MALAYSIA PRODUCTIVITY CORPORATION

AIProduktiviti

AI PRODUCTIVITY ROADMAP

NAVIGATING PRODUCTIVITY OF THE INDUSTRY IN THE DIGITAL AND AI ERA

CHEMICAL MANUFACTURING INDUSTRY

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FOREWORDS

> To boost national productivity, we must harness the power of AI and digital technologies - every sector, every individual has a role to play by equipping themselves with the right knowledge, skills, and competencies to stay ahead

Datuk Zahid Ismail
Director General
Malaysia Productivity Corporation (MPC)

FOREWORDS

"The chemical industry is a cornerstone of Malaysia's growth. This AI Productivity Roadmap inspires us to harness digital innovation, strengthen resilience, and elevate productivity - ensuring a sustainable, competitive future driven by collaboration, agility, and forward-thinking leadership"

Dato' Dr. Mohamed Noor Sany
Champion,
Chemical Productivity Nexus

INDUSTRY OVERVIEW AND DIGITALISATION CHALLENGES

Malaysia's chemical industry is advancing digitalisation through automation, AI, IoT, and data analytics to boost efficiency, compliance, and cost-effectiveness. Guided by the Chemical Industry Roadmap 2030 (CIR 2030), it aims to position the country as a smart manufacturing leader. Despite this progress, challenges such as integration gaps, cybersecurity risks, and a digital talent shortage persist. Overcoming these issues requires strong collaboration between government, industry, and academia, along with focused incentives and upskilling to ensure global competitiveness and sustainable growth.

CHALLENGES IN DIGITALISATION

1. Limited financial capacity among SMEs hampers the adoption of automation and AI, widening the digital divide.
2. Shortage of skilled talent in AI, IoT, and data-driven manufacturing slows digital adoption.
3. Exposing companies to significant cybersecurity risks and costly regulatory compliance

Source : Department of Statistics Malaysia (DOSM)
Chemical Industry Roadmap 2030

NUMBER OF ESTABLISHMENT

6,158 companies (2022)[1]

NUMBER OF EMPLOYEES

451,000[1] (2024)

KEY SUBSECTORS

Petrochemicals, Oleochemicals, Specialty Chemicals, Fertilizers & Industrial Gases, Pharmaceutical Chemicals, Agrochemicals, Paints, Coatings, and Inks, Consumer Chemicals[2]

GDP CONTRIBUTION

RM38.847 billion (2024)[1]

VALUE CHAIN/ SUPPLY CHAIN

Upstream, Midstream, Downstream, End-User Applications

PRODUCTIVITY LEVEL/ GROWTH

RM 304,430[1] (2024)

INDUSTRY OVERVIEW AND DIGITALISATION CHALLENGES

VALUE CHAIN

Feedstock	Base Chemicals / Building Blocks	Intermediates	Polymers	End Consumer

JOB CLUSTER

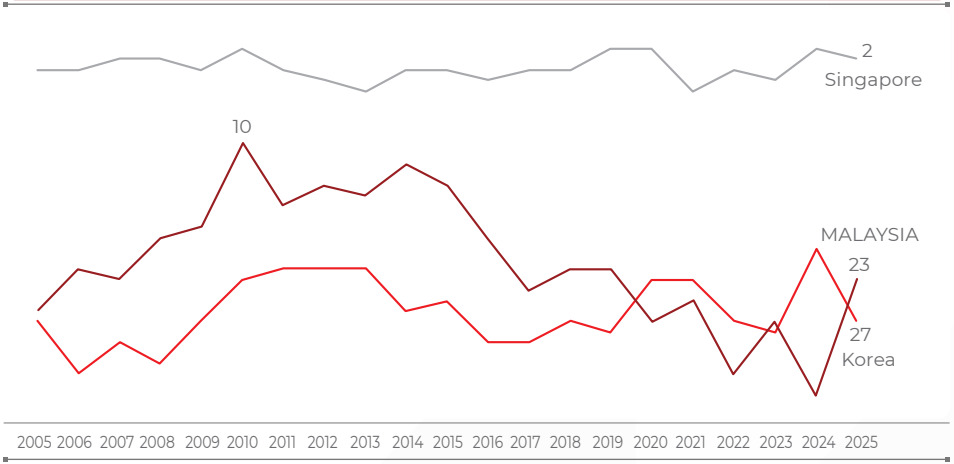
Site Management	Production	Engineering & Maintenance	Quality Assurance & Quality Control	Technical Service and Application	Health, Safety & Environment	Research & Development,	Logistic & Warehousing
Oversee overall site operations, set strategic goals, ensure compliance with regulations, manage budgets, and make high-level decisions Responsible for maintaining profitability and safety while ensuring the production targets are met	Responsible for the day-to-day manufacturing processes Manage production schedules, operate machinery, ensure product quality and maintain production efficiency while adhering to safety procedures	Responsible for the maintenance and improvement of plant's equipment, infrastructure, and processes Design, install, and maintain machinery and equipment, to ensure smooth operations Perform regular maintenance and troubleshoot issues within the production setup	Ensure all products are meeting the required quality standards before being distributed Implement and monitor quality control process, conduct inspections and tests, ensuring compliance with industry standard	Provide technical support and expertise to stakeholders, troubleshoot product-related issues, and advice on product applications. Collaborate with R&D to refine the products based on feedback from customers and market needs	Responsible to maintain a safe work environment and minimize the plant's environmental impact Implement and enforce safety protocols, conduct risk assessment, ensure compliance with environmental regulations, and promote safety culture. Handle incident investigations and continuous improvement in safety practices	Focus on innovation and developing new products or improve existing one Conduct research, experiment with new materials and process, and develop new chemical products Improve product formulations, reduce costs, and ensure new products meet market demands and regulatory requirements	Manage storage and movement of raw materials and finished products Coordinate the storage, handling and transportation of materials and product Manage inventory, optimise warehouse space, and ensure timely delivery Work closely with production and sales to ensure smooth supply chain operations
ROLE FUNCTIONS							
Production, Engineering, Health, Safety, & Environment (HSE)	Production, Production Planning	Maintenance, Construction, Project Engineering	Quality Assurance, Quality Control	Product Application, Technical Service	Process Safety, Environment, Occupational Hygiene	R&D, Product Development, Product Testing	Warehousing, Inventory, Materials Handling

