION TECHNOLOGY, 2021–2026 (USD MILLION)

6.9.1.4 Assembly line vehicles

6.9.1.4.1 Wide use for transportation of subassemblies

TABLE 113 INDUSTRY 4.0 MARKET FOR AGV, FOR ASSEMBLY LINE VEHICLES, BY NAVIGATION TECHNOLOGY, 2017–2020 (USD MILLION)

TABLE 114 INDUSTRY 4.0 MARKET FOR AGV, FOR ASSEMBLY LINE VEHICLES, BY NAVIGATION TECHNOLOGY, 2021–2026 (USD MILLION)

6.9.1.5 Forklift trucks

6.9.1.5.1 Increasing demand for forklift trucks in applications involving heavy materials

TABLE 115 INDUSTRY 4.0 MARKET FOR AGV, FOR FORKLIFT TRUCKS, BY NAVIGATION TECHNOLOGY, 2017–2020 (USD MILLION)

TABLE 116 INDUSTRY 4.0 MARKET FOR AGV, FOR FORKLIFT TRUCKS, BY NAVIGATION TECHNOLOGY, 2021–2026 (USD MILLION)

6.9.1.6 Others

TABLE 117 INDUSTRY 4.0 MARKET FOR AGV, FOR OTHER TYPES, BY NAVIGATION TECHNOLOGY, 2017–2020 (USD MILLION)

TABLE 118 INDUSTRY 4.0 MARKET FOR AGV, FOR OTHER TYPES, BY NAVIGATION TECHNOLOGY, 2021–2026 (USD MILLION)

6.9.2 INDUSTRY 4.0 MARKET FOR AGV, BY NAVIGATION TECHNOLOGY

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TABLE 120 INDUSTRY 4.0 MARKET FOR AGV, BY NAVIGATION TECHNOLOGY, 2021–2026 (USD MILLION)

6.9.2.1 Laser guidance

6.9.2.1.1 Expected to hold largest size of market during forecast period

6.9.2.2 Magnetic guidance

6.9.2.2.1 Chiefly used in food & beverages and automotive industries

6.9.2.3 Inductive guidance

6.9.2.3.1 Wide use due to lack of interference from external noise

6.9.2.4 Optical tape guidance

6.9.2.4.1 Increasing demand in end use industries requiring clean environments

6.9.2.5 Vision guidance

6.9.2.5.1 Expected to register highest CAGR during forecast period

6.9.2.6 Others

6.9.3 INDUSTRY 4.0 MARKET FOR AGV, BY INDUSTRY

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6.9.3.1 Automotive

6.9.3.1.1 Largest share of market during forecast period

6.9.3.2 Metal & heavy machinery

6.9.3.2.1 Growing demand for AGVs to ensure safety in material handling

6.9.3.3 Food & beverages

6.9.3.3.1 Increased global demand driving adoption of AGVs

6.9.3.4 Chemicals

6.9.3.4.1 Use of AGVs to ensure employee safety and manage workflow effectively

6.9.3.5 Healthcare

6.9.3.5.1 Wide use of AGVs to comply with clean environment requirements

6.9.3.6 3PL

6.9.3.6.1 Increased online retailing activities drives demand for AGVs

6.9.3.7 Semiconductors & electronics

6.9.3.7.1 Increased demand for AGVs in cleanroom applications

6.9.3.8 Aviation

6.9.3.8.1 Use of AGVs for manufacturing and assembly operations

6.9.3.9 E-commerce

6.9.3.9.1 Expected to grow at highest rate from 2021 to 2026

6.9.3.10 Others

6.10 INDUSTRY 4.0 MARKET FOR MACHINE CONDITION MONITORING

6.10.1 INDUSTRY 4.0 MARKET FOR MACHINE CONDITION MONITORING, BY MONITORING TECHNIQUE

FIGURE 51 INDUSTRY 4.0 MARKET FOR MACHINE CONDITION MONITORING, BY MONITORING TECHNIQUE

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TABLE 124 INDUSTRY 4.0 MARKET FOR MACHINE CONDITION MONITORING, BY MONITORING TECHNIQUE, 2021–2026 (USD MILLION)

