

AI PRODUCTIVITY ROADMAP

NAVIGATING PRODUCTIVITY OF THE INDUSTRY
IN THE DIGITAL AND AI ERA

PHARMACEUTICAL MANUFACTURING INDUSTRY

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WHERE AND HOW TO START?



FOREWORDS

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

Datuk Zahid Ismail
Director General
Malaysia Productivity Corporation (MPC)

A portrait of a middle-aged man with dark hair, wearing a dark suit, light blue shirt, and a yellow and blue striped tie. He is standing against a solid red background. Scattered around him and the text are various medical supplies, including pills, capsules, syringes, and blister packs, all in shades of red, white, and yellow.

FOREWORDS

Driving productivity in pharmaceuticals requires a mindset shift where agility, innovation, and compliance converge. Let us champion smart technologies, talent development, and collaborative ecosystems to transform challenges into global opportunities.

Mr Ch'ng Kien Peng
Champion
Pharmaceutical Productivity Nexus

INDUSTRY OVERVIEW AND DIGITALISATION CHALLENGES

The Malaysian pharmaceutical industry is a crucial and expanding sector that contributes significantly to public health and the economy by researching, developing, manufacturing, and distributing a variety of pharmaceutical products, including innovative and generic drugs, traditional medicines, and health supplements. This industry comprises both multinational and local manufacturers, benefiting from government support to boost local production, innovation, and competitiveness, with growth driven by a rising and aging population, increased health awareness, and a growing demand for quality pharmaceuticals.

INDUSTRY OVERVIEW

- **Product Categories** : Biopharmaceutical Products, Generic Products, Health Supplement Products, Traditional Products, Cosmetic Products
- **GDP Contribution** : RM3.4 billion (Year 2022)¹
- **Value Chain / Supply Chain** :
 - a. Raw Material Sourcing
 - b. R&D and Drug Development
 - c. Manufacturing & Formulation
 - d. Quality Control & Regulatory Compliance
 - e. Packaging & Distribution
 - f. Post-Marketing
- **Productivity Level/Growth** : RM 96,928 (7.08% - 2024)²

CHALLENGES IN DIGITALISATION

1. **Gaps in Digital Infrastructure and AI Adoption** : Limited access to advanced digital infrastructure, outdated regulatory technology, and slow AI adoption hinder operational efficiency and productivity improvements.
2. **System Fragmentation and Data Silos** : Disconnected digital systems across production, regulatory, and distribution functions slow data integration, reduce visibility, and delay effective decision-making.
3. **Shortage of Skilled Digital and AI Talent** : Insufficient expertise in data analytics, digital supply chain management, and AI applications limits the ability to optimise operations and embrace emerging technologies.

Source :

1. New Industrial Masterplan 2030 – Pharmaceutical Industry
2. Department of Statistics Malaysia

PHARMACEUTICAL SUPPLY CHAIN

KEY ACTIVITIES



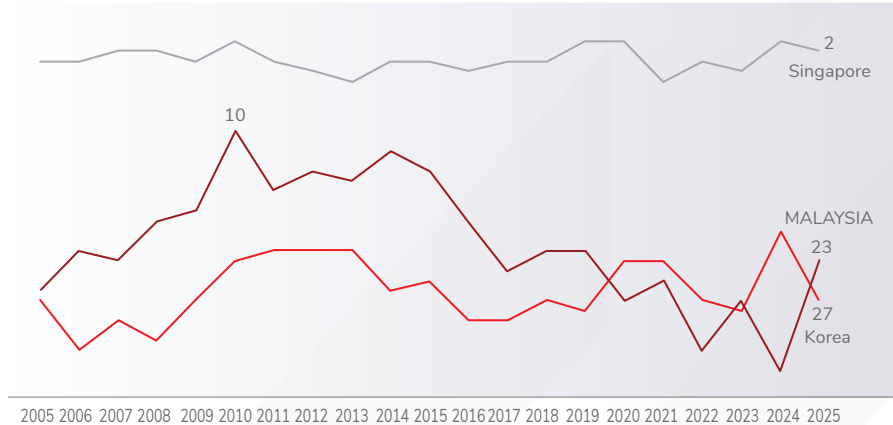
Research and Development (R&D) → Manufacturing → Packaging and Distribution → Post-Marketing →