Source : Talent Corporation Malaysia Berhad, 2024

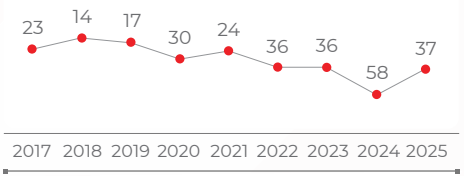
ACCELERATING TECHNOLOGY ADOPTION TO ENHANCE NATIONAL COMPETITIVENESS

Malaysia must urgently accelerate technology adoption to achieve its aspiration of becoming one of the top 12 most competitive nations by 2033

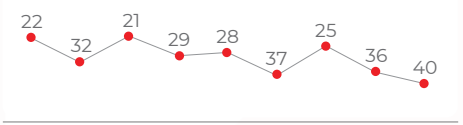
OVERALL COMPETITIVENESS



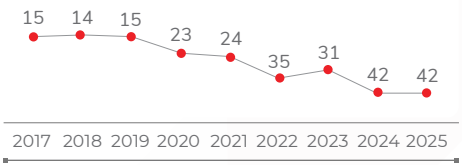
USE OF DIGITAL TOOLS AND TECHNOLOGY



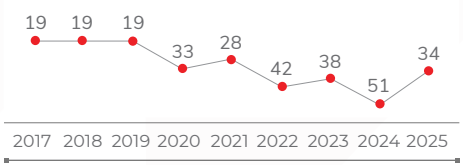
DIGITAL/TECHNOLOGICAL SKILLS



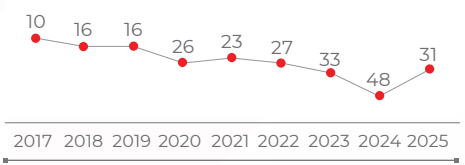
MANAGEMENT PRACTICES



CORPORATE AGILITY



DIGITAL TRANSFORMATION IN COMPANIES



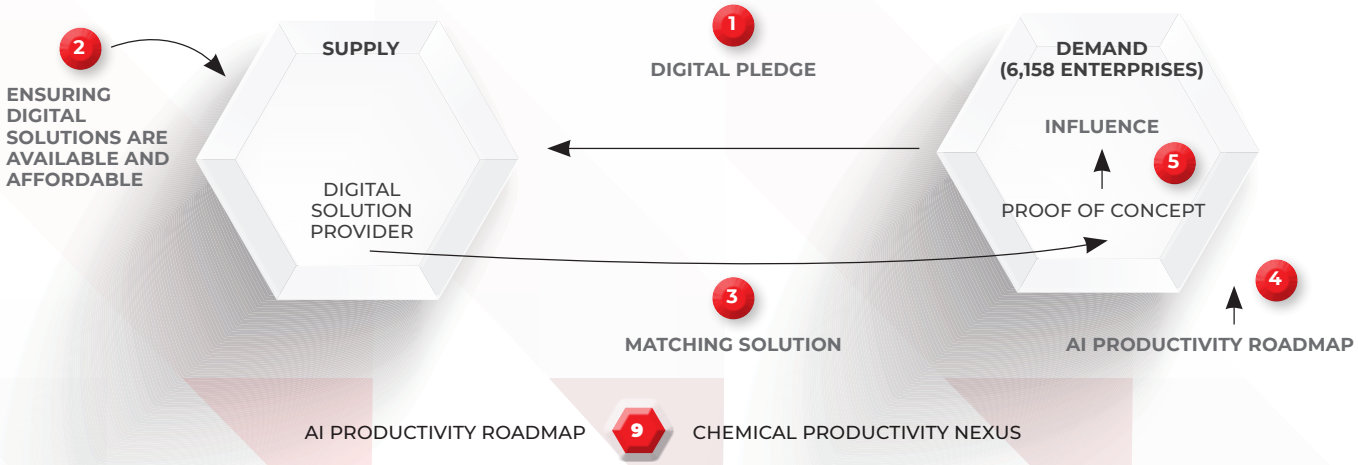
Source : World Competitiveness Yearbook

ACCELERATING PRODUCTIVITY THROUGH DIGITALISATION VIA MPC'S DIGITAL PLATFORM NETWORK+

Business leaders can enhance productivity and strengthen the ecosystem by leveraging MPC's Digital Platform Network+ (DPN+), which provides access to affordable digital solutions and promotes skills enhancement to drive digital transformation.

STEP 1	STEP 2	STEP 3	STEP 4	STEP 5
Digital Pledge (Business Leader/ CEO): Commit to digital transformation and prioritize it in the business strategy.	**Supply** (Digital Solution Providers): Ensure digital solutions are available, affordable, and scalable for businesses.	**Matching Solution** (MPC/Business Leader): Identify and match the right digital solutions to business needs.	**AI Productivity Roadmap** (Business Leader/ CEO): Create a clear, actionable plan for integrating digital technologies	**Influence** (Business Leader/ CEO): Use proof of concept to drive adoption and build internal capacity for digital transformation.

ACTION : IMPROVING THE ECOSYSTEM TO ENCOURAGE ADOPTION, TRANSFORMATION AND SKILL ENHANCEMENT FOR TECHNOLOGY UTILIZATION



SECTORAL TRANSFORMATION : 14 INDUSTRY-SPECIFIC ROADMAPS

Each roadmap outlines the industry overview, digitalisation challenges, and adoption strategies across basic, intermediate, and advanced levels.

LEVEL	DEFINITION
Basic	Foundational tools to digitalize basic processes like record-keeping and sales
Intermediate	Integration of data-driven tools to optimize operations and improve traceability
Advanced	Automation and predictive systems leveraging A.I, IoT and real-time analytics

It also includes recommended digital tools, real-world use cases, and proof-of-concept (POC) projects implemented by actual companies through Nexus collaborations.