6.10.1.1 Vibration monitoring

6.10.1.1.1 Significance of route-based monitoring services in vibration monitoring technique

FIGURE 53 INDUSTRY 4.0 MARKET FOR VIBRATION MONITORING, BY SYSTEM TYPE, 2020

6.10.1.2 Embedded systems

6.10.1.2.1 Wide adoption in oil & gas and power generation industries

6.10.1.3 Vibration analyzers and meters

6.10.1.3.1 Support effective machine condition monitoring

6.10.1.4 Thermography

6.10.1.4.1 High adoption due to ability to detect large number of defects

6.10.1.5 Oil analysis

6.10.1.5.1 Advantages of oil analysis make it prominent machine condition monitoring technique

FIGURE 54 ADVANTAGES OF OIL ANALYSIS TECHNIQUE

6.10.1.6 Corrosion monitoring

6.10.1.6.1 Defects detected by corrosion monitoring help prevent corrosion of equipment

6.10.1.7 Ultrasound emission

6.10.1.7.1 Ultrasound emission monitoring helps detect defects in electric equipment

6.10.1.8 Motor current analysis

6.10.1.8.1 Early detection of faults by motor current analysis monitoring technique

6.10.2 INDUSTRY 4.0 MARKET FOR MACHINE CONDITION MONITORING, BY OFFERING

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TABLE 125 INDUSTRY 4.0 MARKET FOR MACHINE CONDITION MONITORING, BY OFFERING, 2017–2020 (USD MILLION)

TABLE 126 INDUSTRY 4.0 MARKET FOR MACHINE CONDITION MONITORING, BY OFFERING, 2021–2026 (USD MILLION)

6.10.2.1 Hardware

6.10.2.1.1 Vibration sensors

6.10.2.1.2 Accelerometers

6.10.2.1.2.1 Increased deployment in industrial plants to monitor machine acceleration

6.10.2.1.3 Proximity probes

6.10.2.1.3.1 Used for accurate displacement measurement of devices

6.10.2.1.4 Tachometers

6.10.2.1.4.1 Rising adoption to effectively monitor speed of rotating machines

6.10.2.1.5 Infrared sensors

6.10.2.1.5.1 Thermal infrared sensors

6.10.2.1.5.1.1 Increased use to detect possible heat-induced faults in machines

6.10.2.1.5.2 Quantum infrared sensors

6.10.2.1.5.2.1 High demand for quantum infrared sensors to identify temperature variations in machines

6.10.2.1.6 Spectrometers

6.10.2.1.6.1 Infrared spectrometers

6.10.2.1.6.1.1 Growing demand for infrared spectrometers to identify various materials

6.10.2.1.6.2 Ultraviolet spectrometers

6.10.2.1.6.2.1 Significant tools for oil analysis

6.10.2.1.6.3 Atomic spectrometers

6.10.2.1.6.3.1 Increasingly used to identify foreign particles in oil samples

6.10.2.1.6.4 Mass spectrometers

6.10.2.1.6.4.1 Used to identify contaminating compounds in lubricating oil samples

6.10.2.1.7 Ultrasound detectors

6.10.2.1.7.1 Sound pressure meters

6.10.2.1.7.1.1 Increased use for noise level measurements

6.10.2.1.7.2 Stethoscopes

6.10.2.1.7.2.1 Surging penetration in industries to monitor noise in machine components

6.10.2.1.7.3 Ultrasound leak detectors

6.10.2.1.7.3.1 Growing adoption for identification of leakage in vacuum and compressed air systems

6.10.2.1.8 Spectrum analyzers

6.10.2.1.8.1 Real-time spectrum analyzers

6.10.2.1.8.1.1 Increased adoption for motor current analysis

6.10.2.1.9 Corrosion probes

6.10.2.1.9.1 Growing use for corrosion rate measurements

6.10.2.1.10 Others

TABLE 127 INDUSTRY 4.0 MARKET FOR MACHINE CONDITION MONITORING HARDWARE, BY TYPE, 2017–2020 (USD MILLION)