API	Excipient	Manufacturer	Packaging & Labelling	Distribution & Logistic	- Government Hospital - Private Hospital - Private Clinics - Retail Pharmacies - Export Market	 Patient/ User
Sourcing and production of Active Pharmaceutical Ingredients (API), the primary active components that produce the intended effects in medications.	Creation and preparation of non-active ingredients used in drug formulations, such as fillers, binders, and preservatives, which aid in the delivery of the API.	Process of transforming APIs and excipients into final pharmaceutical products like tablets, capsules, and injectables.	Stage that involves safely packaging pharmaceutical products for distribution and adding necessary labeling for compliance and information.	Storage and transportation of pharmaceutical products from manufacturers to end users, including wholesale and retail distribution.		

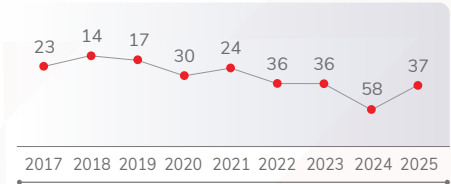
ACCELERATING TECHNOLOGY ADOPTION TO ENHANCE NATIONAL COMPETITIVENESS

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

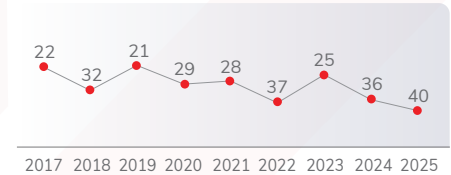
OVERALL COMPETITIVENESS



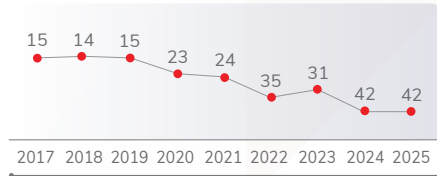
USE OF DIGITAL TOOLS AND TECHNOLOGY



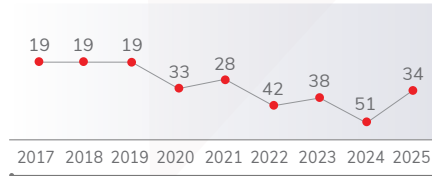
DIGITAL/TECHNOLOGICAL SKILLS



MANAGEMENT PRACTICES



CORPORATE AGILITY



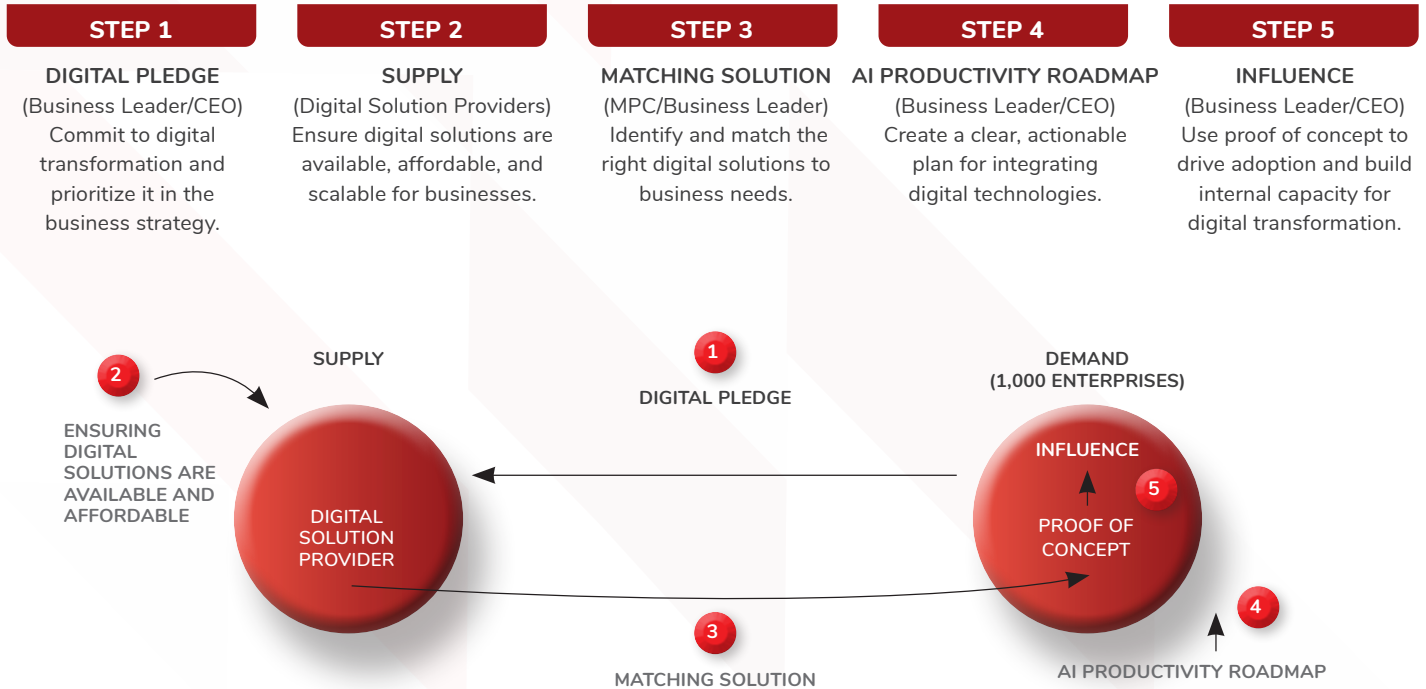
DIGITAL TRANSFORMATION IN COMPANIES



Source : World Competitiveness Yearbook

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

The figure illustrates a structured approach to strengthening the digitalisation ecosystem by aligning technology supply with industry demand.



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 Machine Learning

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

AI AND DIGITAL ADOPTION IN PHARMACEUTICAL INDUSTRY

AI and digital tools are becoming essential for pharmaceutical manufacturers and supply chain players to enhance efficiency, ensure compliance, and remain globally competitive.

This roadmap highlights key areas where AI and digital adoption can deliver significant impact.