For Chemical Productivity Nexus, the **AI Productivity Roadmap for Chemical Manufacturing Industry**, outlines AI-driven digital transformation across three core value chain categories :

1. **Raw Material Sourcing & Supply Chain Optimization**
2. **Manufacturing & Process Efficiency**
3. **Distribution, Customer Engagement & Market Expansion**

Each category aligns with strategic AI adoption to enhance **operational efficiency, cost reduction, and competitive growth** in the chemical industry.

AI AND DIGITAL ADOPTION IN CHEMICAL MANUFACTURING INDUSTRY

This roadmap outlines the progressive digital transformation stages in a manufacturing company within the chemical industry, structured along the value chain. It categorizes digital adoption into Basic, Intermediate, and Advanced levels to drive efficiency, sustainability, and competitiveness.

CATEGORY	FUNCTIONS IN SERVICES	BASIC	INTERMEDIATE	ADVANCED
Raw Material Sourcing and Supply Chain	• Sourcing raw materials (petrochemicals, oleochemicals, specialty chemicals) • Sourcing main and secondary process supplier. • Supplier and logistics performance and coordination. • Environmental compliance & resource sustainability	• Manual procurement & supplier management via spreadsheets • Paper-based inventory and compliance records • Basic Enterprise Resource Planning (ERP) for procurement • Manual supplier performance evaluation. • Foundational manpower development (e.g. Basic Excel, AI basic knowledge).	• IoT sensors for real-time raw material tracking. • Cloud-based procurement automation platforms. • Data-driven supplier performance evaluation • Intermediate manpower development (e.g. Data Analytic, AI Knowledge)	• AI-powered demand forecasting for just-in-time procurement & cost optimization. • Digital twins for supply chain simulations and resource allocation. • Real-time sustainable sourcing analytics (carbon footprint monitoring) • AI-powered supplier performance integration and continuous improvement • Advanced manpower development (e.g. Data Analytic, AI Application)
		AVAILABLE TOOLS • Google Sheets • Odoo • ERPNext • Coursera / edX / Udemy	**AVAILABLE TOOLS** • ThingsBoard, Blynk, Node-RED • Google Workspace, Odoo, Zoho Inventory • OpenAI ChatGPT	**AVAILABLE TOOLS** • Google Sheets with Add-ons (e.g., Forecasting Add-ons), Microsoft Power BI • Python libraries (SimPy, PySim) • Microsoft Learn & Coursera