TABLE 128 INDUSTRY 4.0 MARKET FOR MACHINE CONDITION MONITORING HARDWARE, BY TYPE, 2021–2026 (USD MILLION)

6.10.2.2 Software

TABLE 129 LIST OF MACHINE CONDITION MONITORING SOFTWARE PROVIDERS

6.10.2.2.1 Data integration

6.10.2.2.1.1 Eliminates need to maintain multiple data logs for monitoring equipment

6.10.2.2.2 Diagnostic reporting

6.10.2.2.2.1 Increased use to analyze overall health of industrial machines and plants

6.10.2.2.3 Order tracking analysis

6.10.2.2.3.1 Increasingly used for signal amplitude measurements

6.10.2.2.4 Parameter calculation

6.10.2.2.4.1 Increased deployment in industrial plants to evaluate reliability parameters of equipment

TABLE 130 INDUSTRY 4.0 MARKET FOR MACHINE CONDITION MONITORING SOFTWARE, BY MONITORING TECHNIQUE, 2017–2020 (USD MILLION)

TABLE 131 INDUSTRY 4.0 MARKET FOR MACHINE CONDITION MONITORING SOFTWARE, BY MONITORING TECHNIQUE, 2021–2026 (USD MILLION)

6.10.3 INDUSTRY 4.0 MARKET FOR MACHINE CONDITION MONITORING, BY DEPLOYMENT TYPE

FIGURE 57 INDUSTRY 4.0 MARKET FOR MACHINE CONDITION MONITORING, BY DEPLOYMENT TYPE

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6.10.3.1 On-premises deployment

6.10.3.1.1 Limitations of on-premises deployment to impact market growth

FIGURE 59 LIMITATIONS OF ON-PREMISES DEPLOYMENT OF MACHINE CONDITION MONITORING SOLUTIONS AND SYSTEMS

6.10.3.2 Cloud deployment

6.10.3.2.1 Advantages over on-premises deployment to drive demand

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6.10.5.3 Mining & metals

6.10.5.3.1 Use of vibration sensors to identify faults in mining machinery

6.10.5.4 Chemicals

6.10.5.4.1 Deployment of machine condition monitoring solutions and systems to monitor chemical processes

6.10.5.5 Automotive

6.10.5.5.1 IoT enables adoption of simple machine condition monitoring solutions

6.10.5.6 Aerospace & defense

6.10.5.6.1 Adoption of smart factory solutions for machine condition monitoring

6.10.5.7 Food & beverages

6.10.5.7.1 Rapid technological developments to fuel demand for machine condition monitoring systems and solutions

6.10.5.8 Marine

6.10.5.8.1 Predictive maintenance gaining significant importance in global marine industry

6.10.5.9 Others

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7.2.1 US

7.2.1.1 Growing manufacturing base accounts for large size of Industry 4.0 market

7.2.2 CANADA

7.2.2.1 Demand from food & beverage processing industry to drive market

7.2.3 MEXICO

7.2.3.1 Growing government impetus propelling demand for Industry 4.0 technologies

TABLE 145 INDUSTRY 4.0 MARKET IN NORTH AMERICA, BY COUNTRY, 2021–2026 (USD BILLION)

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FIGURE 67 EUROPE: SNAPSHOT OF INDUSTRY 4.0 MARKET

7.3.1 GERMANY

7.3.1.1 Government initiatives to promote smart factories drives market growth

7.3.2 UK

7.3.2.1 Growing market for AI and blockchain propels growth of Industry 4.0 market

7.3.3 FRANCE

7.3.3.1 Increasing government efforts to boost use of AI and IoT technologies in manufacturing sector

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7.4.1.1 Increasing labor costs contribute to growth of Industry 4.0 market

7.4.2 JAPAN

7.4.2.1 Ongoing developments in smart manufacturing processes to boost market

7.4.3 INDIA

7.4.3.1 Make in India campaign to boost demand for Industry 4.0 solutions in manufacturing sector

7.4.4 SOUTH KOREA

7.4.4.1 Increasing government investments to spur market growth

7.4.5 REST OF APAC

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7.5.1.1 Increasing penetration of AI and IoT technologies in Brazil and Argentina to drive market growth

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