The focused key areas are as follows :

SUPPLY CHAIN & INVENTORY

Leveraging AI for demand forecasting, raw material planning, and inventory optimization can reduce waste, mitigate shortages, and improve procurement strategies.

MANUFACTURING & FORMULATION

Science-based Design of Experiments (DoE) significantly shortens the product development cycle by systematically optimizing experimental processes. This approach enhances decision-making efficiency, reduces the number of trials required, and ensures faster delivery of high-quality products to market.



AI AND DIGITAL ADOPTION IN PHARMACEUTICAL 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
Supply Chain & Inventory	- Inventory Management - Procurement & Supplier Management	- Manual stock tracking (Excel, paper-based) - Traditional procurement (phone, email) - Local supplier engagement without integration	- RFID/barcode tracking for real-time inventory visibility - Supplier management platforms for digital procurement and automated workflows	- AI-powered demand forecasting to optimize inventory and reduce waste - IoT-enabled smart warehousing for real-time monitoring
		Suggested Tools - Excel, Google Sheets, email - WhatsApp - basic procurement systems	Suggested Tools - Barcode/RFID-based Tracking - Inventory Management Software - Supplier Management Platforms - e-Perolehan modules	Suggested Tools - AI-driven Demand Forecasting - IoT-enabled Smart Warehousing - AI-driven Procurement Analytics - Blockchain-based Smart Contracts



For more info on the digitalisation tools, go here : <https://www.mpc.gov.my/digitalplatformnetwork>. Or scan the QR code

AI AND DIGITAL ADOPTION IN PHARMACEUTICAL INDUSTRY

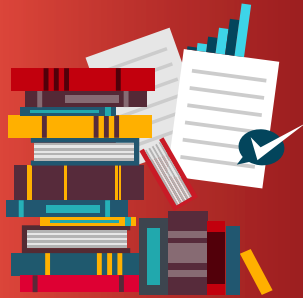
This roadmap outlines the progressive digital transformation stages in a manufacturing company within the chemical industry, structured along the value chain. It categorizes digital adoption into Basic, Intermediate, and Advanced levels to drive efficiency, sustainability, and competitiveness.