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CATEGORY	FUNCTIONS IN SERVICES	BASIC	INTERMEDIATE	ADVANCED
Manufacturing & Process Optimization	• Chemical formulation & batch processing. • Equipment maintenance & safety compliance. • Energy & waste management	• Manual batch processing and quality inspections • Monitoring machine performance (e.g., OEE) • Paper-based maintenance and safety reporting • Basic SCADA (Supervisory Control & Data Acquisition) for limited process control • Basic workforce skills (Excel, foundational AI)	• IoT sensors for real-time process monitoring and predictive maintenance • AI-driven quality control for error detection and yield improvement • Cloud-based compliance & hazard monitoring • AI-enhanced machine and process effectiveness tracking (e.g., OEE) • Workforce trained in data analytics & AI fundamentals	• Fully automated smart factories with AI-driven robotic process automation (RPA) • Digital twins for process simulation and energy/raw material optimization • AI-powered sustainability tracking for carbon and ESG compliance • Smart manufacturing solutions (e.g., autonomous guided vehicles) • Advanced AI-based process optimization & workforce expertise
		AVAILABLE TOOLS • Google Sheets • Open OEE • OpenSCADA	**AVAILABLE TOOLS** • ThingsBoard, Blynk, Node-RED • Google AutoML Vision • Microsoft Power Automate	**AVAILABLE TOOLS** • Node-RED • Microsoft Power BI • ROS (Robot Operating System), TinkerCAD / Arduino IDE

AI AND DIGITAL ADOPTION IN CHEMICAL MANUFACTURING INDUSTRY

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CATEGORY	FUNCTIONS IN SERVICES	BASIC	INTERMEDIATE	ADVANCED
Distribution, Customer Engagement & Market Expansion	• Warehousing & distribution logistics • Customer engagement & digital marketing • Regulatory compliance & reporting	• Manual warehouse and inventory tracking • Basic CRM for customer service and distribution • Paper-based regulatory documentation for hazardous chemicals • Manpower development (e.g. Basic Excel, AI basic knowledge). •	• Automated inventory tracking using RFID & IoT sensors • AI-driven customer analytics for demand forecasting and product personalization • Cloud-based compliance reporting aligned with global standards • Manpower development (e.g. Data Analytic, AI Knowledge).	• Blockchain-enabled traceability for product verification and compliance • AI-powered logistics automation optimizing routes and reducing costs • Intelligent warehouses with autonomous guided vehicles (AGVs) • Omnichannel customer engagement integrating AI chatbots and predictive analytics • Manpower development (e.g. Data Analytic, AI Knowledge)
		AVAILABLE TOOLS • Google Sheets, Zoho Inventory • HubSpot CRM • Google Drive • Coursera	**AVAILABLE TOOLS** • ThingsBoard, Blynk, Node-RED • Google Analytics • Google Workspace	**AVAILABLE TOOLS** • Hyperledger Fabric, IBM Blockchain • Google OR-Tools • ROS (Robot Operating System) • Intercom, ManyChat

AI-POWERED DIGITAL TRANSFORMATION JOURNEY FOR CHEMICAL MANUFACTURING INDUSTRY

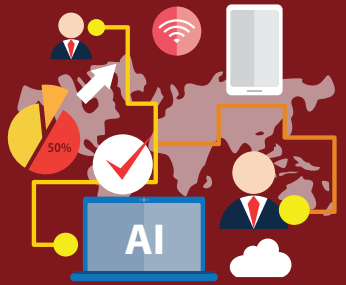
BASIC

Manual processes dominate with paper-based tracking and basic ERP/SCADA systems.

INTERMEDIATE

Adoption of IoT sensors, cloud platforms, and AI-driven analytics enables real-time monitoring, predictive maintenance, automated compliance, and enhanced customer insights.

ADVANCED



Fully automated smart factories with AI-powered robotics, digital twins, blockchain traceability, and intelligent logistics optimize operations end-to-end.

AI AND DIGITAL TRANSFORMATION USE CASES : ENHANCING OPERATIONAL EFFICIENCY

This page highlights real-world examples of successful digital adoption across industries, showcasing how automation and technology integration drive operational improvements, cost savings, and enhanced customer satisfaction.

CHUGOKU PAINT (M) SDN BHD

Chugoku Paints (Malaysia) focuses on the manufacturing and sales of various paint products, including marine, industrial, wood, and container coatings.

PROBLEM

The company faced inefficiencies due to the **manual retrieval of job cards** required for production. Operators had to walk and wait to collect job orders daily, causing delays and inefficiencies. Additionally, supervisors had to manually prepare, print, and distribute job cards, further increasing operational inefficiencies.

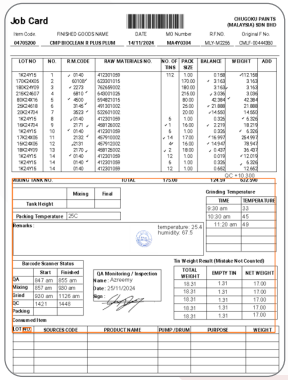
SOLUTION

Chugoku Paint implemented an **automating the job card retrieval process**. This eliminated unnecessary walking and waiting time, streamlining workflow and improving efficiency.

IMPACT

90% decreased in job errors, minimizing production delays & reworks **30% faster** job order processing.

Source : MPC analysis based on Digital Lean proof of concept



The Digital Lean Programme at Chugoku Paint improved productivity by reducing labour costs, enhancing administrative efficiency, minimizing errors, and cutting printing expenses through automation.

HOW TO GET STARTED?

Start by scanning the **QR** code and signing the pledge

DIGITAL PLEDGE

For more information :

https://www.mpc.gov.my/digitalplatformnetwork

APPENDIX

TOOLS	DESCRIPTION
Google Sheets	Free, cloud-based spreadsheets with real-time collaboration.
Odoo	Open-source ERP with inventory management modules.
ERPNext	Open-source ERP solution that covers procurement, inventory, and supplier management.
Coursera / edX / Udemy	Free and low-cost online courses on Excel and AI fundamentals.
ThingsBoard	Open-source IoT platform for device management, data collection, and visualization.
Blynk	IoT platform for connecting sensors and monitoring data via mobile apps.
Node-RED	Connects AI with IoT devices to automate tasks, analyze data, and make smart decisions in real-time.
Zoho Inventory	Basic inventory and order management for small businesses.
Google Workspace	Simple cloud-based tracking and communication tools for suppliers.
OpenAI ChatGPT (free tier)	Explore AI applications and basics through interactive learning.
Google Sheets with Add-ons (e.g., Forecasting Add-ons)	Basic forecasting using built-in functions and simple AI-powered extensions.
Microsoft Power BI	Visualization with forecasting capabilities using AI insights.
Python libraries (SimPy, PySim)	Open-source tools for custom supply chain simulations.
Google Data Studio	Create dashboards that integrate multiple data sources for supplier performance visualization.

APPENDIX

TOOLS	DESCRIPTION
Open OEE	Open-source tools to monitor equipment effectiveness.
OpenSCADA	Open-source SCADA system for basic process control and monitoring.
Google AutoML Vision	Simplifies AI-powered image-based quality inspection.
Microsoft Power Automate	Automate compliance data collection and hazard alerts.
ROS (Robot Operating System)	Open-source framework for building and simulating autonomous robots including AGVs.
TinkerCAD / Arduino IDE	Tools for prototyping robotics and automation hardware.
HubSpot CRM	AI-powered customer relationship management platform designed to streamline sales, marketing, and customer service processes.
Google Drive	Cloud-based storage service developed by Google that allows users to store, access, share, and collaborate on files from anywhere with an internet connection.
Google Analytics	Powerful tool for tracking customer behavior, helping with market insights and forecasting.
SAP EHS	Helps organizations manage environmental, health, and safety processes by integrating with SAP systems for monitoring, reporting, and compliance.
Sphera	Integrates with AI and IoT to enhance environmental, health, safety (EHS) management by providing real-time data analysis, predictive insights, and automation.
IBM Blockchain	Enterprise-level blockchain for product verification and compliance management.
Google OR-Tools	A suite of optimization tools, including routing and logistics optimization algorithm
Intercom	Customer engagement platform with AI-powered chatbots and predictive analytics for enhancing user experience
ManyChat	Chatbot platform that integrates with Facebook Messenger and other messaging platforms, equipped with basic AI functionality

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