CATEGORY	FUNCTIONS IN SERVICES	BASIC	INTERMEDIATE	ADVANCED
Manufacturing & Formulation	- Batch Production - Equipment Monitoring - Process Optimization - Formulation Control	- Manual batch records - Paper SOPs - Whiteboard scheduling	- Supplier databases & ERP - Barcode/RFID tracking - Digital compliance checklists	- AI-driven supplier risk scoring & predictive analytics - IoT-integrated smart warehousing systems - Blockchain-based traceability and authentication
		Suggested Tools - Microsoft Excel / Google Sheets - Manual filing systems - Email communication logs	Suggested Tools - SAP ERP - Microsoft Dynamics 365 - Barcode/RFID Tracking Systems - Digital Compliance Checklists - Supply Chain Management Solutions - PAT process analytical technology - RPA robotic process automation	Suggested Tools - IBM Watson for Drug Discovery - IoT-Integrated Smart Warehousing Systems - Blockchain-Based Traceability & Authentication - AI-Driven Supplier Risk Scoring & Predictive Analytics - Advanced Manufacturing Execution Systems



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AI-POWERED DIGITAL TRANSFORMATION JOURNEY PHARMACEUTICAL MANUFACTURING JOURNEY



BASIC

Basic stage relies on manual processes, using Excel or Google Sheets for tracking. Equipment monitoring and process optimization are paper-based, with minimal automation and integration.



INTERMEDIATE

Intermediate stage, automation is introduced with ERP systems, barcode/RFID tracking, and digital compliance checklists. These tools improve inventory management and process visibility but lack advanced predictive analytics or full integration.



ADVANCED

The advanced stage integrates AI, IoT, and blockchain.

AI-driven forecasting optimizes inventory, while IoT-enabled smart warehousing enhances real-time monitoring. Blockchain ensures traceability, optimizing processes and improving security through advanced technologies.

WHERE AND HOW TO START?

Start by scanning the QR code and signing the pledge

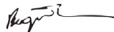
DIGITAL PLEDGE

**Pledge**
GO B.I.G WITH DIGITAL
BREAKTHROUGH. INTEGRITY. GOOD

I commit to Go B.I.G with Digital—to lead with integrity, embrace technology, and boost productivity. Digital is for everyone, and it starts with me.

Saya komited untuk Go B.I.G with Digital—memimpin dengan integriti, menerima teknologi, dan meningkatkan produktiviti. Digital untuk semua, dan ia bermula dengan saya.

Go B.I.G with Digital



Business Leader
(Organisation Leader)

Dato' Wei Chuan Beng
Champion
Digital Productivity Nexus



For more information :

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



ACKNOWLEDGEMENT

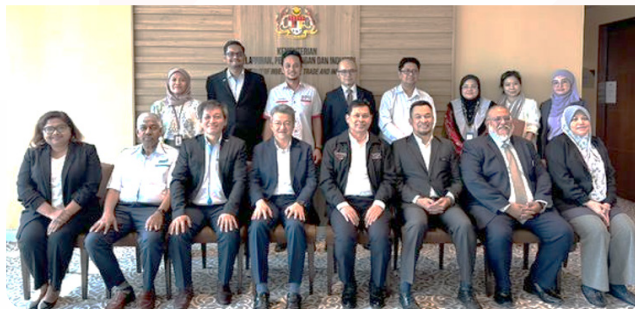
NAME AND DESIGNATION

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Pharmaceutical Productivity Nexus	Mr Ch'ng Kien Peng, Champion Mr. Billy S. Urudra, Malaysian Organisation of Pharmaceutical Industries (MOPI) Mr. Wan Amir - Jeffery Shafaf Ahmad Nazimuddin, Doupharma Biotech Berhad Mr. Joe Sian, Biocon Sdn Bhd Mr. Rahil Mahmood, Novugen Pharma Sdn Bhd Mr. Peter Rayar Sowrimuthu, KCK Pharmaceutical Industries Sdn Bhd Mr. David Ho, Hovid Berhad Dr. Badarulhisam Abdul Rahman, Pharmaniaga Berhad Representatives Ministry of Investment, Trade and Industry (MITI) Representatives Ministry of Health Malaysia (MOH) Representatives Ministry of Science, Technology and Innovation (MOSTI) Representatives National Pharmaceutical Regulatory Agency (NPRA) Representatives Malaysia External Trade Development Corporation (MATRADE) Representatives Malaysian Investment Development Authority (MIDA)
Industry Partners	Malaysian Organisation of Pharmaceutical Industries (MOPI)

GALLERY



GALLERY



NOTES

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MALAYSIA PRODUCTIVITY CORPORATION